Knik Arm Crossing

Cost Estimate Review
Final – May 2009

KABATA KNIK ARM CROSSING DOTAPF

Prepared by:

U.S. Department of Transportation
Federal Highway Administration

EXECUTIVE SUMMARY

The FHWA Innovative Program Delivery Office, the FHWA Office of Infrastructure, the FHWA Alaska Division Office, the Knik Arm Bridge and Toll Authority (KABATA), KABATA's consultant PND Engineers, Inc., and the National Constructor's Group conducted a workshop to review the cost estimate for the Knik Arm Crossing (Project). This Team met at the KABATA office in Anchorage, Alaska from February 23 through February 27, 2009 to assess the reasonableness of the current cost estimate and to develop a probability range for the cost estimate that represents the Project's current stage of development. A Cost Estimate Review for this project was previously performed by FHWA in April 2006. This CER is based on a more advanced design, an evaluation of resulting risks, and an updated cost estimate.

Significant results of the review:

- The proposed delivery of this Project is through a Public Private Partnership (P3) Concession contract. While this allows for a substantial innovation and flexibility in the Concession's design and construction methods, the final design of the project is not known at this time. Therefore, unlike traditional delivery methods such as design-bid-build, details of the design, construction and schedule will not be known until later in the procurement process. This CER used quantities developed from KABATA's design. The successful Concession will develop more accurate quantities based on their design, which may be considerably different from the ones used here.

- The environmental mitigation for threatened and endangered species has not been determined. It is important to determine the necessary environmental mitigations for this Project as soon as possible to manage the Project's budget.

- Because of the P3 procurement approach being proposed for this project, many details that would be known in a traditional project delivery method are not known yet, such as location of borrow sites on the east side of the Project; the bridge and embankment construction methods; and construction phasing to maximize revenue (toll) collection.

- KABATA should consider obtaining agreements with the Port of Anchorage, the U.S. Army Corps of Engineers, and the Elmendorf Air Force Base regarding access, material sources, and hauling prior to releasing the Request for Proposal (RFP). Securing borrow sources in advance of the RFP will provide more flexibility in construction staging for the Concession.

- Most of the Project's construction cost risk, which will be borne primarily by the Concession, is due to the uncertainty in escalation costs (especially for Phase 2) and due to the uncertainty in the Phase 2 construction cost.

- Because the final design is not known at this point in the P3 procurement process the overall length of the bridge, the number of spans and span lengths and the final approach embankments are unknown which may impact the accuracy of estimated construction cost. However, the Concession will make a "hard bid" offer for the procurement and will bear most of the risk for the construction cost.

- The results of the review indicate that there is a 90% likelihood that the range of all costs (e.g. construction, contingencies, support, environmental mitigations, engineering, utilities, right-of-way, tolling, etc.) for the entire Project will be between approximately $1.5 billion and $1.6 billion. For Phase 1, the 90% likelihood is between approximately $670 million and $740 million. For Phase 2, the 90% likelihood is between approximately $750 million and $920 million. For Phase 2, the review team had to develop assumptions for construction work that could be scheduled between 10 and 20 years out. For Phase 2, especially, the impact of cost escalation is the largest factor in the variability of costs.

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Chapter 1 - Review Summary

INTRODUCTION: The FHWA Innovative Program Delivery Office, the FHWA Office of Infrastructure, the FHWA Alaska Division Office, the Knik Arm Bridge and Toll Authority (KABATA), KABATA's consultant PND Engineers, Inc., and the National Constructor's Group conducted a workshop to review the cost estimate for the Knik Arm Crossing (Project). This Team met at the KABATA office in Anchorage, Alaska from February 23 through February 27, 2009. A Cost Estimate Review for this project was previously performed by FHWA in April 2006. This Cost Estimate Review is based on a more advanced design, an evaluation of resulting risks, and an updated KABATA cost estimate.

The objective of the review was to assess the reasonableness of the current cost estimate and to develop a probability range for the cost estimate that represents the Project's current stage of design. This document summarizes and reports the results of this review.

The Review Team's methodology was to conduct an unbiased risk-based review of the Project's cost. The Review Team was briefed by KABATA on the Project scope, current cost and schedule estimates, and status. The Review Team reviewed current relevant documents and reports on the Project.

The Safe, Accountable, Flexible, Efficient Transportation Equity Act: A Legacy for Users (SAFETEA-LU) (Pub.L. 109-59, 119 Stat. 1144) requires the financial plan for all Federal-aid projects with an estimated total cost of $500,000,000 or more to be approved by the Secretary (i.e., FHWA) based on reasonable assumptions. The $500,000,000 threshold includes all costs (NEPA, PE, CN, R/W, UT, CE, etc.). The FHWA has interpreted reasonable assumptions to be a risk based analysis. (Projects that are between $100 million and $500 million are subject to review at the discretion of the FHWA Division Office.) The cost estimate reviews are required to provide the risk based assessment of the estimate and are used in the review of the financial plan.

The Appendix of this Report includes the Review Team's draft close-out presentation given on February 27, 2009.

PROJECT BACKGROUND: The Knik Arm Crossing Project includes the construction of a bridge across the Upper Cook Inlet above Anchorage, Alaska, to connect the Municipality of Anchorage (MOA) with the Matanuska-Susitna (Mat-Su) Borough. The Project is expected to consist of the Initial Buildout in Phase 1 and a Future build-out in Phase 2 as described in the Final Environmental Impact Statement (EIS). The cost estimate review was consistent with Phase 1 and Phase 2 description in the EIS.

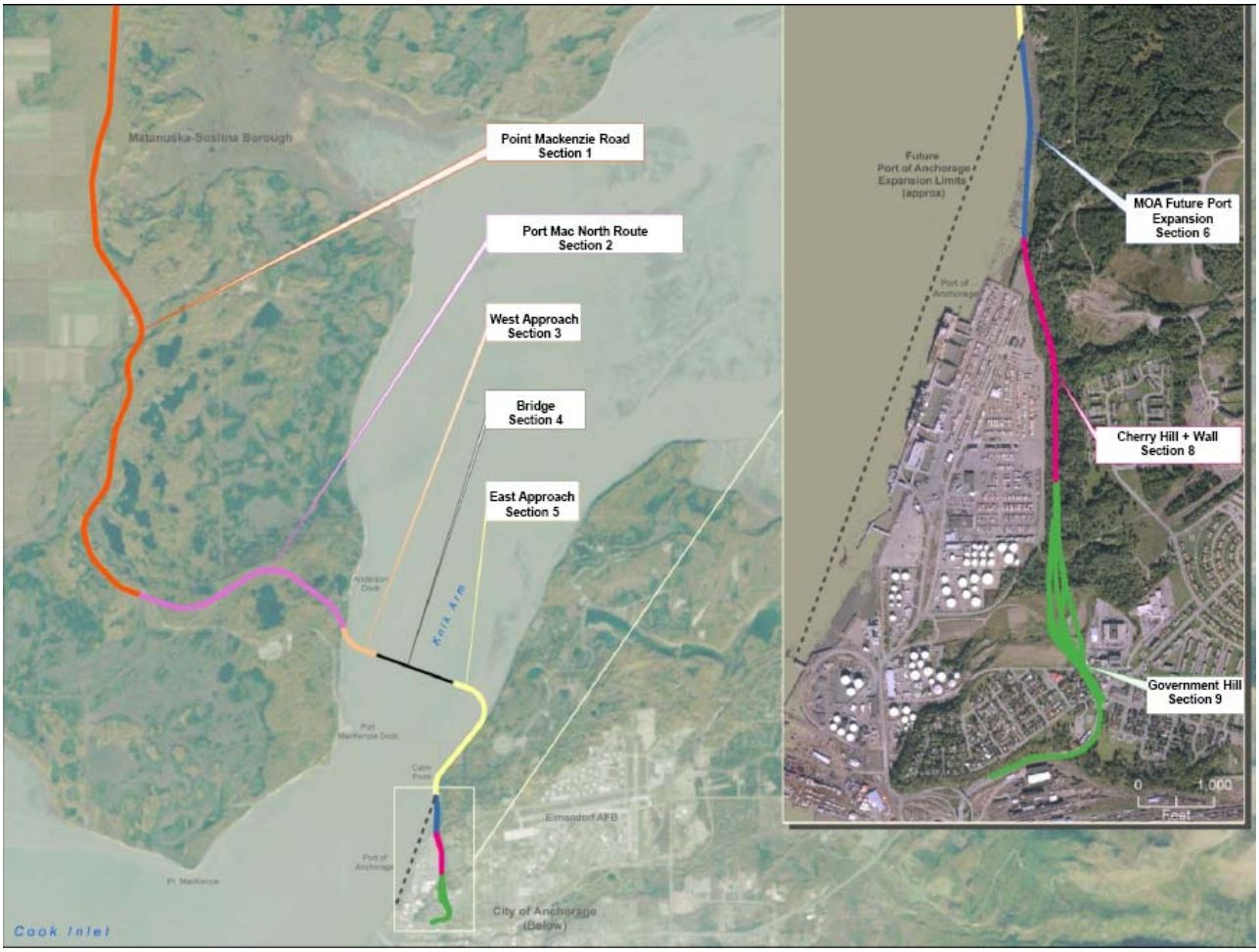
The EIS identified Phase 1 as a '2 lane' 2 way system. The EIS also requires the project eventually to be expanded to '4 lanes' along with a multi purpose pathway. The assumption was made during the review that a single bridge substructure would be built during Phase 1 that would accommodate the full design layout including a pedestrian

path, without the need for additional piles or piers. The Phase 1 embankments and roadways must also be capable of being expanded to '4 lanes' along with a multi purpose pathway. The EIS conceptual design does not provide for embankment construction in the tideland area during Phase 2. Phase 1 includes:

- Improving Point MacKenzie Road from the western bridge approach northward to Burma Road
- Constructing the west and east bridge approaches (constructed fill)
- Constructing the bridge
- Constructing a fill through the Port of Anchorage area (below the Cherry Hill bluff)
- Constructing a cut and cover tunnel through the Government Hill historic area, and
- Connecting the Knik Arm Crossing roadway to the "A" Street/"C" Street couplet.

Phase 2 is defined by the work necessary for 4 lane – 2 way traffic and the road connection to Ingra Street and Gamble Street. The Knik Arm Bridge and Toll Authority (KABATA) was established within the Alaska Department of Transportation and Public Facilities (ADOT&PF) to deliver the Project. The bridge that is to be constructed is expected to be 8,200 feet in length.

The Knik Arm Crossing will be part of the National Highway System (NHS), and the assumption was made during the review that the Project will be constructed in accordance with FHWA and Alaska Department of Transportation and Public Facility standards.


Point Mackenzie Road
Section 1
Port Mac North Route
Section 2
West Approach
Section 3
Bridge
Section 4
East Approach
Section 5
MOA Future Port
Expansion
Section 6
Cherry Hill + Wall
Section 8
Government Hill
Section 9
Matanuska-Susitna Borough
Future
Port of Anchorage
Expansion Limits
(approx)
Knik Arm
Elmendorf AFB
City of Anchorage
(Below)
Cook Inlet
0
1,000
Feet

COST SUMMARY:

The National Constructors Group developed a Knik Arm Crossing Conceptual Cost Estimate, dated January 2009, under contract with the ADOT&PF. The estimate was based on conceptual design documents provided by ADOT&PF and was developed based upon procedures utilized by heavy civil engineering contractors to prepare competitive bids to public transportation agencies. This estimate was made available to the review team prior to the review and was used to model construction costs for non-bridge work during the review.

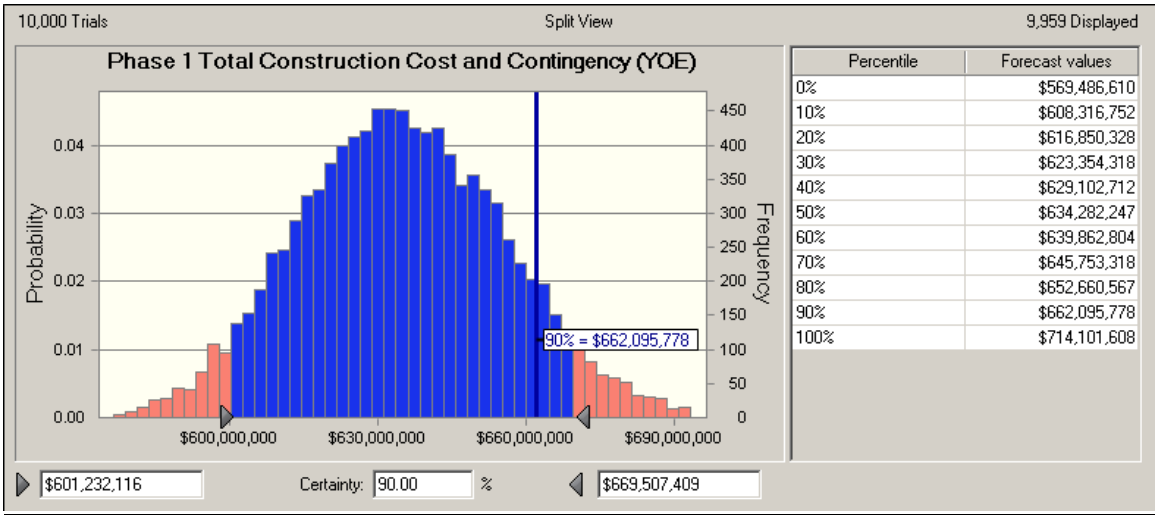
During the review, KABTA provided a cost estimate for the Project. The KABATA bridge estimate was used to model bridge costs.

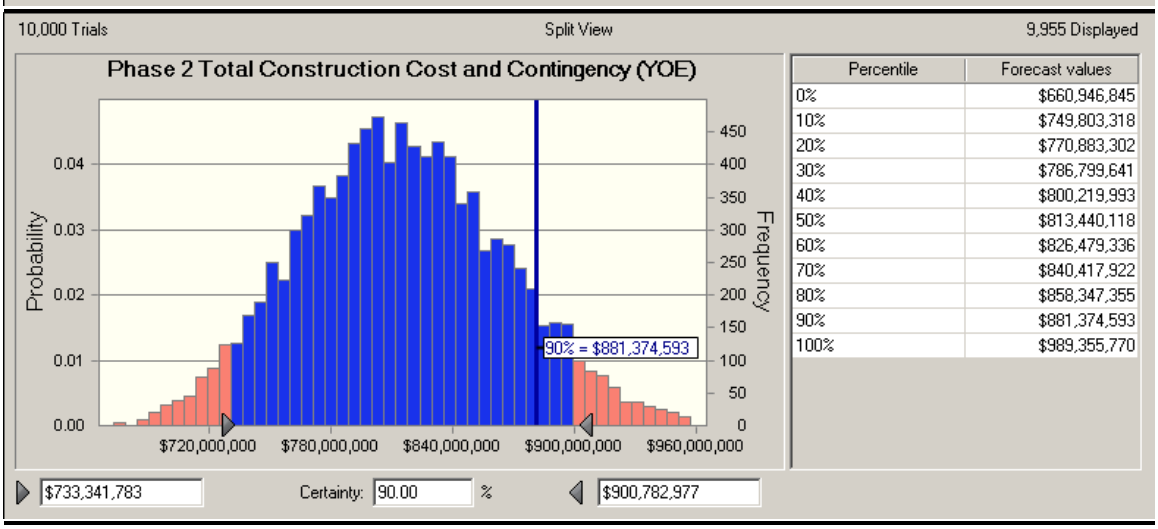
Although the estimate model used during this review was based on the best available information, the Concession's cost estimate will be based on the Concession's design and that estimate may result in different design quantities and different pay items.

The construction cost estimate includes a 15% contingency which is intended to cover known costs that have not been included in the estimate (e.g. frontage roads and pedestrian paths) and unknown costs.

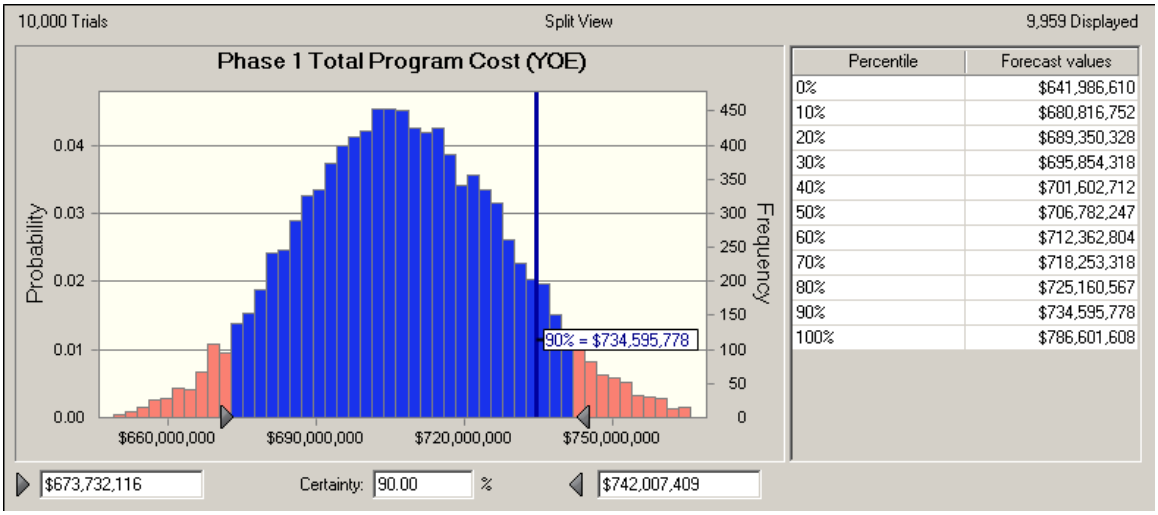
To express the estimate as a range, threats and opportunities were developed and the workshop review team selected assumption curves that best modeled the cost impacts and probabilities based on the uncertainty associated with those threats and opportunities. The assumption curves were incorporated into a Monte Carlo program to develop forecast curves that represent a cost estimate range for the Project. This simulation was performed on the revised estimate.

The following two charts show the year of expenditure construction cost estimates with contingency for Phase 1 and Phase 2. The certainty in the Chart (shown using the blue or darker shaded area) represents the likelihood that the total cost for the cost identified will be between the two values shown under the curve, based on the threats, opportunities and uncertainties modeled during the reviews. The certainty shown is based on the potential variability of the inputs used to derive the estimate. As such, it should be noted that events such as deflation or extreme inflation, the impact of world events, or other unforeseen extreme circumstances were not considered in the review.

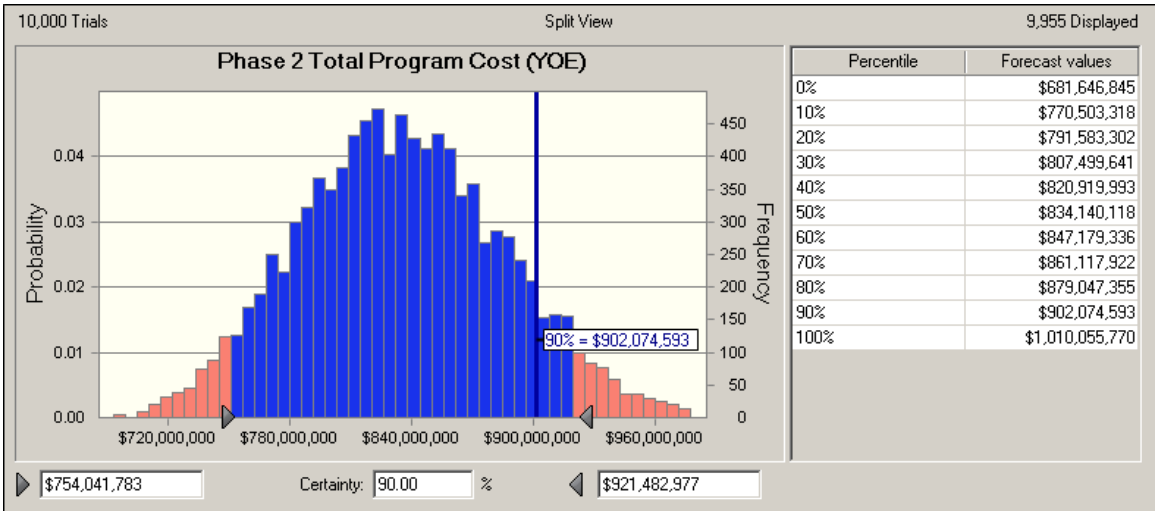




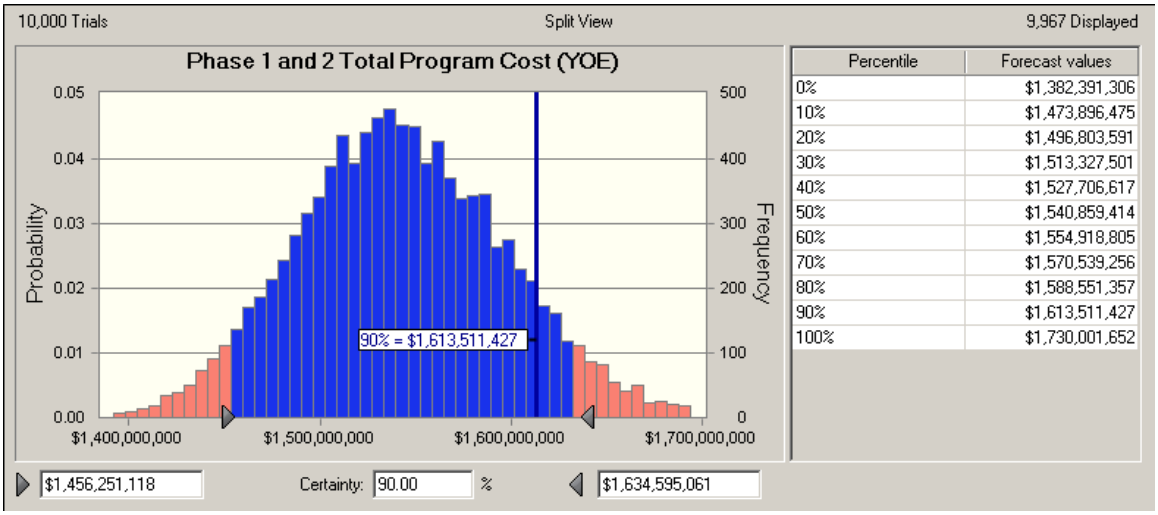
The next three charts represent the simulation for the total overall program cost (including construction, contingencies support, environmental mitigations, engineering, utilities, right-of-way, tolling, etc.) of the Project for Phase 1, Phase 2, and for the combined Phase 1 and Phase 2. The certainty in the Chart (shown using the blue or darker shaded area) represents the likelihood that the total cost for the cost identified will be between the two values shown under the curve, based on the threats, opportunities and uncertainties modeled during the reviews. The certainty shown is based on the potential variability of the inputs used to derive the estimate. As such, it should be noted that events such as deflation or extreme inflation, the impact of world events, or other unforeseen extreme circumstances were not considered in the review.



Percentile	Forecast values
0%	$641,986,610
10%	$680,816,752
20%	$689,350,328
30%	$695,854,318
40%	$701,602,712
50%	$706,782,247
60%	$712,362,804
70%	$718,253,318
80%	$725,160,567
90%	$734,595,778
100%	$786,601,608



Percentile	Forecast values
0%	$681,646,845
10%	$770,503,318
20%	$791,583,302
30%	$807,499,641
40%	$820,919,993
50%	$834,140,118
60%	$847,179,336
70%	$861,117,922
80%	$879,047,355
90%	$902,074,593
100%	$1,010,055,770



Percentile	Forecast values
0%	$1,382,391,306
10%	$1,473,896,475
20%	$1,496,803,591
30%	$1,513,327,501
40%	$1,527,706,617
50%	$1,540,859,414
60%	$1,554,918,805
70%	$1,570,539,256
80%	$1,588,551,357
90%	$1,613,511,427
100%	$1,730,001,652

SENSITIVITY ANALYSIS:

A Sensitivity Chart demonstrates the relative impact of each assumption curve in the estimate model. The following Charts show the relative impacts of the modeled uncertainly for the Phase 1, Phase 2 and total year of expenditure program cost:

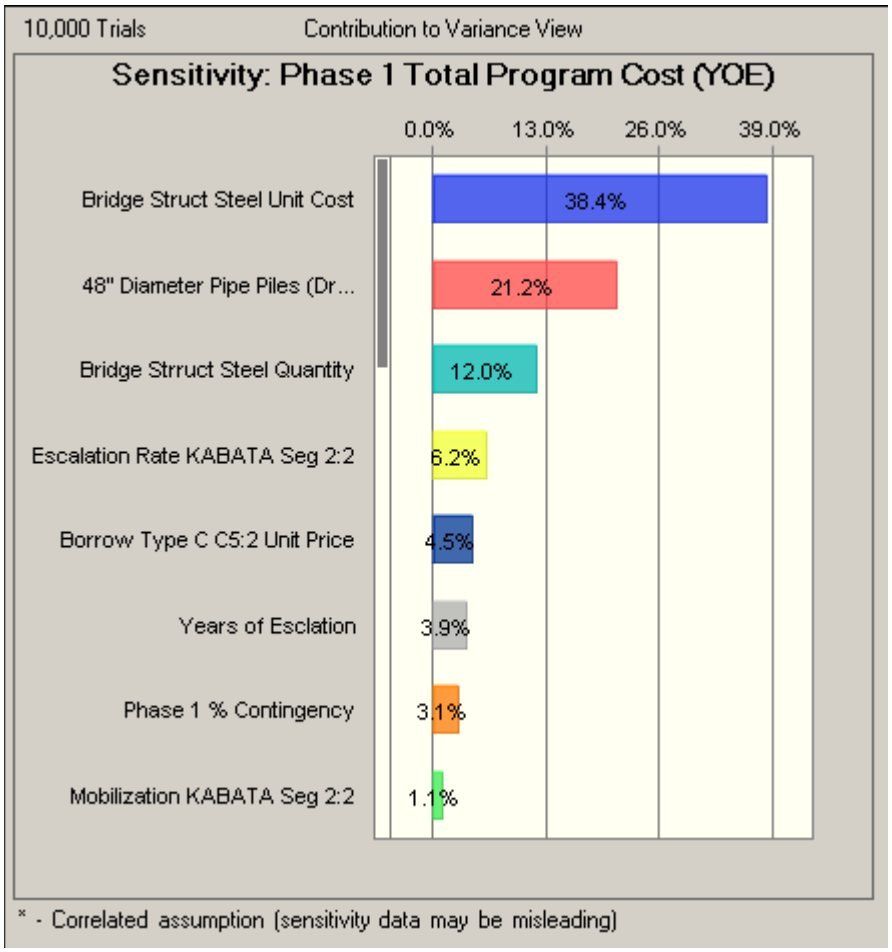


Figure 1

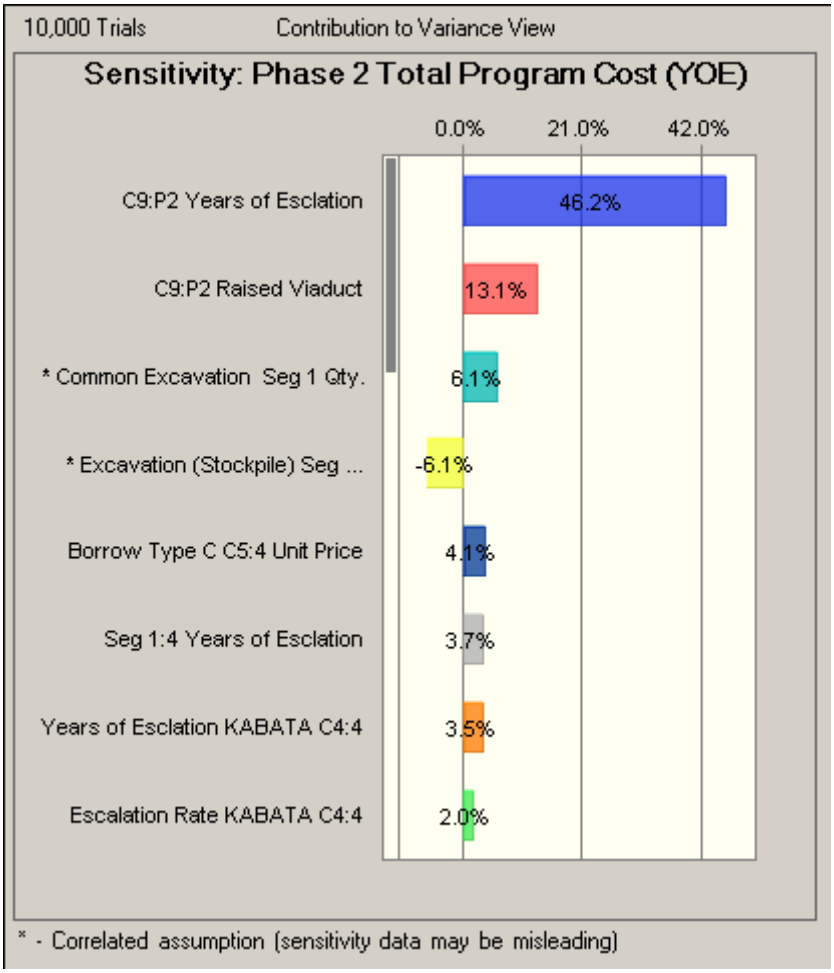

10,000 Trials
Contribution to Variance View
Sensitivity: Phase 2 Total Program Cost (YOE)
0.0%
21.0%
42.0%
C9:P2 Years of Esclation
46.2%
C9:P2 Raised Viaduct
13.1%
* Common Excavation Seg 1 Qty.
6.1%
* Excavation (Stockpile) Seg ...
-6.1%
Borrow Type C C5:4 Unit Price
4.1%
Seg 1:4 Years of Esclation
3.7%
Years of Esclation KABATA C4:4
3.5%
Escalation Rate KABATA C4:4
2.0%
* - Correlated assumption (sensitivity data may be misleading)

Figure 2

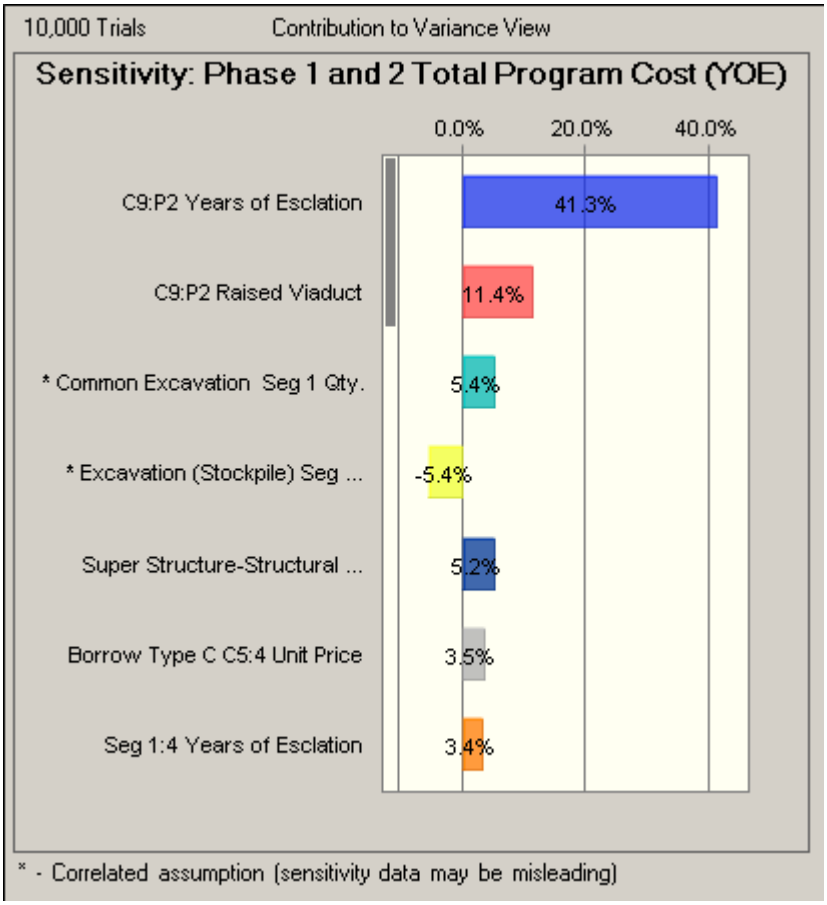


Figure 3

Overall, the greatest contribution to the variation in the total program cost estimate is due to estimated escalation costs for the construction costs for Phase 2 of Section 9 (Government Hill). (See Figure 3) The year of expenditure construction estimate for this work is over $400 million (including contingency). The escalation amount for this construction work was based on an estimated 18 years to the midpoint of construction. At this time, the construction phasing and schedule of the project is unknown since the Concession has significant flexibility to schedule Phase 2 improvements that maximizes revenues and minimizes construction cost. These factors contribute to a wide range of potential escalation cost. The impact of cost escalation is the largest factor in the variability of costs.

The second greatest contribution to the overall variation in the total cost estimate is due to the Viaduct construction cost for Phase 2 of Section 9 (Government Hill). (See Figure 3) The current year construction cost for the Viaduct is estimated at $93 million with a variance of plus or minus 20%.

Since the estimate model correlated the Common Excavation quantity with the Excavation quantity to reflect the potential for earthwork balancing, these times show up

on the Sensitivity Chart with a high contribution to the overall variation. However, this is misleading. As one quantity increases, the other decreases; therefore these two items do not provide a significant overall effect on the overall Project estimate.

The next contributor to the overall variation is the unit price for the Structural Steel for the bridge superstructure in Phase 1. There is uncertainty regarding this item due to the uncertainty in the final design affecting bridge length and spans, unknown contractor construction methods, unknown specifics in the structural steel fabrication; and the potential for strict construction tolerances. The total current year cost for this item is $187 million and the variance is plus or minus 12%.

RISK (THREATS AND OPPORTUNITIES) SUMMARY: During the course of the workshop the Review Team identified the following risks (threats and opportunities):

THREATS -

- Segment 1 - Maintaining existing Mat-Su Borough roads during construction.
- Segment 1 - Uncertainty in the quantity of muck excavation (Phase 2).
- Segment 2 – Uncertainty in the Port Mackenzie Egress Interchange design.
- Segments 3 and 5 - Constructing embankments below 20 feet (and below 30 feet) require working around the tidal influences of the Knik Arm. At this time, the design and construction details are not known and are expected to be finalized by the Concession.
- Segment 4 - Noise Attenuation requirements during installation of pipe piles.
- Segment 4 – Uncertainty in pile cap design and construction.
- Segment 4 – Uncertainty regarding mitigation requirements for wildlife and marine life (e.g. Beluga Whale and salmon) and its effects on construction operations.
- Segment 4 – Uncertainty about the financial approach regarding equipment for construction of the bridge.
- Segment 4 – Bridge design (e.g. span lengths and materials) may be impacted by threatened and endangered species mitigation.
- Segment 4 – Uncertainty in scour design (e.g. Armor Rock).
- Segment 5 - Borrow sites, material sources and haul distance are uncertain. Although this is a risk for all segments, the greatest potential impact is on Section 5 due to the limited availability of significant borrow near the project on the Anchorage side.
- Section 8 - Uncertainty of the stability and icing of Cherry Hill slope.
- Section 9 – Although surveyed, there is uncertainty in the quantity and severity of contamination.
- All segments – Possibility of seismic and volcano activity during construction.
- All segments – All projects have a potential for unknown risks (e.g. management reserve)
- All segments - All permits (including wetland mitigation) have not been obtained; therefore final permit conditions have not been established.
- All segments – Right-of-way has not been purchased.

- All segments – The impact of the American Recovery and Re-investment Act on the construction market is uncertain.
- All segments – Due to design and environmental uncertainties, identifying a contractor's risk tolerance is difficult.
- All segments – There is potential for schedule delays
    - ROD
    - NOAA-NMFS
    - Procurement
- All segments – Construction delays could impact Concession's revenue stream.

OPPORTUNITIES -

- Segments 3 and 5 - Reinforced earth walls or slopes could reduce the cost of the approach embankments.
- Segment 3 and 5 – Alternative methods to construction approach embankments (i.e. trestle system) could reduce costs.
- Segment 4 – Consideration for alternate foundations.
- Segment 8 – Flatten or steep slopes to reduce the amount of wall needed.
- Segment 8 – Consider the use of alternative wall concepts.
- Segment 8 – Evaluate moving alignment at Cherry Hill west to reduce cut and associated retaining wall costs.
- All segments - Develop a public information video and good public relations. This may include developing good communications with Government Hill and Anchorage residents to show how quickly cut and cover tunnels can be built.
- All segments – Maximizing design flexibility in a PPP procurement can save cost
- All segments - Obtain materials agreement with Elmendorf AFB for use of borrow pits prior to RFP.
- All segments – There is a potential to use 3 lane concept (with a reversible lane) to defer the need to expand to 4 lanes.
- All segments - Obtain access permission through Port of Anchorage prior to RFP.
- All segments (except Segment 4) – Optimize schedule and alignment to balance earthwork.
- All segments – Evaluate the use of dredged material from other operations (e.g. Army Corps contracts).
- All segments – Obtain permits with design flexibility prior to RFP to reduce permit uncertainty.

ISSUES NOT MODELED: Although not modeled in the simulation, the Team identified the following issues that require follow-up:

- Material and Access agreements should be executed before the Request for Proposals is issued.
- NEPA – The ROD with necessary environmental mitigations should be issued before the Request for Proposals is issued. The simulation did not model the cost impacts associated with a new location for the bridge or other major scope changes.

- IFP and PMP approvals – The Alaska Division Office must accept a Project Initial Financial Plan and a Project Management Plan before awarding a Concession contract.

REVIEW RECOMMENDATIONS: During the workshop, the Review Team developed the following recommendations for implementation:

- Continue to periodically update estimates.
- Continue to resolve environmental and permitting issues.
- Pursue agreements with ports and Elmendorf AFB regarding access, material sources, and hauling.
- Follow up with the development of a risk management plan to manage threats and opportunities – and update risk analysis

NEXT STEPS: These follow-up actions were developed at the end of the workshop:

- The closeout presentation made on February 27, 2009 completed the review. FHWA will prepare a draft report documenting review findings on or about 30 days after the review. After receipt of comments, FHWA will finalize the report within 30 days.

- The FHWA will use the results of this estimate review during the completion of the ROD process.

Chapter 2 - Review Methodology

STUDY OBJECTIVE: The objective of the review was to verify the accuracy and reasonableness of the current total cost estimate and schedule to complete the Project and to develop a probability range for the cost estimate that represents the Project's stage of design.

REVIEW TEAM: The Project Review Team was developed with the intent of having individuals with a strong knowledge of the Project and/or of major project work and expertise in specific disciplines of the Project. This Review Team participated together throughout the workshop, and individuals with specific Project expertise briefed the Review Team on that portion of the Project estimate development process, including the development of the Project cost estimate quantities, unit prices, assumptions, opportunities and risks.

The following organizations were represented at portions of the review:

- FHWA Alaska Division
- FHWA Office of Infrastructure
- FHWA Innovative Program Delivery Office – Project Delivery Team
- Knik Arm Bridge and Toll Authority (KABATA)
- PND Engineers, Inc.
- The National Constructor's Group

During the opening and close-out, the Alaska Department of Transportation and Public Facilities (Alaska DOT/FP) was represented.

DOCUMENTS REVIEWED: Documents provided by KABATA and the Alaska DOT/FP to the Review Team prior to and during the workshop:

- Knik Arm Crossing Conceptual Cost Estimate, dated January 2009, prepared by The National Constructor's Group for AK DOT/PF
- KABATA Bridge cost estimate prepared by PND
- Cost Estimate Review Study dated June 2006, prepared by PBS&J for FHWA, and updated by KABATA
- Project Environmental Impact Statement
- FHWA Memorandum dated February 17, 2006 from Joe Krolak, Senior Hydraulic Engineer, Office of Bridge Technology, Hydraulic and Scour Review of Knik Arm Bridge
- SHPO commitments
- Bid Tabs
    - Alaska DOT
    - Point Mackenzie (Mat-Su Borough)
    - Port of Anchorage Expansion: North Extension – Barge Berth
- Spin Fin Piles Report, prepared by PND

GOOD PRACTICES:

- Estimates were provided for all Project costs. (Construction, Agency, Support, Utilities, ROW, etc.)
- Use of the National Constructor's Group to develop a cost estimate.
- Update of the previous FHWA cost review from 2006
- Preparation of a cost risk analysis report
- Use of local consultant (PND) familiar with the local Alaska environment.
- Use of up to date unit price histories
- Use of contingencies (15%)

REVIEW PROCESS:

- Project Team input
    - FHWA, KABATA, The National Constructor's Group, PND)
- Methodology
    - Understanding of the estimate development process
    - Determining reasonableness of unit costs and quantities
    - Developing the Threats and Opportunities for various items
- Threats and Opportunities Analysis
    - Focused on major cost items
    - Determined impact and probability for identified risks
    - Developed probability assumption curves
- Performed Monte Carlo modeling of potential cost outcomes to determine a probabilistic estimate forecast
- Not an independent estimate
- Assumed a Public Private Partnership procurement
- Only valid for model assumptions

Chapter 3 – Probability Analysis

The objective of the probability analysis during the workshop was to determine the Review Team's confidence level in the current values being produced for the estimate. The results of this probability analysis could then be used to determine if the risk/contingency factors in the estimate are reasonable.

The Review Team discussed the current estimate, scope, schedule, threats and opportunities. Based on this review, probability assumption curves were selected for items in the Project estimate, considering the probability that the values would be within a certain range. Next, forecast curves were generated from the random sampling (10,000 iterations) of the input probability curves previously defined by the Review Team. This type of analysis provided a statistical level of certainty that the variation of the forecast distribution curve reflected the underlying variation of the cost inputs (in the form of assumption curves) as determined by the Review Team.

The resulting forecast curves were then analyzed to provide information on the confidence level in the Project cost estimates and remaining budgets.

The Review Team used a statistical software tool called Crystal Ball® in order to establish a sense of perspective on the cost expectations for the Project. This software selection is an add-in program for use with the Excel™ spreadsheet program and it permitted the application of Monte Carlo simulation technology to analyze key components of current cost estimates prepared by the Project delivery team. As is the case with many real-world problems involving elements of uncertainty, the analysis of the variables is much too complex to be solved by strict analytical methods. There are simply too many combinations of input values to calculate every possible result. In the case of this workshop cost model, the Monte Carlo simulation supplied random numbers for selected cells identified as "assumption cells", with these random numbers falling within the range of real-life possibilities defined by the study team. Each set of these random numbers is essential input to a "what-if" scenario. In this case, each scenario outcome represents a possible outcome from an expected real-world bidding and construction cycle. The model is recalculated for each scenario many times and builds a final forecast probability curve that reflects the combined uncertainty of the assumption cells on the model's output. This plotted probability curve provides a range that can be expected for a final Project cost, with degrees of certainty to model the potential final outcome.

The outcome depicted in this final probability curve is typically stated in the following manner:

"There is a 90% (or whatever percentage depicted) degree of certainty that the construction cost will be in a range from $x to $y, provided that our understandings and related assumptions do not change significantly between now and the end of construction."

For this to work correctly the Review Team must supply the program with the probable range of costs for each assumption cell in the spreadsheet, and must supply an indicative characterization for the probability spread for each of these cells. This is illustrated in the form of probability assumption curves.

The probability assumption curves depict how the Review Team considered modeling the cost elements. Based on these assumption curves, the Monte Carlo analysis selects a random number for each of these curves and sums each random selection for the resulting probabilities.

Appendix B includes all of the probability assumption curves used for the Project estimate.

Appendix A – Workshop Close-out Presentation –

Knik Arm Closeout Presentation.pdf

Appendix B – Crystal Ball Report

Crystal Ball Report.pdf

Appendix C – CER Estimate

Knik Arm Estimate.pdf

Knik Arm Crossing

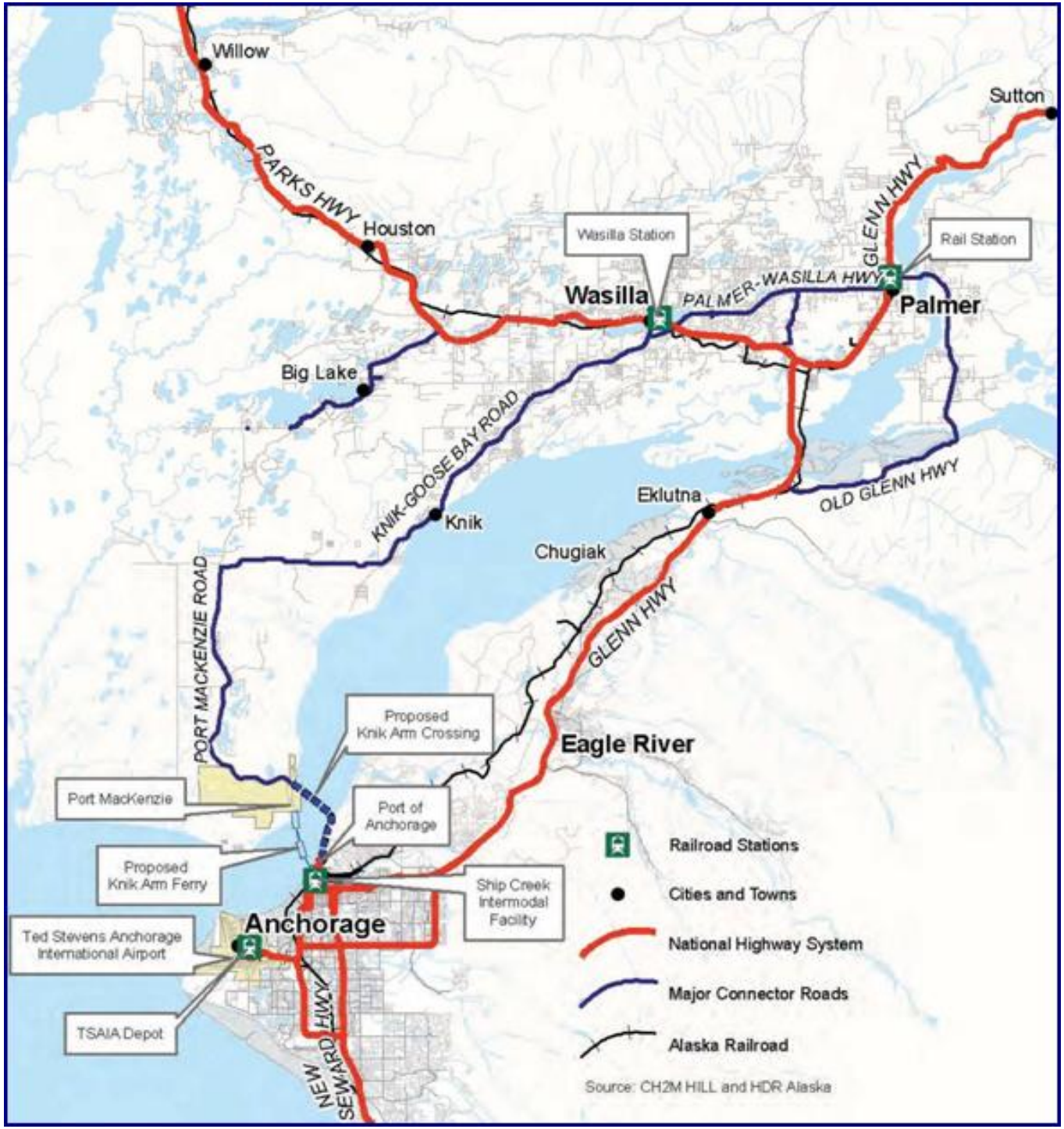
Cost Estimate Review

Close out

February 27, 2009

U.S. Department of Transportation
Federal Highway Administration

KABATA KNIK ARM CROSSING DOT&PF


Willow
Sutton
PARKS HWY
Houston
Wasilla Station
Rail Station
GLENN HWY
Wasilla
PALMER-WASILLA HWY
Palmer
Big Lake
KNIK-GOOSE BAY ROAD
OLD GLENN HWY
Eklutna
Knik
Chugiak
PORT MACKENZIE ROAD
GLENN HWY
Proposed
Knik Arm Crossing
Eagle River
Port MacKenzie
Port of
Anchorage
Proposed
Knik Arm Ferry
Ship Creek
Intermodal
Facility
Anchorage
Ted Stevens Anchorage
International Airport
TSAIA Depot
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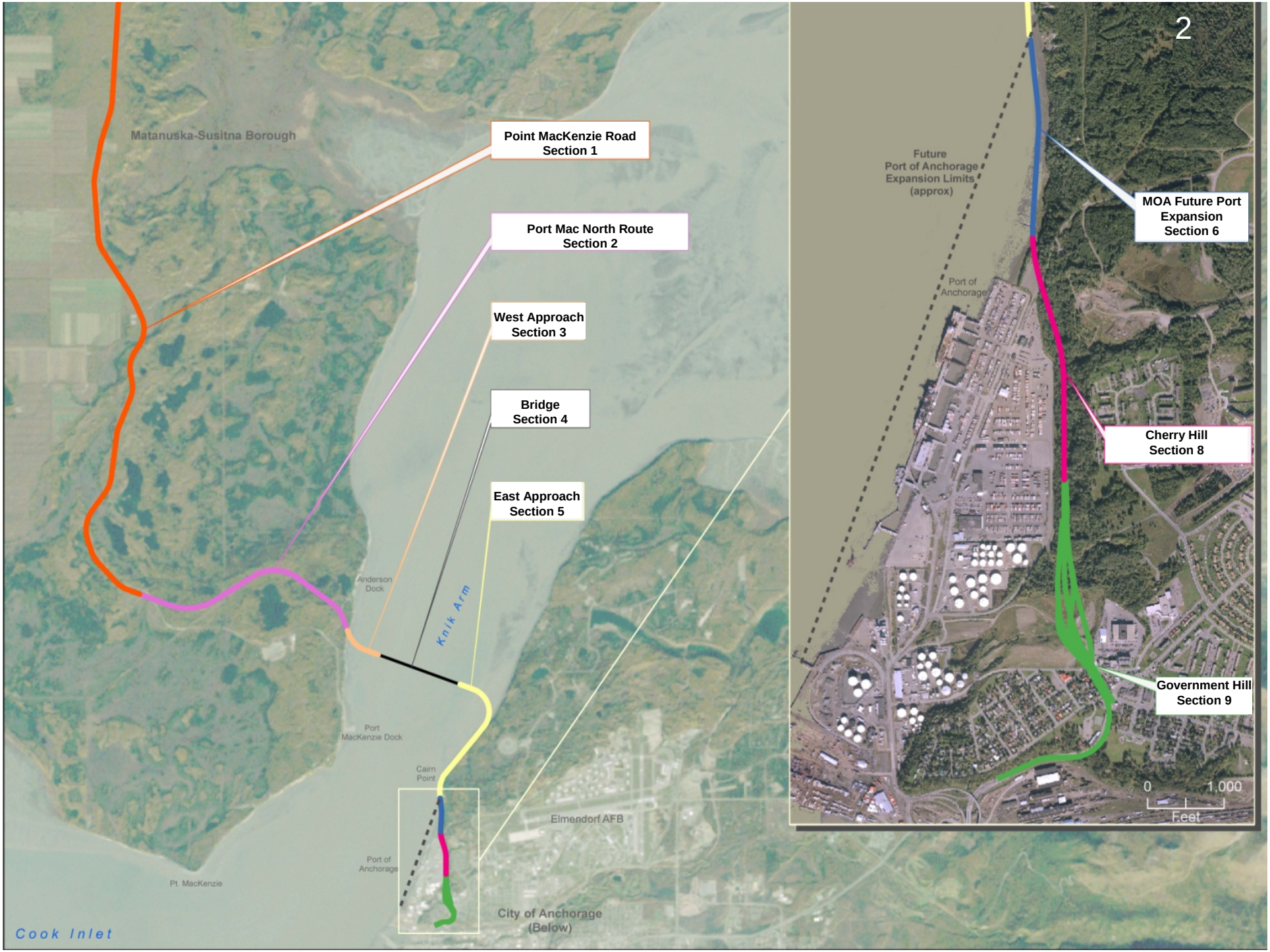
Railroad Stations
Cities and Towns
National Highway System
Major Connector Roads
Alaska Railroad
Source: CH2M HILL and HDR Alaska


2
Matanuska-Susitna Borough
Point MacKenzie Road
Section 1
Port Mac North Route
Section 2
West Approach
Section 3
Bridge
Section 4
East Approach
Section 5
Anderson
Dock
Knik Arm
Port
MacKenzie Dock
Cairn
Point
Elmendorf AFB
Port of
Anchorage
Pt. MacKenzie
Cook Inlet
City of Anchorage
(Below)
Future
Port of Anchorage
Expansion Limits
(approx)
Port of
Anchorage
MOA Future Port
Expansion
Section 6
Cherry Hill
Section 8
Government Hill
Section 9
0
1,000
Feet

Knik Arm Crossing
Cost Estimate Review
Objective

Conduct an unbiased risk-based review to verify the accuracy and reasonableness of the current total cost estimate to complete the Knik Arm Crossing and to develop a probability range for the cost estimate that represents the project's current stage of design.

Knik Arm Crossing
Cost Estimate Review
Financial Plans (SAFETEA-LU)

Threshold (All costs, PE, CN, R/W, UT, CE, etc.)

- $500 Million – Major Project – Required concurrence from HQ
- $100 to $500 Million – Required, however review is at each Division's discretion

"Cost to complete estimates based on reasonable assumptions as determined by the Secretary."
Secretary = FHWA
Reasonable assumptions = Risk based analysis

Knik Arm Crossing
Review Participants

- FHWA Alaska Division Office
- FHWA Headquarters
  - Office of Infrastructure
  - Program Delivery Office – Project Delivery Team)
- Knik Arm Bridge and Toll Authority (KABATA)
  - PND Engineers, Inc.
- The National Constructor's Group

Knik Arm Crossing
Review Agenda

Monday, February 23

Introductions

Familiarize Review Team with project scope and overall estimate

Project Phasing and Construction Schedule

Begin Review of Segments 1, 2, and 3

Tuesday, February 24

Review Segment 4

Wednesday, February 25

Continue Review of Segments 1, 2, and 3

Review Segments 5, 6, 8, and 9

Knik Arm Crossing
Review Agenda

Thursday, February 26

Review Support and Other Costs

Construction Schedule and Escalation

Develop Findings and Recommendations

Friday, February 27

Draft Presentation

Final Presentation

Knik Arm Crossing
Documentation Provided

- Knik Arm Crossing Conceptual Cost Estimate, dated January 2009, prepared by The National Constructor's Group for AK DOT/PF
- KABATA bridge cost estimate prepared by PND.
- Cost Estimate Review Study dated June 2006, prepared by PBS&J for FHWA, and updated by KABATA
- Project Environmental Impact Statement
- FHWA Memorandum dated February 17, 2006 from Joe Krolak, Senior Hydraulic Engineer, Office of Bridge Technology, Hydraulic and Scour Review of Knik Arm Bridge

Knik Arm Crossing
Documentation Provided

- SHPO commitments
- Bid Tabs
  - Alaska DOT
  - Point Mackenzie (Mat-Su Borough)
  - Port of Anchorage Expansion: North Extension – Barge Berth
- Spin Fin Piles Report, prepared by PND

Knik Arm Crossing
Review Methodology

- **Review Team input**
  - FHWA
  - KABATA
  - The National Constructor's Group
  - PND

- **Estimate Review**
  - Understanding of estimate development process
  - Threats and Opportunities for various items
  - Contingencies and Escalation

Knik Arm Crossing
Review Methodology (continued)

- Threats and Opportunities Analysis
  - Evaluated project threats and opportunities
  - Applied probability assumption curves
- Performed Monte Carlo simulation to generate a project cost estimate forecast as a range using Crystal Ball software program.

Knik Arm Crossing
Basis of Review

- The estimate model was developed based on some estimate information provided by KABATA and the National Constructor's Group in advance and supplemented with current information made available during the review.
- Purpose of review to develop a probabilistic range based on assumptions modeled in the estimate
  - Not an independent FHWA estimate
  - Did not verify quantities and unit price analysis
  - Only valid for model assumptions

Knik Arm Crossing
Aspects of Review

- Public Private Partnership procurement
- Significant cost and schedule uncertainty
  - Design
  - Construction
    - Access (East Side)
    - Availability of Embankment Materials
  - NEPA Document
  - Environmental Mitigation
- Assumptions for Contractor's risk

Knik Arm Crossing Review Findings

- Good estimating practices
  - Estimates were provided for all project costs. (Construction, Agency, Support, Utilities, ROW, etc.)
  - Use of the National Constructor's Group to develop a cost estimate.
  - Update of the previous FHWA cost review from 2006
  - Preparation of a cost risk analysis report
  - Use of local consultant (PND) familiar with the local Alaska environment.
  - Use of up to date unit price histories
  - Use of contingencies (15%)

Knik Arm Crossing
Risks – Threats

Threats:

- Segment 1 - Maintaining existing Mat-Su Borough roads during construction.
- Segment 1 - Uncertainty in the quantity of muck excavation (Phase 2).
- Segment 2 – Uncertainty in the Port Mackenzie Egress Interchange design.
- Segments 3 and 5 - Constructing embankments below 20 feet (and below 30 feet) require working around the tidal influences of the Knik Arm.

Knik Arm Crossing
Risks – Threats

Threats Continued:

- Segment 4 - Noise Attenuation requirements during installation of pipe piles.
- Segment 4 – Uncertainty in pile cap design and construction.
- Segment 4 – Wildlife and marine life (e.g. Beluga Whale) effects on construction operations.
- Segment 4 – Uncertainty about the financial approach regarding equipment for construction of the bridge.

Knik Arm Crossing
Risks – Threats

Threats Continued:

- Segment 4 – Bridge design may be impacted by threatened and endangered species mitigation.
- Segment 4 – Uncertainty in scour design (e.g. Armor Rock).
- Segment 5 - Borrow sites, material sources and haul distance are uncertain.
- Section 8 - Uncertainty of the stability and icing of Cherry Hill slope.
- Section 9 – Although surveyed, there is uncertainty in the quantity and severity of contamination.

Knik Arm Crossing
Risks – Threats

Threats Continued:

- All segments – Possibility of seismic and volcano activity during construction.
- All segments – All projects have a potential for unknown risks (e.g. management reserve)
- All segments - All permits (including wetland mitigation) have not been obtained; therefore final permit conditions have not been established.
- All segments – Right-of-way has not been purchased.

Knik Arm Crossing
Risks – Threats

Threats Continued:

- All segments – The impact of the American Recovery and Re-investment Act on the construction market is uncertain.
- All segments – Due to design and environmental uncertainties, identifying a contractor's risk tolerance is difficult.
- All segments – There is potential for schedule delays
  - ROD
  - NOAA-NMFS
  - Procurement
- All segments – Construction delays could impact concessionaire revenue stream.

Knik Arm Crossing
Risks – Opportunities

Opportunities:

- Segments 3 and 5 - Reinforced earth walls or slopes could reduce the cost of the approach embankments.
- Segment 3 and 5 – Alternative methods to construction approach embankments (i.e. trestle system) could reduce costs.
- Segment 4 – Consider alternate foundations.
- Segment 8 - Cut slopes back to reduce the amount of wall needed.

Knik Arm Crossing
Risks – Opportunities

Opportunities Continued:

- Segment 8 – Consider the use of alternative wall concepts.
- Segment 8 – Evaluate moving alignment at Cherry Hill west to reduce cut and associated retaining wall costs.
- All segments - Develop a public information video and good public relations.
- All segments – Maximizing design flexibility in a PPP procurement can save cost
- All segments - Obtain materials agreement with Elmendorf AFB for use of borrow pits prior to RFP.

Knik Arm Crossing
Risks – Opportunities

Opportunities Continued:

- All segments – There is a potential to use 3 lane concept (with a reversible lane) to defer the need to expand to 4 lanes.
- All segments - Obtain access permission through Port of Anchorage prior to RFP.
- All segments (except Segment 4) – Optimize earthwork to balance earthwork.
- All segments – Evaluate the use of dredged material from other operations (e.g. Army Corps contracts).
- All segments – Obtain permits with design flexibility prior to RFP to reduce permit uncertainty.

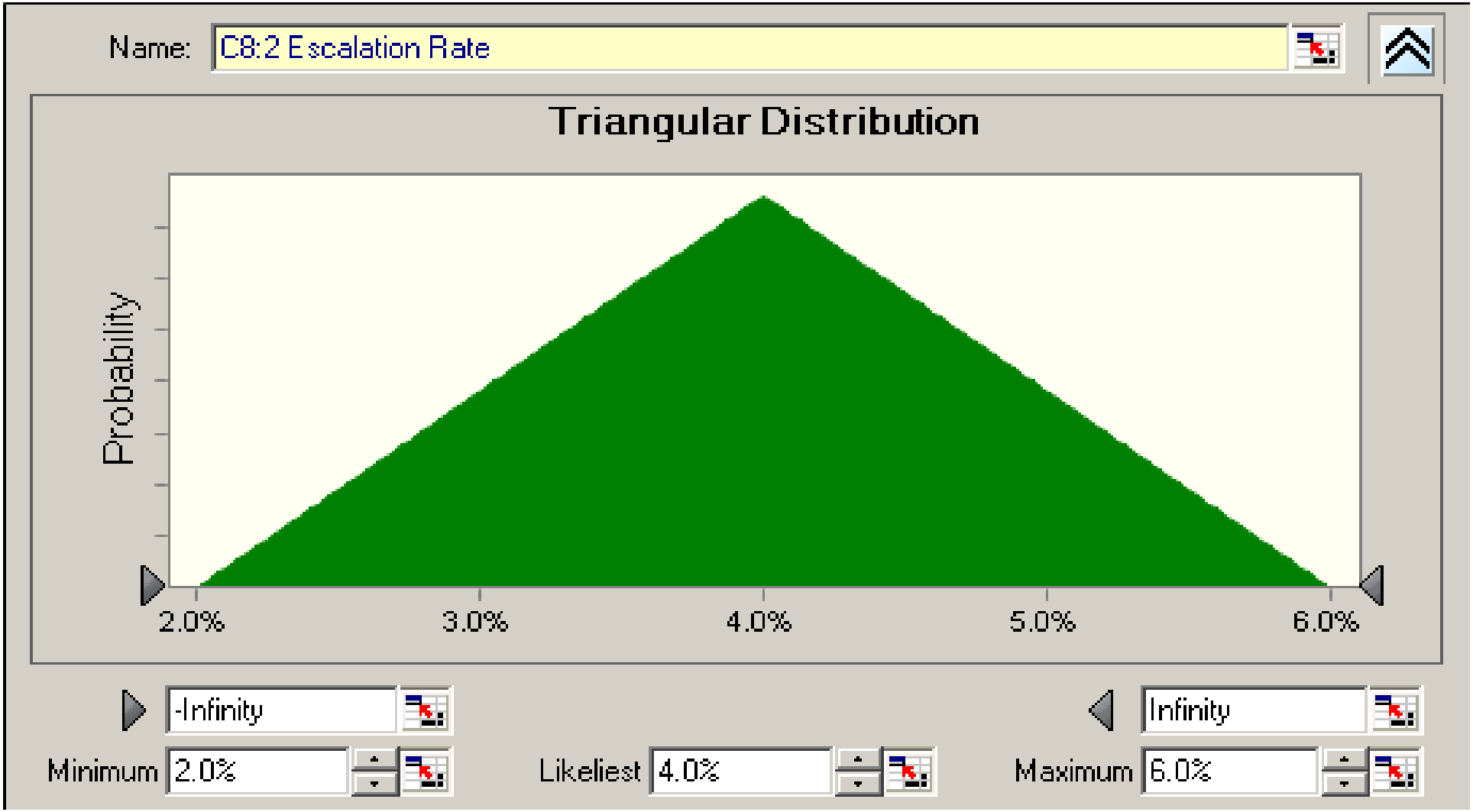
Knik Arm Crossing

Incorporation of Threats and Opportunities into the estimate

- Developed assumption curves that model the cost impact and probability of the threat/opportunity.
- Quantified individual threat/opportunities that were not modeled in the estimate (e.g. noise mitigation, production inefficiencies).
- Crystal Ball software
    - 10,000 Monte Carlo iterations

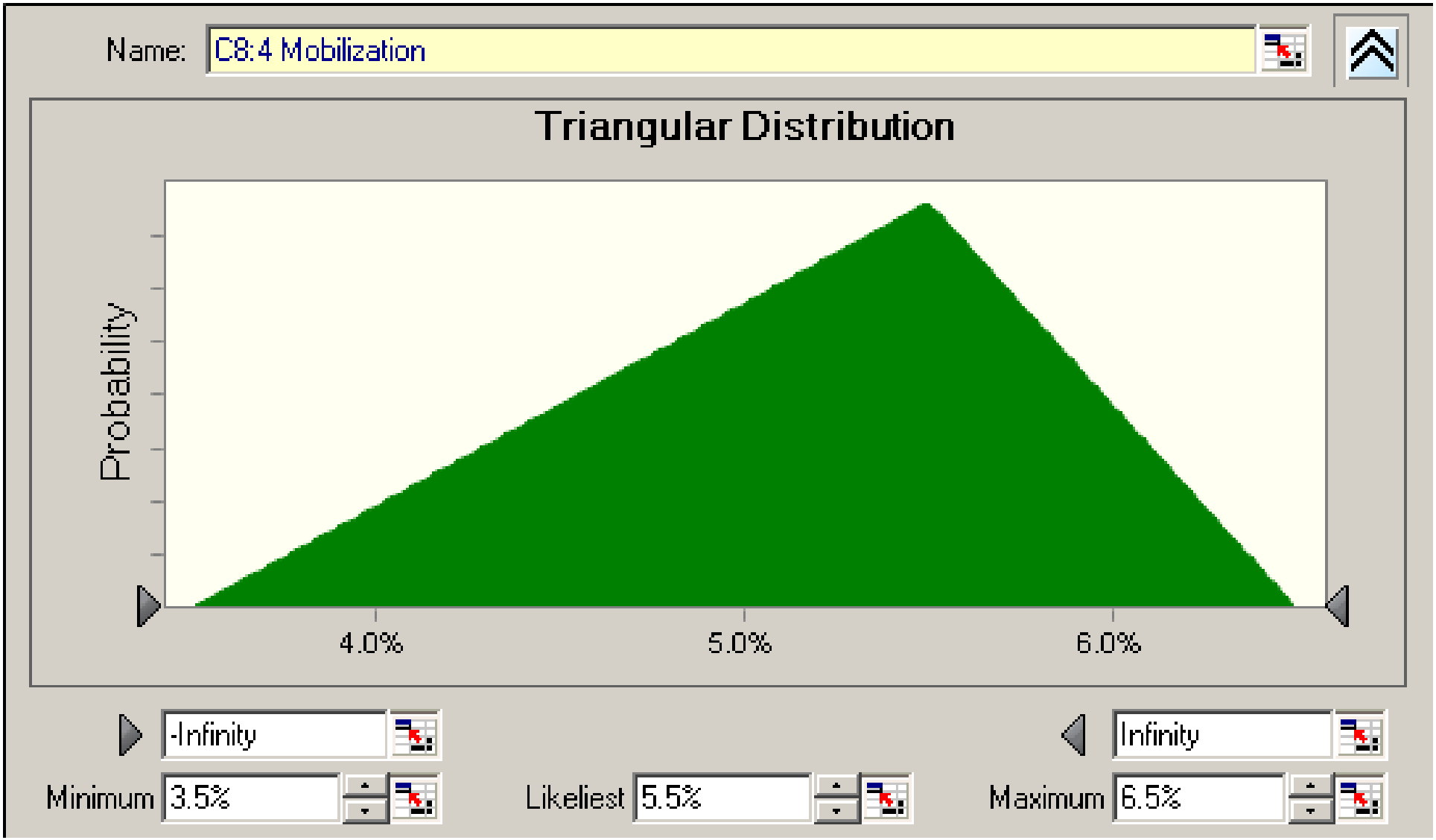
Knik Arm Crossing Risk Analysis

Sample Assumption Curve



Knik Arm Crossing Risk Analysis

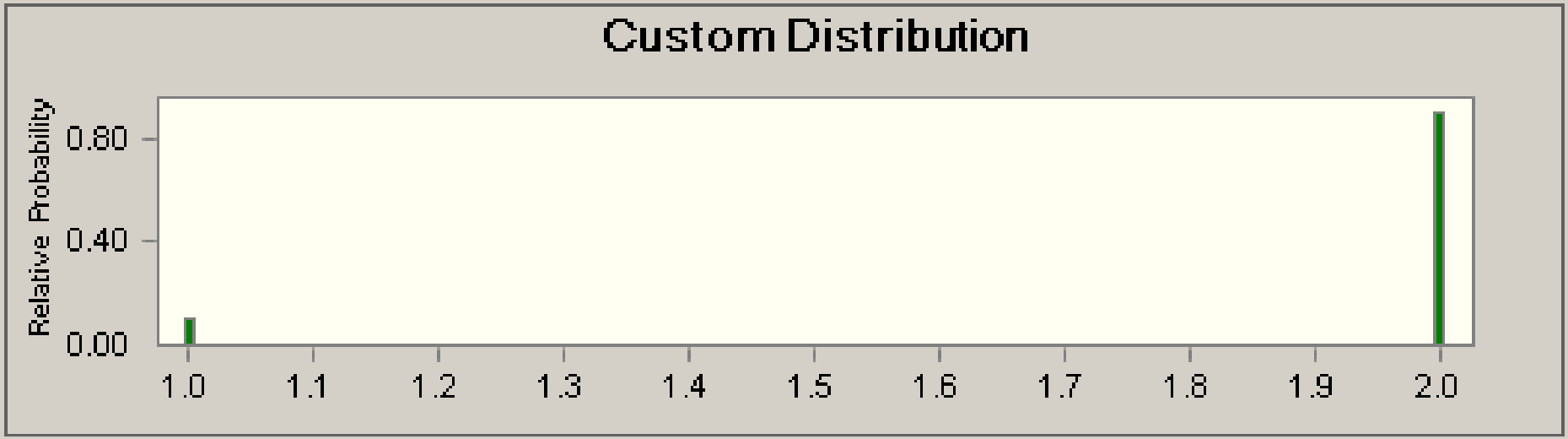
Sample Assumption Curve



Knik Arm Crossing Risk Analysis

Sample Assumption Curve

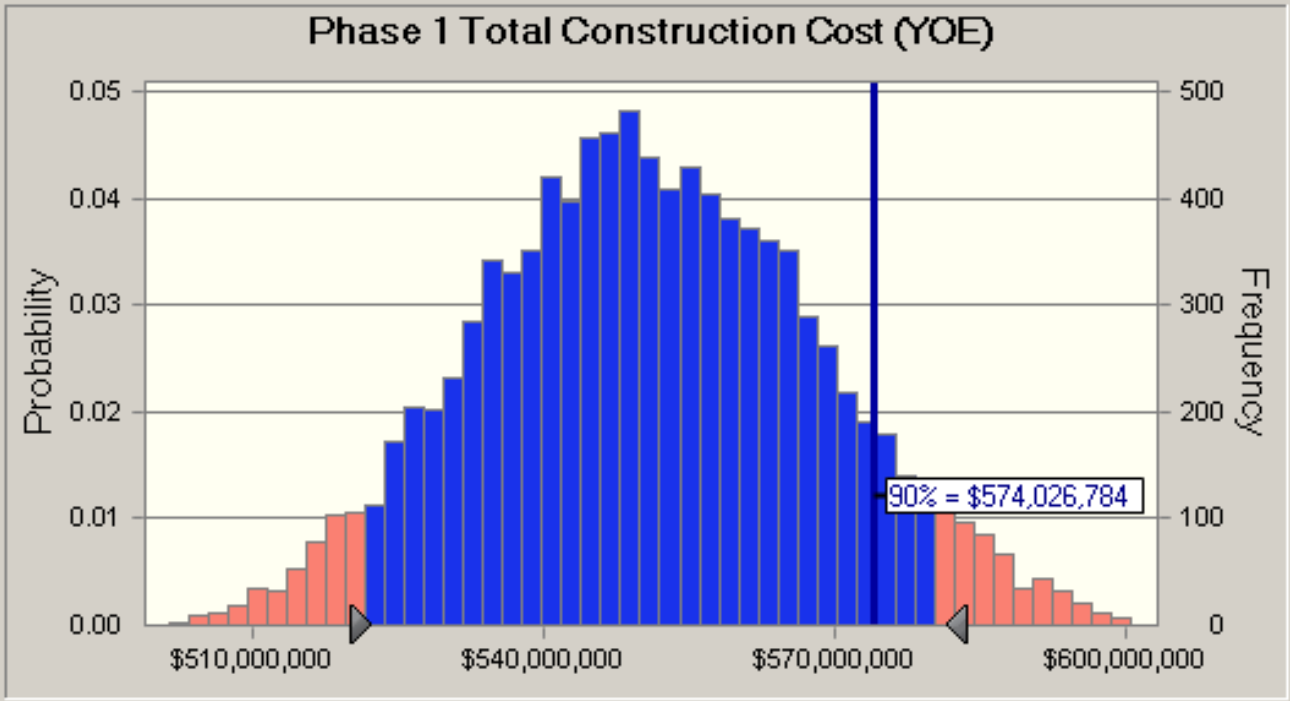
Name: Years of Esclation



	Value	Probability
	1.0	0.1
	2.0	0.9
▶		

Load Data...

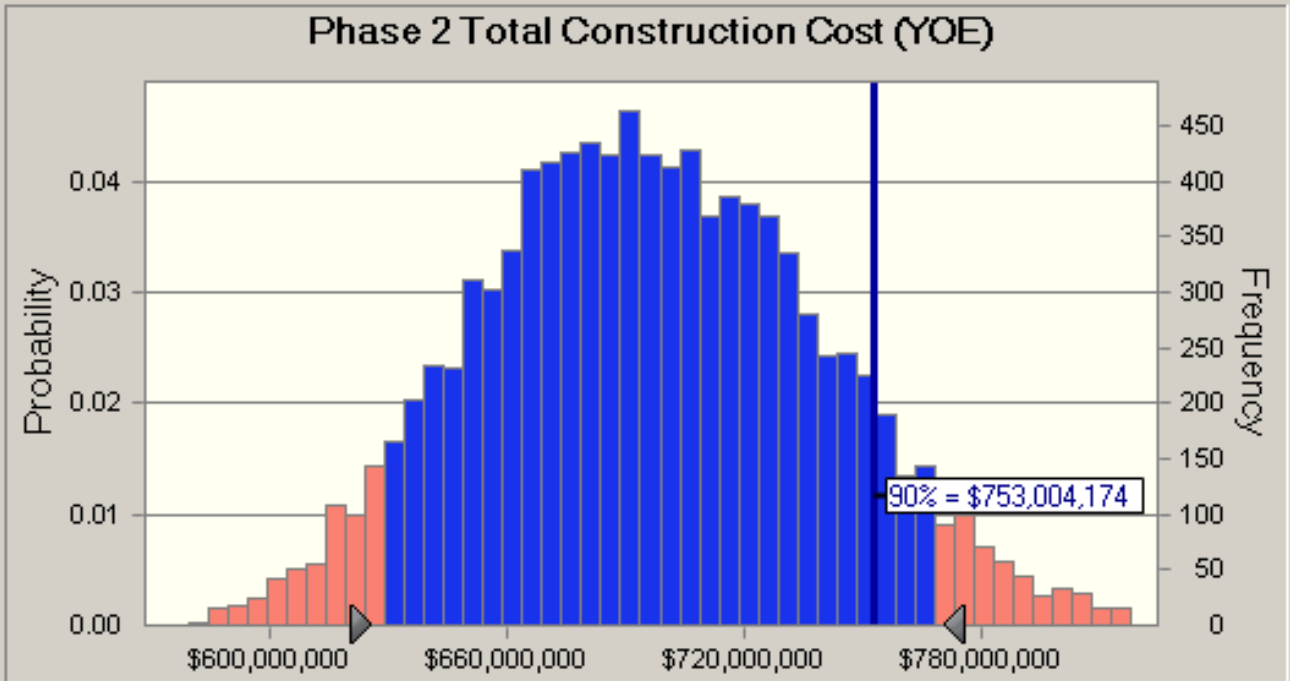
10,000 Trials | Split View | 9,950 Displayed



Percentile	Forecast values
0%	$488,716,408
10%	$528,003,909
20%	$535,672,753
30%	$541,233,856
40%	$545,983,069
50%	$550,300,990
60%	$555,105,546
70%	$560,147,958
80%	$565,816,843
90%	$574,026,784
100%	$627,678,289

$522,410,546 Certainty: 90.00 % $580,842,179

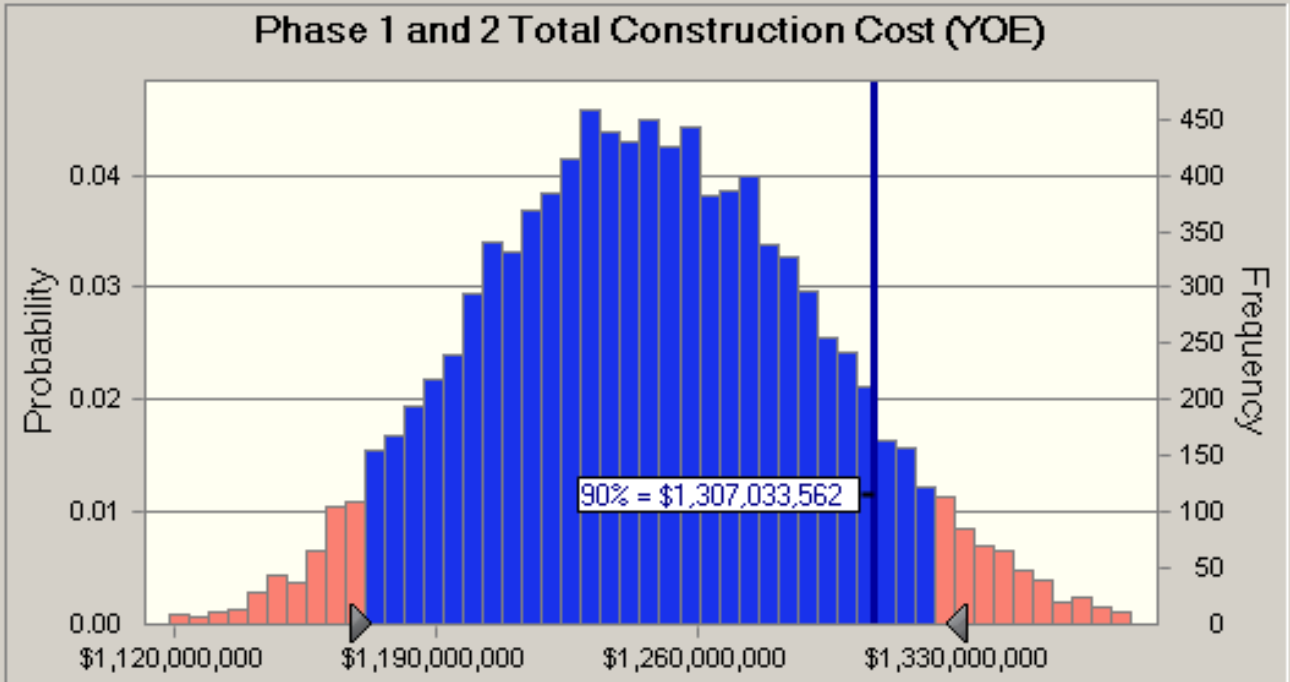
10,000 Trials | Split View | 9,959 Displayed



Percentile	Forecast values
0%	$560,431,283
10%	$640,388,353
20%	$658,842,430
30%	$671,647,274
40%	$683,342,910
50%	$694,722,682
60%	$706,377,553
70%	$719,325,879
80%	$733,068,725
90%	$753,004,174
100%	$862,364,357

$626,689,470 Certainty: 90.00 % $768,961,582

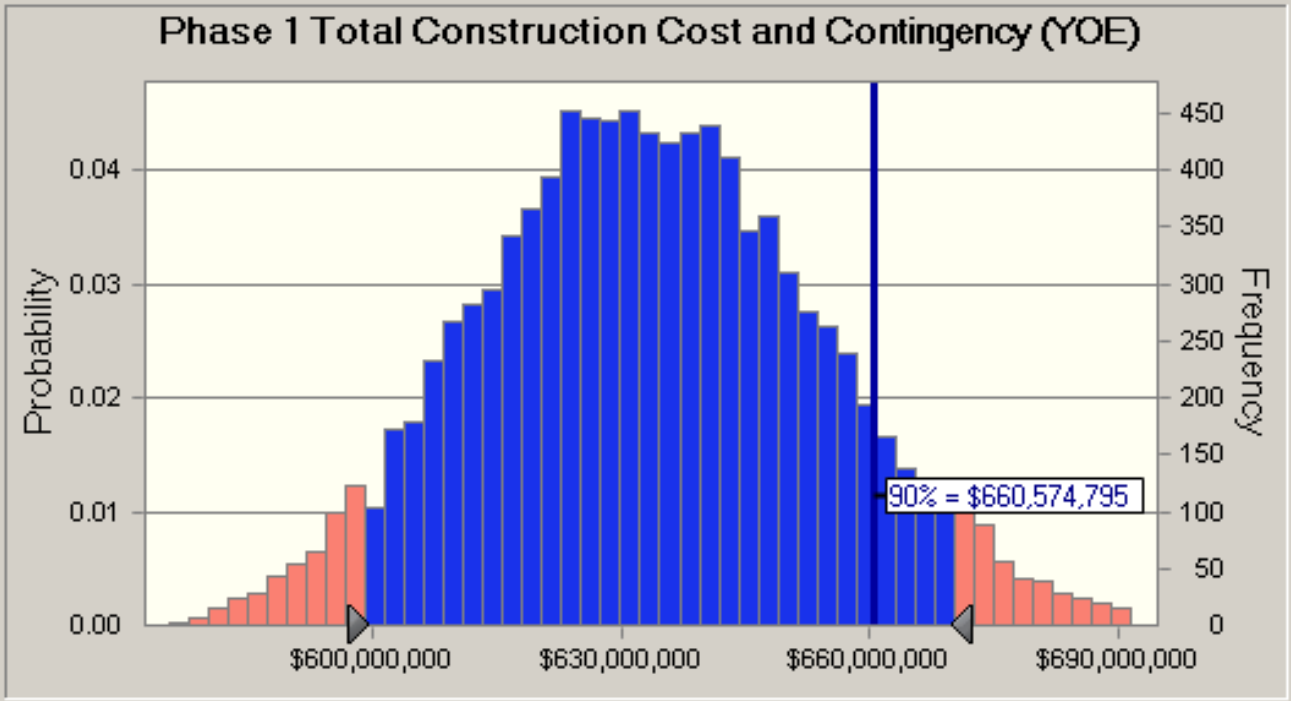
10,000 Trials | Split View | 9,958 Displayed



Percentile	Forecast values
0%	$1,102,436,033
10%	$1,187,900,832
20%	$1,207,055,983
30%	$1,221,582,129
40%	$1,233,994,966
50%	$1,245,757,758
60%	$1,258,217,205
70%	$1,271,250,628
80%	$1,286,203,914
90%	$1,307,033,562
100%	$1,416,056,111

$1,173,520,824 Certainty: 90.00 % $1,324,784,380

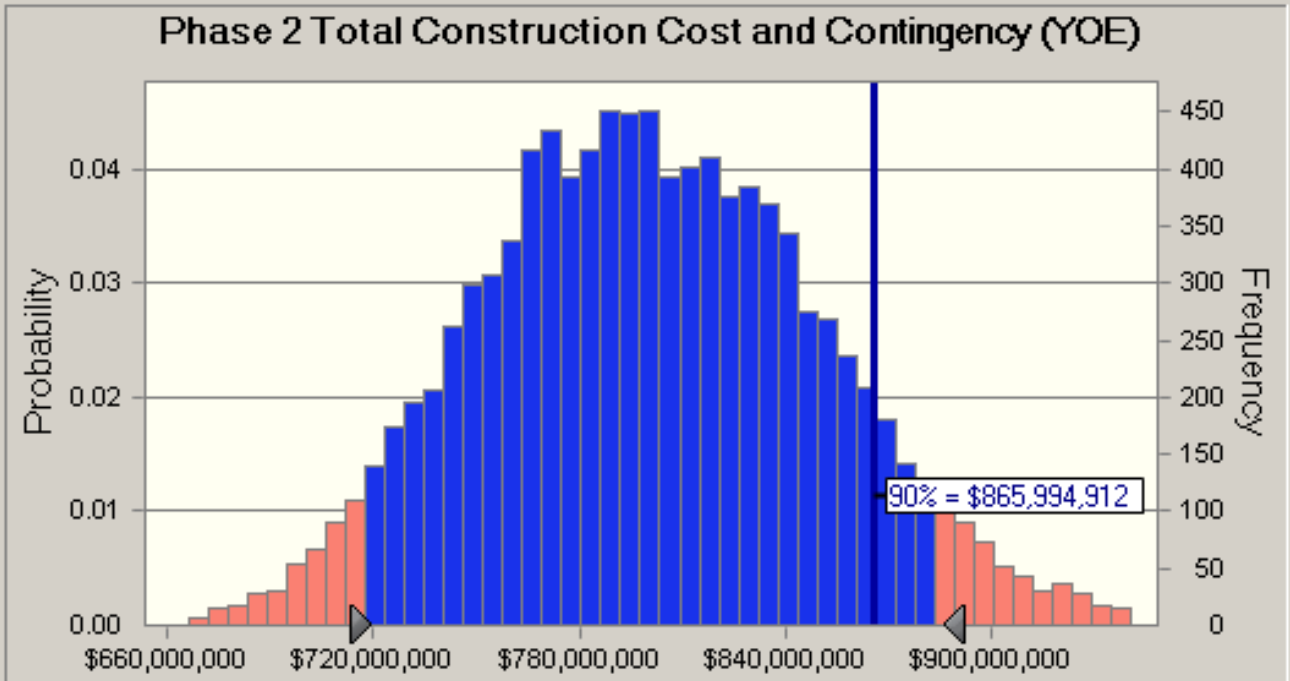
10,000 Trials | Split View | 9,960 Displayed



Percentile	Forecast values
0%	$564,235,431
10%	$607,169,909
20%	$615,827,855
30%	$622,363,889
40%	$627,672,801
50%	$632,914,379
60%	$638,425,258
70%	$644,034,936
80%	$650,915,008
90%	$660,574,795
100%	$721,653,025

$600,198,733 Certainty: 90.00 % $669,104,346

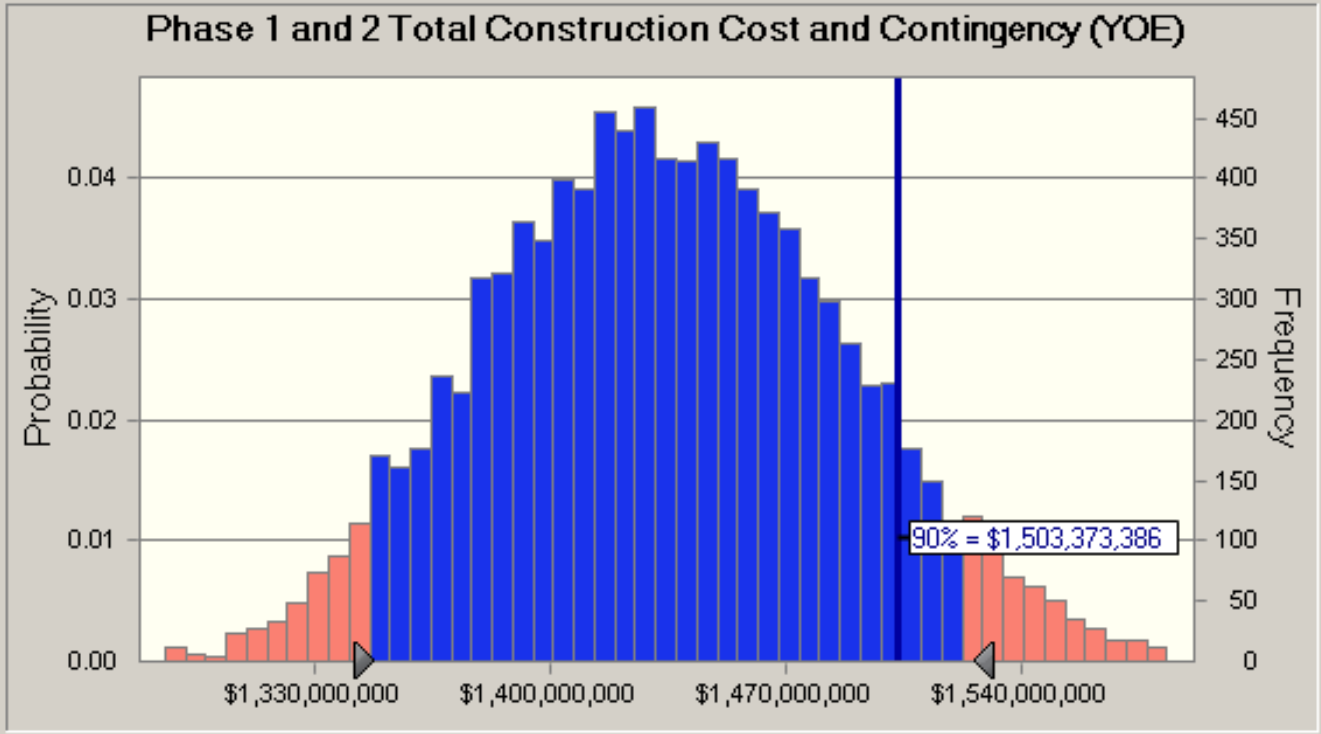
10,000 Trials | Split View | 9,959 Displayed



Percentile	Forecast values
0%	$644,791,579
10%	$736,524,919
20%	$757,607,365
30%	$772,276,793
40%	$786,230,900
50%	$799,079,350
60%	$812,888,315
70%	$827,276,675
80%	$843,098,522
90%	$865,994,912
100%	$998,072,738

$720,310,688 Certainty: 90.00 % $884,780,307

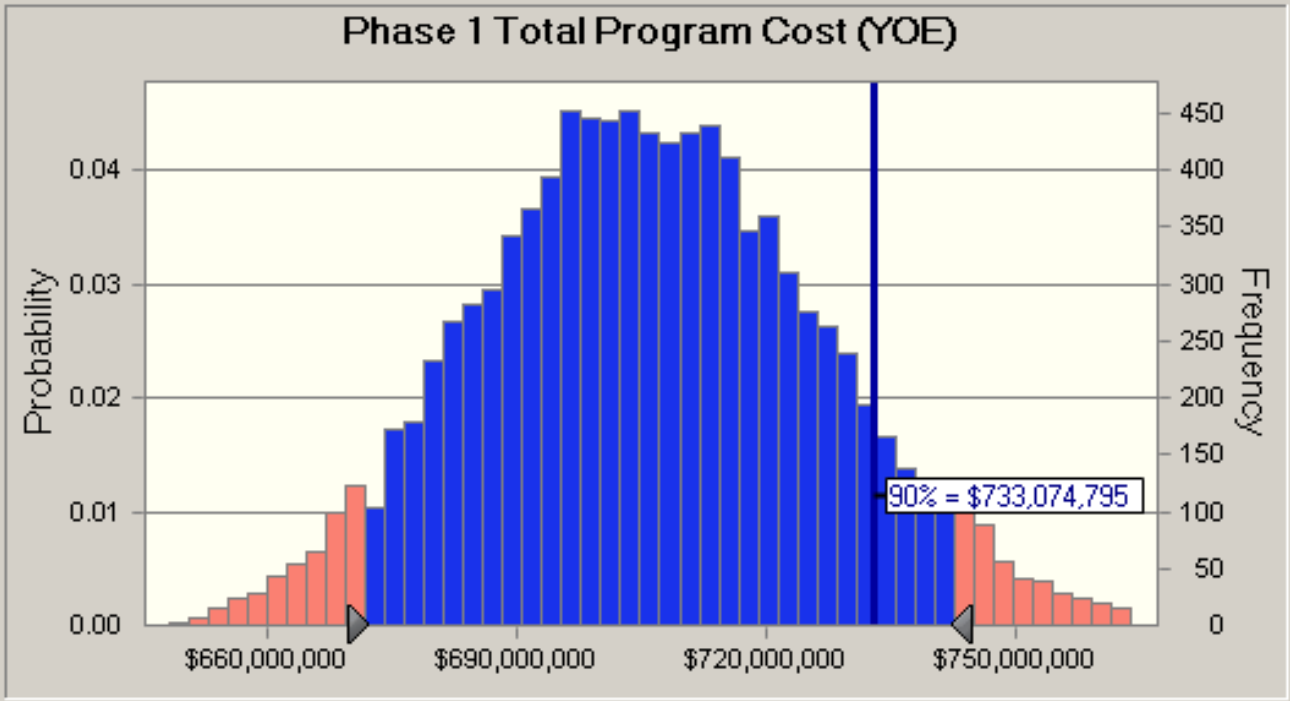
10,000 Trials | Split View | 9,959 Displayed



Percentile	Forecast values
0%	$1,269,786,475
10%	$1,365,963,190
20%	$1,387,871,688
30%	$1,404,548,923
40%	$1,419,155,067
50%	$1,432,639,795
60%	$1,447,148,650
70%	$1,462,211,466
80%	$1,479,554,756
90%	$1,503,373,386
100%	$1,627,629,865

$1,348,859,917 Certainty: 90.00 % $1,523,800,930

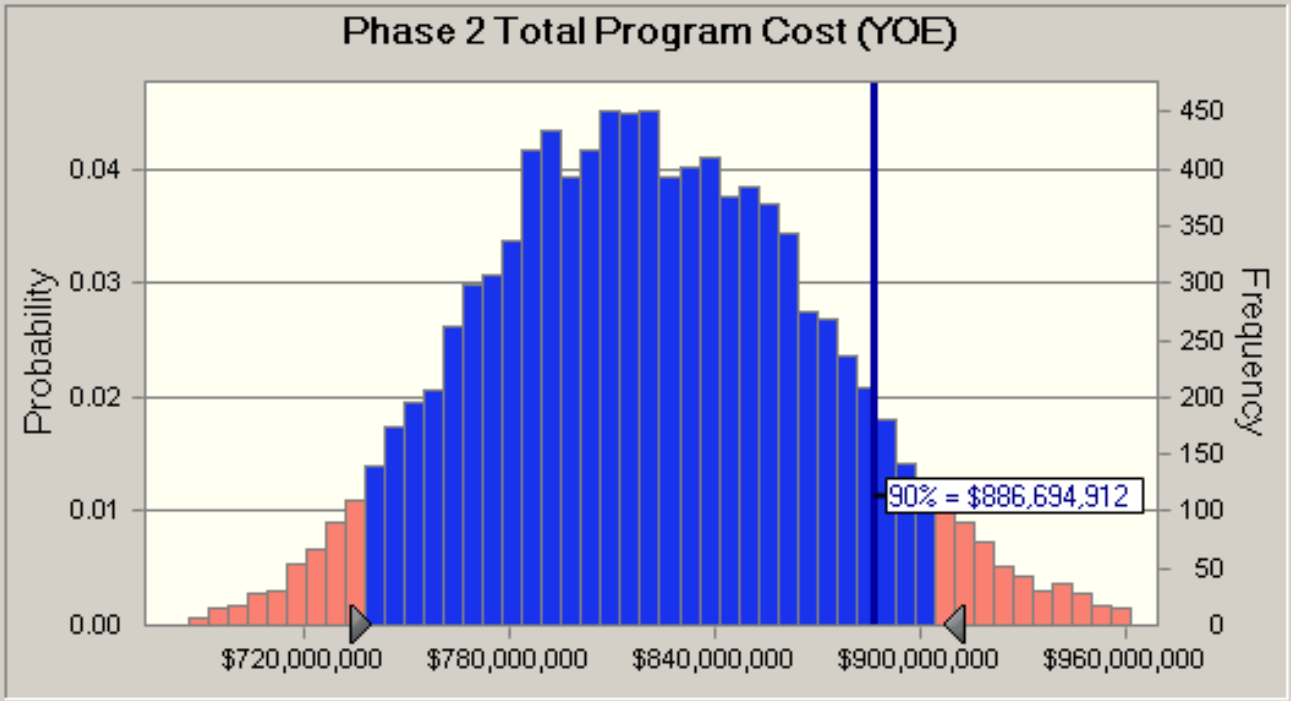
10,000 Trials | Split View | 9,960 Displayed



Percentile	Forecast values
0%	$636,735,431
10%	$679,669,909
20%	$688,327,855
30%	$694,863,889
40%	$700,172,801
50%	$705,414,379
60%	$710,925,258
70%	$716,534,936
80%	$723,415,008
90%	$733,074,795
100%	$794,153,025

$672,698,733 Certainty: 90.00 % $741,604,346

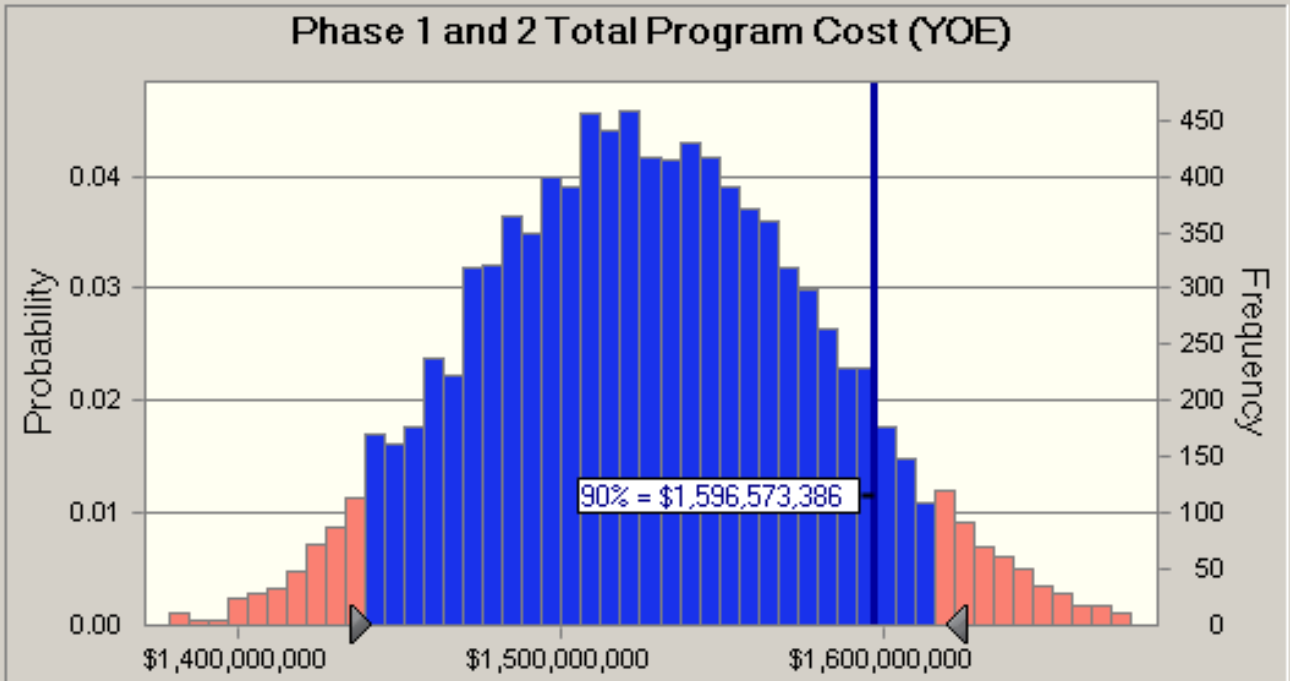
10,000 Trials | Split View | 9,959 Displayed



Percentile	Forecast values
0%	$665,491,579
10%	$757,224,919
20%	$778,307,365
30%	$792,976,793
40%	$806,930,900
50%	$819,779,350
60%	$833,588,315
70%	$847,976,675
80%	$863,798,522
90%	$886,694,912
100%	$1,018,772,738

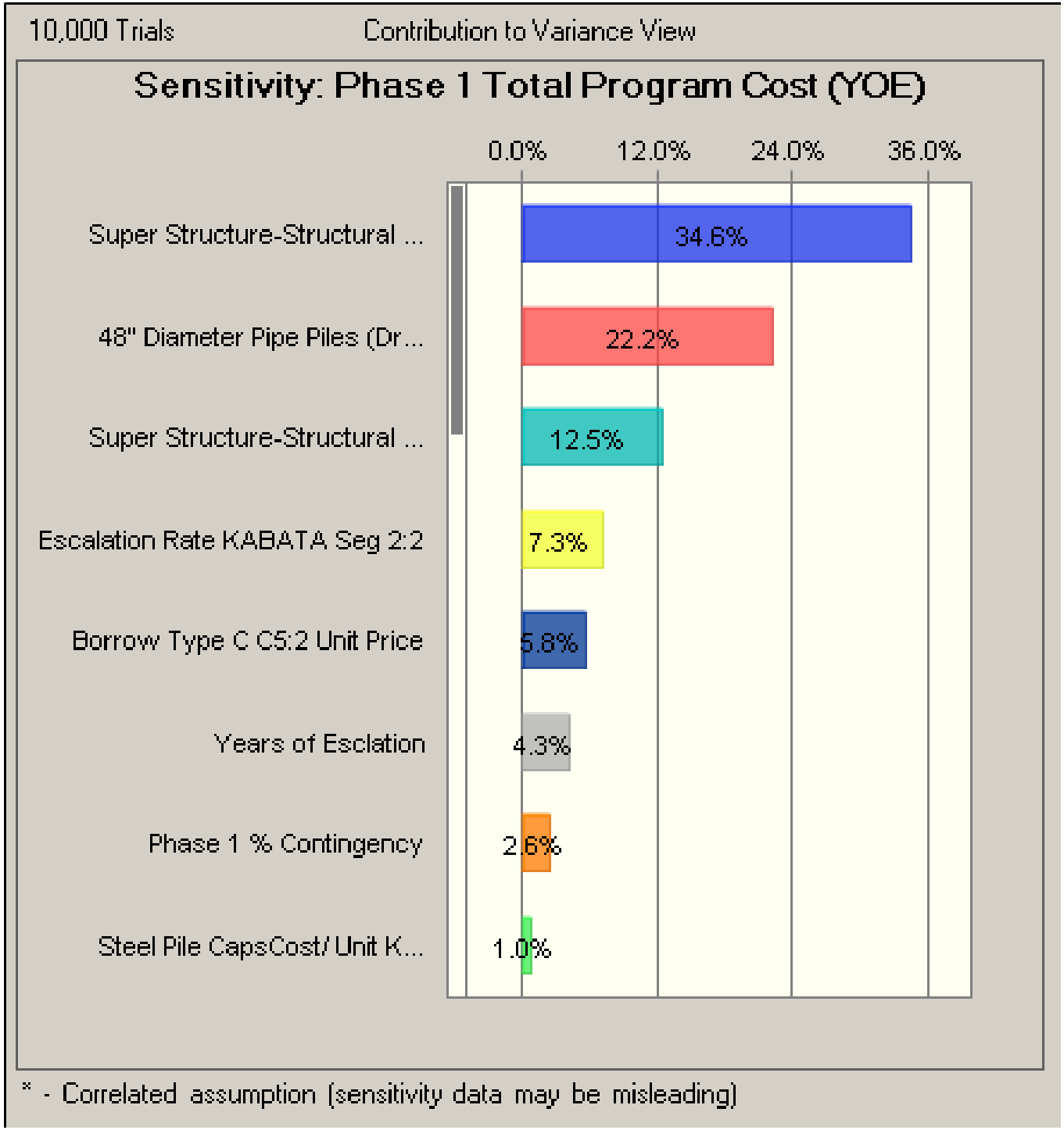
$741,010,688 Certainty: 90.00 % $905,480,307

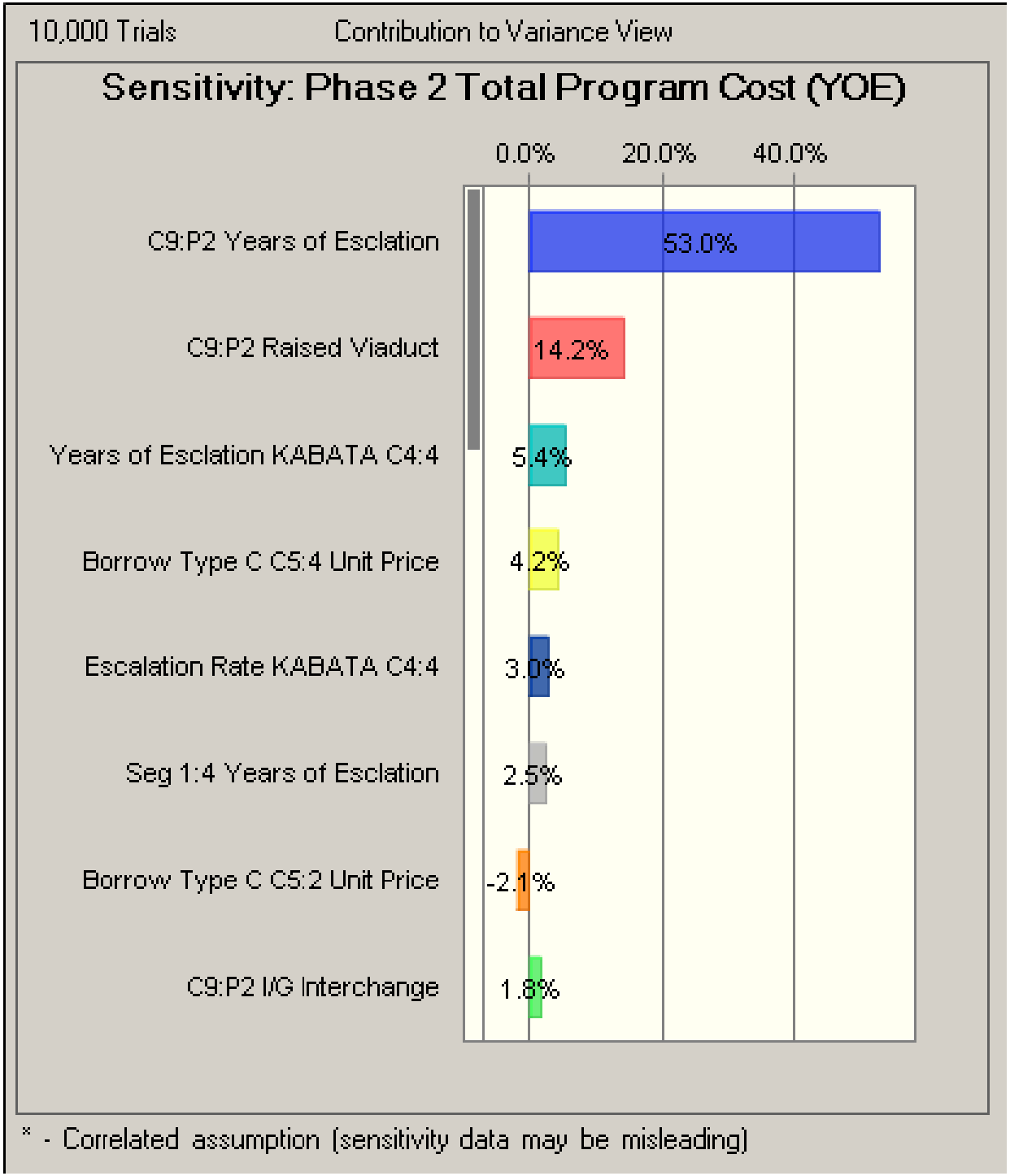
10,000 Trials | Split View | 9,959 Displayed

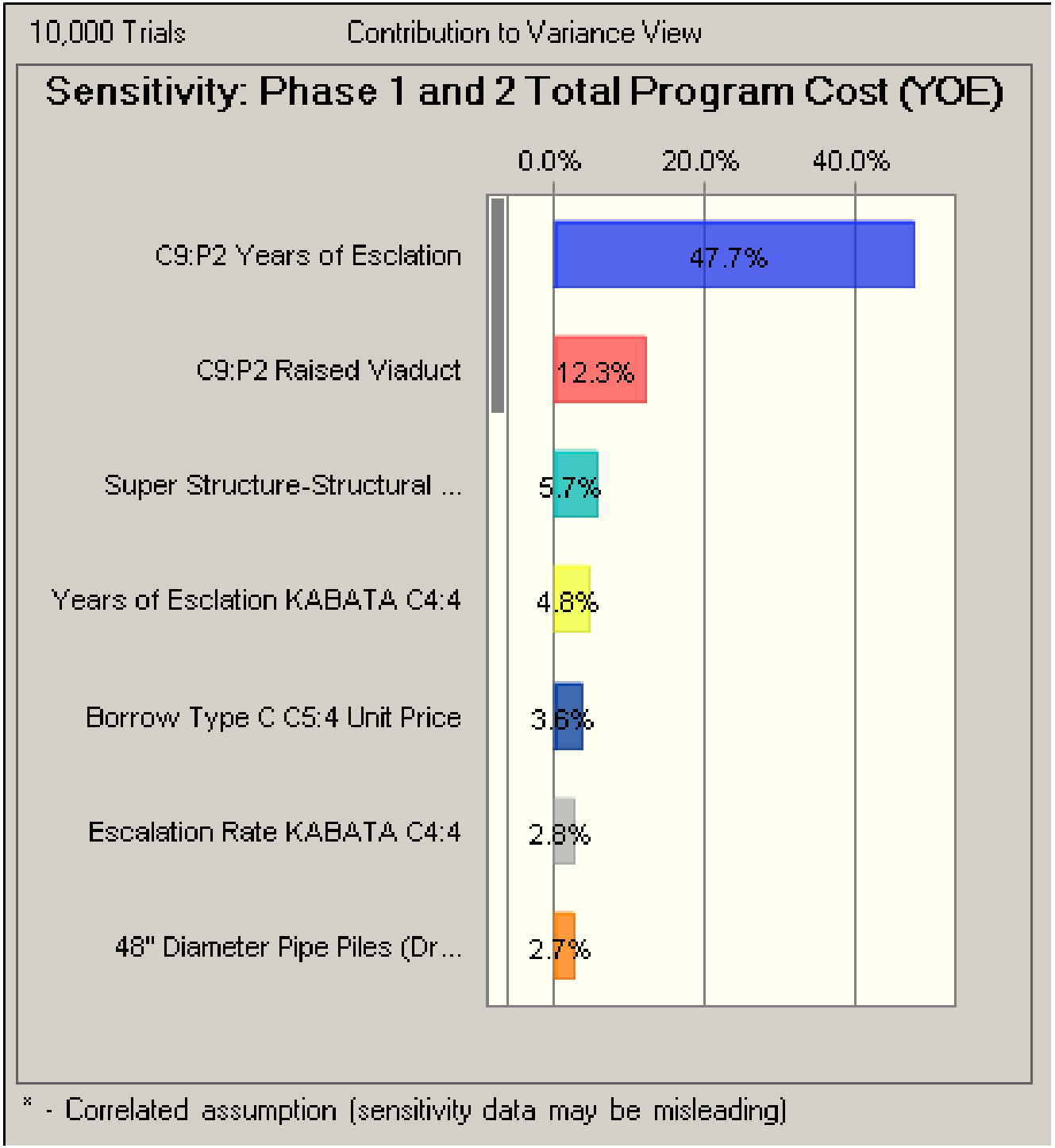


Percentile	Forecast values
0%	$1,362,986,475
10%	$1,459,163,190
20%	$1,481,071,688
30%	$1,497,748,923
40%	$1,512,355,067
50%	$1,525,839,795
60%	$1,540,348,650
70%	$1,555,411,466
80%	$1,572,754,756
90%	$1,596,573,386
100%	$1,720,829,865

$1,442,059,917 Certainty: 90.00 % $1,617,000,930


10,000 Trials
Contribution to Variance View
Sensitivity: Phase 1 Total Program Cost (YOE)
0.0%
12.0%
24.0%
36.0%
Super Structure-Structural ...
34.6%
48" Diameter Pipe Piles (Dr...
22.2%
Super Structure-Structural ...
12.5%
Escalation Rate KABATA Seg 2:2
7.3%
Borrow Type C C5:2 Unit Price
5.8%
Years of Esclation
4.3%
Phase 1 % Contingency
2.6%
Steel Pile CapsCost/ Unit K...
1.0%
* - Correlated assumption (sensitivity data may be misleading)


10,000 Trials
Contribution to Variance View
Sensitivity: Phase 2 Total Program Cost (YOE)
0.0%
20.0%
40.0%
C9:P2 Years of Esclation
53.0%
C9:P2 Raised Viaduct
14.2%
Years of Esclation KABATA C4:4
5.4%
Borrow Type C C5:4 Unit Price
4.2%
Escalation Rate KABATA C4:4
3.0%
Seg 1:4 Years of Esclation
2.5%
Borrow Type C C5:2 Unit Price
-2.1%
C9:P2 I/G Interchange
1.8%
* - Correlated assumption (sensitivity data may be misleading)


10,000 Trials
Contribution to Variance View
Sensitivity: Phase 1 and 2 Total Program Cost (YOE)
0.0%
20.0%
40.0%
C9:P2 Years of Esclation
47.7%
C9:P2 Raised Viaduct
12.3%
Super Structure-Structural ...
5.7%
Years of Esclation KABATA C4:4
4.8%
Borrow Type C C5:4 Unit Price
3.6%
Escalation Rate KABATA C4:4
2.8%
48" Diameter Pipe Piles (Dr...
2.7%
* - Correlated assumption (sensitivity data may be misleading)

Knik Arm Crossing
Cost Estimate Review
Draft Recommendations

- Continue to periodically update estimates.
- Continue to resolve environmental and permitting issues.
- Pursue agreements with ports and AFB regarding access, material sources, and hauling.
- Follow up with the development of a risk management plan to manage threats and opportunities – and update risk analysis.

Knik Arm Crossing

Cost Estimate Review is Completed!

Next steps:

- FHWA will prepare a final report documenting review findings.
  - Draft report for review within 30 days.
    - Draft report will be e-mailed to Division Office
    - Division Office will review the draft and if acceptable will forward it to KABATA and AK DOT&PF
  - Final report within 30 days after receipt of comments will be forwarded to the Division Office for distribution to KABATA and AK DOT&PF

FHWA will use the results of this estimate review during the completion of the ROD.

Knik Arm Crossing
Cost Estimate Review

Questions ?

Crystal Ball Report - Full
Simulation started on 4/1/2009 at 10:24:36
Simulation stopped on 4/1/2009 at 10:24:44

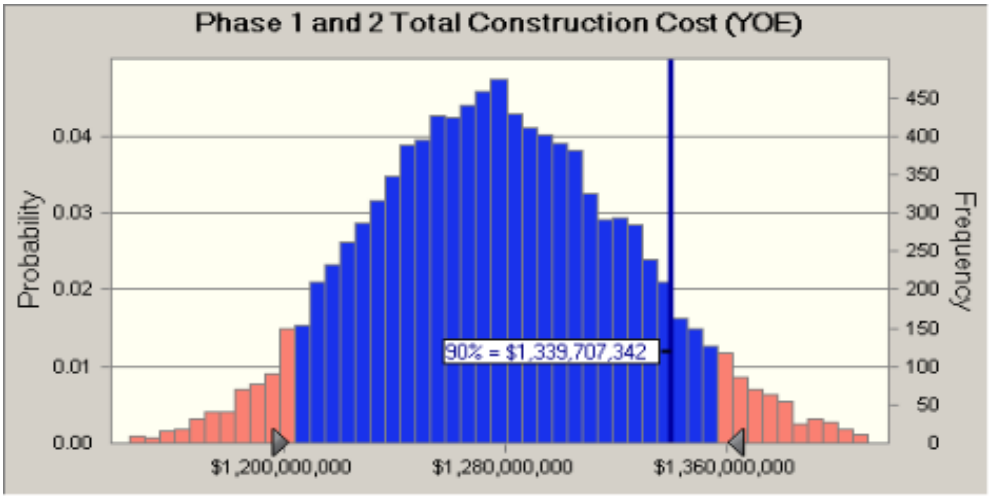
Run preferences:	
Number of trials run	10,000
Extreme speed	
Monte Carlo	
Random seed	
Precision control on	
Confidence level	95.00%
Run statistics:	
Total running time (sec)	9.02
Trials/second (average)	1,108
Random numbers per sec	175,141
Crystal Ball data:	
Assumptions	158
Correlations	1
Correlated groups	1
Decision variables	0
Forecasts	11

Forecasts

Worksheet: [Crystal Ball Estimate rev5 mean.xls]Exec Summary

Forecast: Phase 1 and 2 Total Construction Cost (YOE) **Cell: F25**

Summary:
Certainty level is 90.00%
Certainty range is from $1,202,241,809 to $1,358,833,972
Entire range is from $1,111,840,535 to $1,466,663,648
Base case is $1,244,096,342
After 10,000 trials, the std. error of the mean is $477,795



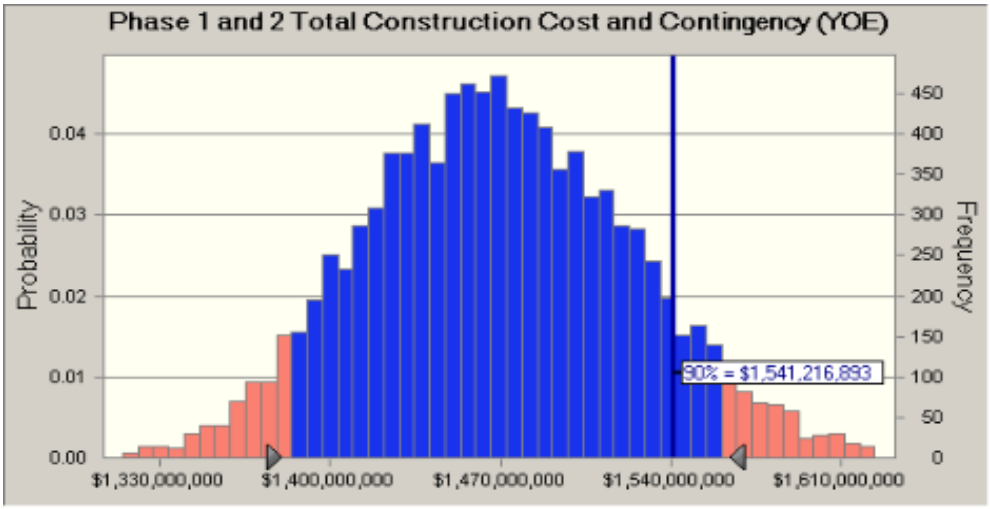
Statistics:	Forecast values
Trials	10,000
Mean	$1,277,665,848
Median	$1,276,015,492
Mode	---
Standard Deviation	$47,779,496
Variance	################
Skewness	0.1657
Kurtosis	2.91
Coeff. of Variability	0.0374
Minimum	$1,111,840,535
Maximum	$1,466,663,648
Range Width	$354,823,113
Mean Std. Error	$477,795

Forecast: Phase 1 and 2 Total Construction Cost (YOE) (cont'd) **Cell: F25**

Percentiles:	Forecast values
0%	$1,111,840,535
10%	$1,216,551,375
20%	$1,236,525,694
30%	$1,251,142,750
40%	$1,264,045,564
50%	$1,276,011,583
60%	$1,288,431,005
70%	$1,302,213,868
80%	$1,318,634,969
90%	$1,339,707,342
100%	$1,466,663,648

Forecast: Phase 1 and 2 Total Construction Cost and Contingency (YOE) **Cell: F28**

Summary:
Certainty level is 90.00%
Certainty range is from $1,381,393,882 to $1,562,483,885
Entire range is from $1,278,995,071 to $1,685,702,328
Base case is $1,430,710,793
After 10,000 trials, the std. error of the mean is $551,989



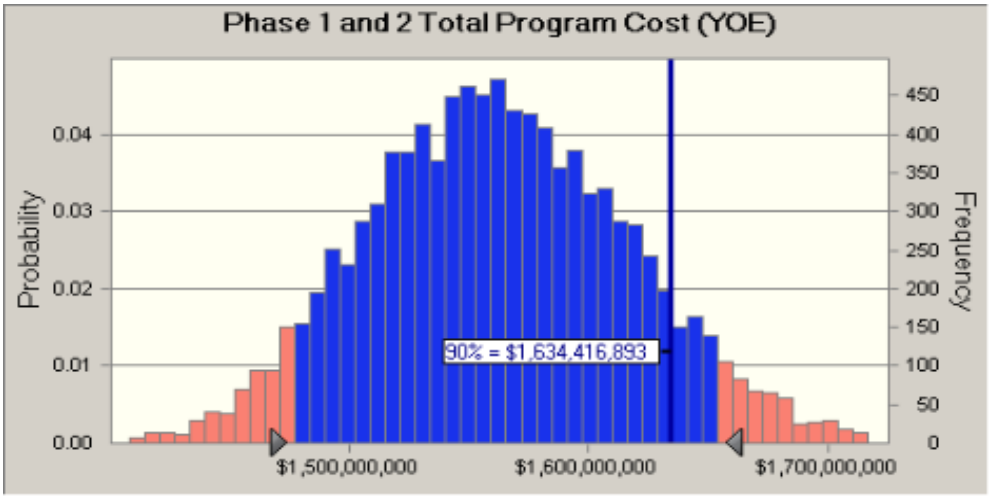
Statistics:	Forecast values
Trials	10,000
Mean	$1,469,265,108
Median	$1,467,539,229
Mode	---
Standard Deviation	$55,198,915
Variance	################
Skewness	0.1595
Kurtosis	2.89
Coeff. of Variability	0.0376
Minimum	$1,278,995,071
Maximum	$1,685,702,328
Range Width	$406,707,257
Mean Std. Error	$551,989

Forecast: Phase 1 and 2 Total Construction Cost and Contingency (YOE) (cont'd) **Cell: F28**

Percentiles:	Forecast values
0%	$1,278,995,071
10%	$1,398,802,229
20%	$1,422,024,078
30%	$1,438,458,198
40%	$1,453,808,382
50%	$1,467,523,109
60%	$1,481,750,794
70%	$1,497,917,275
80%	$1,516,313,863
90%	$1,541,216,893
100%	$1,685,702,328

Forecast: Phase 1 and 2 Total Program Cost (YOE) **Cell: F74**

Summary:
Certainty level is 90.00%
Certainty range is from $1,474,593,882 to $1,655,683,885
Entire range is from $1,372,195,071 to $1,778,902,328
Base case is $1,523,910,793
After 10,000 trials, the std. error of the mean is $551,989



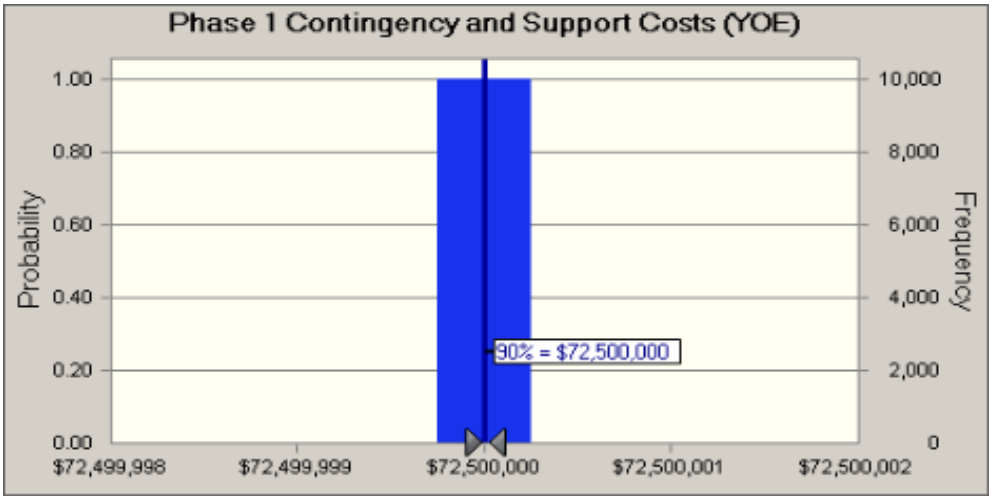
Statistics:	Forecast values
Trials	10,000
Mean	$1,562,465,108
Median	$1,560,739,229
Mode	---
Standard Deviation	$55,198,915
Variance	################
Skewness	0.1595
Kurtosis	2.89
Coeff. of Variability	0.0353
Minimum	$1,372,195,071
Maximum	$1,778,902,328
Range Width	$406,707,257
Mean Std. Error	$551,989

Forecast: Phase 1 and 2 Total Program Cost (YOE) (cont'd) **Cell: F74**

Percentiles:	Forecast values
0%	$1,372,195,071
10%	$1,492,002,229
20%	$1,515,224,078
30%	$1,531,658,198
40%	$1,547,008,382
50%	$1,560,723,109
60%	$1,574,950,794
70%	$1,591,117,275
80%	$1,609,513,863
90%	$1,634,416,893
100%	$1,778,902,328

Forecast: Phase 1 Contingency and Support Costs (YOE) **Cell: D72**

Summary:
Certainty level is 90.00%
Certainty range is from $72,500,000 to $72,500,000
Entire range is from $72,500,000 to $72,500,000
Base case is $72,500,000
After 10,000 trials, the std. error of the mean is $0



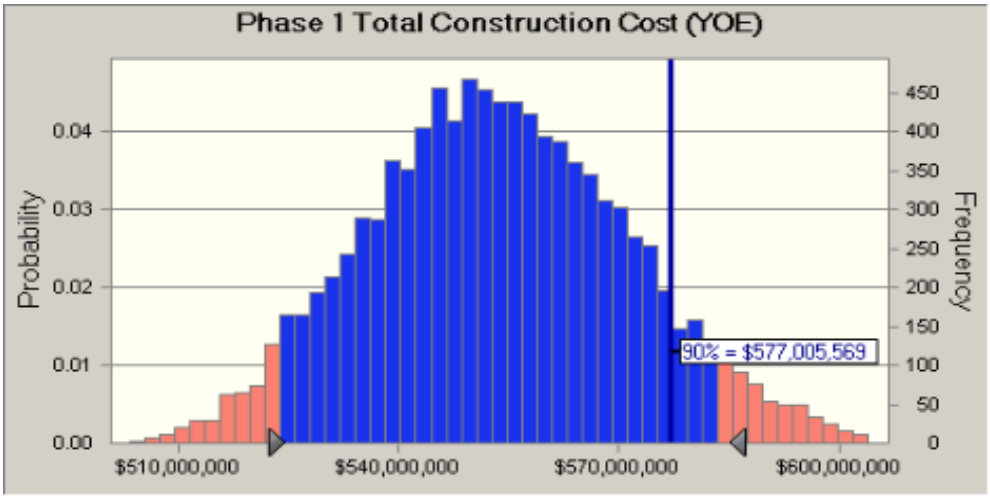
Statistics:	Forecast values
Trials	10,000
Mean	$72,500,000
Median	$72,500,000
Mode	$72,500,000
Standard Deviation	$0
Variance	$0
Skewness	---
Kurtosis	---
Coeff. of Variability	0.00
Minimum	$72,500,000
Maximum	$72,500,000
Range Width	$0
Mean Std. Error	$0

Forecast: Phase 1 Contingency and Support Costs (YOE) (cont'd) **Cell: D72**

Percentiles:	Forecast values
0%	$72,500,000
10%	$72,500,000
20%	$72,500,000
30%	$72,500,000
40%	$72,500,000
50%	$72,500,000
60%	$72,500,000
70%	$72,500,000
80%	$72,500,000
90%	$72,500,000
100%	$72,500,000

Forecast: Phase 1 Total Construction Cost (YOE) **Cell: B25**

Summary:
Certainty level is 90.00%
Certainty range is from $524,873,218 to $584,364,388
Entire range is from $495,290,210 to $615,865,763
Base case is $550,482,174
After 10,000 trials, the std. error of the mean is $179,694



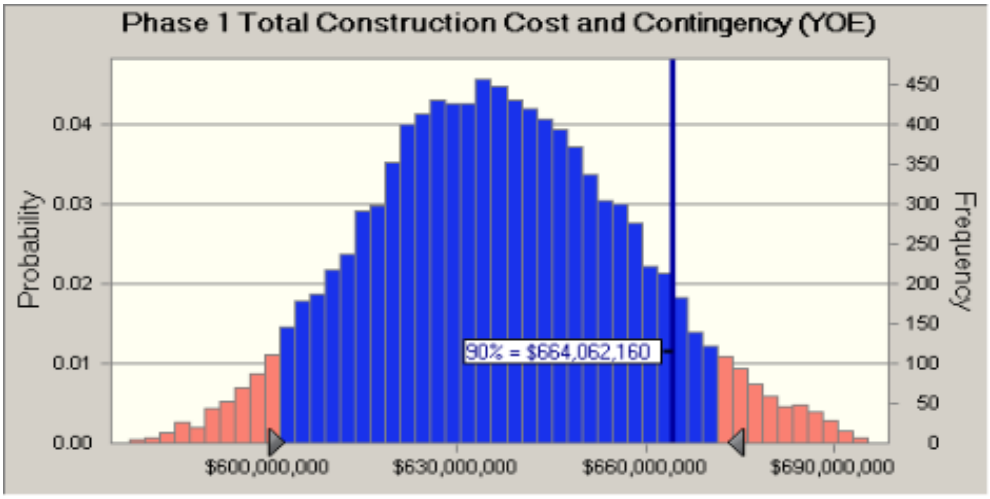
Statistics:	Forecast values
Trials	10,000
Mean	$553,638,186
Median	$553,085,511
Mode	---
Standard Deviation	$17,969,368
Variance	################
Skewness	0.1522
Kurtosis	2.84
Coeff. of Variability	0.0325
Minimum	$495,290,210
Maximum	$615,865,763
Range Width	$120,575,553
Mean Std. Error	$179,694

Forecast: Phase 1 Total Construction Cost (YOE) (cont'd) **Cell: B25**

Percentiles:	Forecast values
0%	$495,290,210
10%	$530,446,199
20%	$538,274,411
30%	$543,899,560
40%	$548,592,298
50%	$553,084,094
60%	$557,766,647
70%	$562,928,430
80%	$568,980,426
90%	$577,005,569
100%	$615,865,763

Forecast: Phase 1 Total Construction Cost and Contingency (YOE) **Cell: B28**

Summary:
Certainty level is 90.00%
Certainty range is from $602,991,098 to $672,163,855
Entire range is from $565,919,447 to $712,188,653
Base case is $633,054,500
After 10,000 trials, the std. error of the mean is $209,593



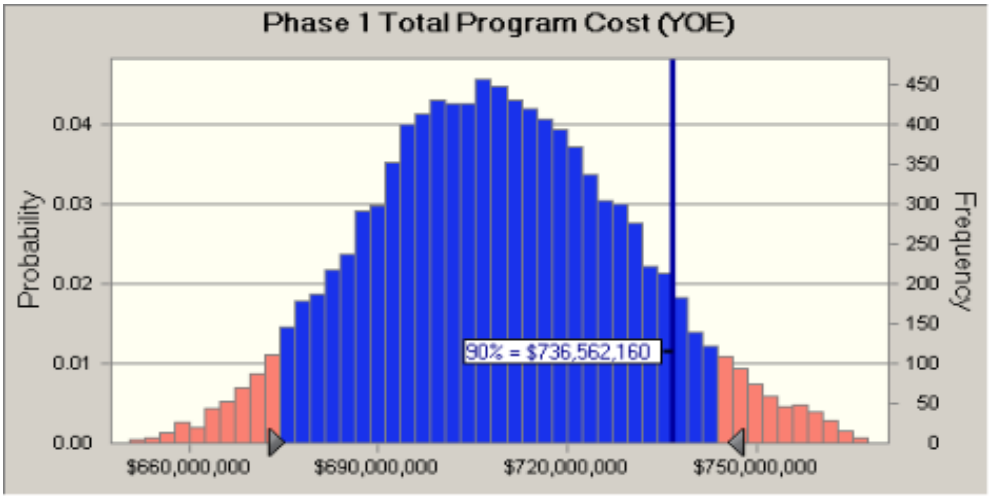
Statistics:	Forecast values
Trials	10,000
Mean	$636,606,535
Median	$636,006,184
Mode	---
Standard Deviation	$20,959,256
Variance	################
Skewness	0.1423
Kurtosis	2.82
Coeff. of Variability	0.0329
Minimum	$565,919,447
Maximum	$712,188,653
Range Width	$146,269,207
Mean Std. Error	$209,593

Forecast: Phase 1 Total Construction Cost and Contingency (YOE) (cont'd) **Cell: B28**

Percentiles:	Forecast values
0%	$565,919,447
10%	$609,772,362
20%	$618,767,159
30%	$624,961,599
40%	$630,564,434
50%	$636,003,241
60%	$641,498,150
70%	$647,468,147
80%	$654,559,146
90%	$664,062,160
100%	$712,188,653

Forecast: Phase 1 Total Program Cost (YOE) **Cell: D74**

Summary:
Certainty level is 90.00%
Certainty range is from $675,491,098 to $744,663,855
Entire range is from $638,419,447 to $784,688,653
Base case is $705,554,500
After 10,000 trials, the std. error of the mean is $209,593



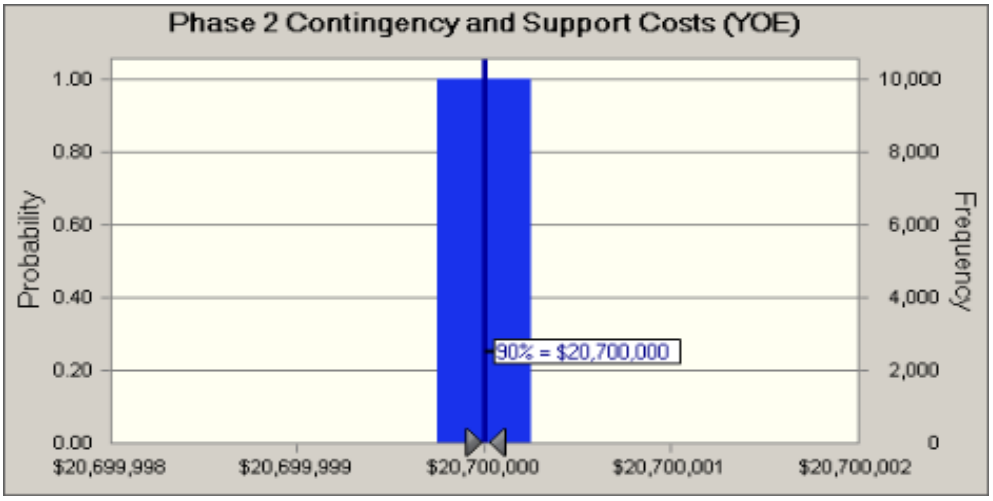
Statistics:	Forecast values
Trials	10,000
Mean	$709,106,535
Median	$708,506,184
Mode	---
Standard Deviation	$20,959,256
Variance	################
Skewness	0.1423
Kurtosis	2.82
Coeff. of Variability	0.0296
Minimum	$638,419,447
Maximum	$784,688,653
Range Width	$146,269,207
Mean Std. Error	$209,593

Forecast: Phase 1 Total Program Cost (YOE) (cont'd) **Cell: D74**

Percentiles:	Forecast values
0%	$638,419,447
10%	$682,272,362
20%	$691,267,159
30%	$697,461,599
40%	$703,064,434
50%	$708,503,241
60%	$713,998,150
70%	$719,968,147
80%	$727,059,146
90%	$736,562,160
100%	$784,688,653

Forecast: Phase 2 Contingency and Support Costs (YOE) **Cell: E72**

Summary:
Certainty level is 90.00%
Certainty range is from $20,700,000 to $20,700,000
Entire range is from $20,700,000 to $20,700,000
Base case is $20,700,000
After 10,000 trials, the std. error of the mean is $0



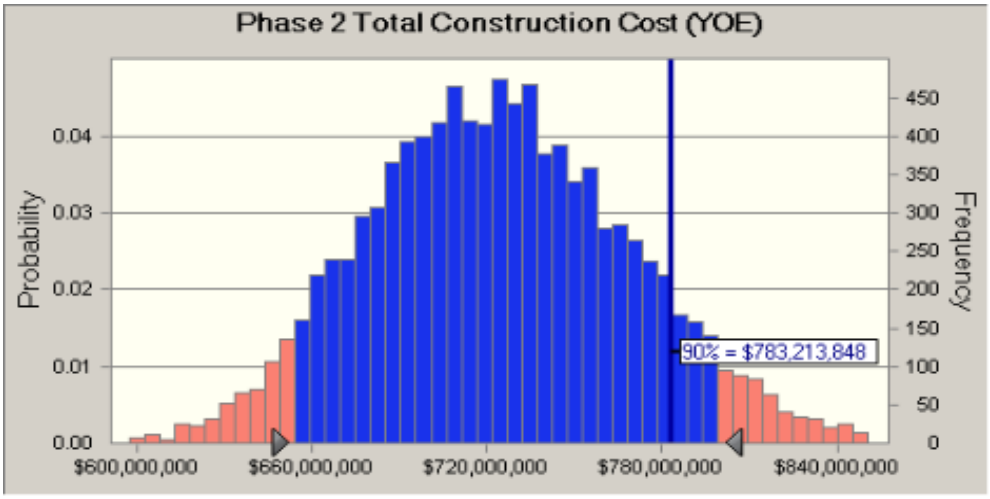
Statistics:	Forecast values
Trials	10,000
Mean	$20,700,000
Median	$20,700,000
Mode	$20,700,000
Standard Deviation	$0
Variance	$0
Skewness	---
Kurtosis	---
Coeff. of Variability	0.00
Minimum	$20,700,000
Maximum	$20,700,000
Range Width	$0
Mean Std. Error	$0

Forecast: Phase 2 Contingency and Support Costs (YOE) (cont'd) **Cell: E72**

Percentiles:	Forecast values
0%	$20,700,000
10%	$20,700,000
20%	$20,700,000
30%	$20,700,000
40%	$20,700,000
50%	$20,700,000
60%	$20,700,000
70%	$20,700,000
80%	$20,700,000
90%	$20,700,000
100%	$20,700,000

Forecast: Phase 2 Total Construction Cost (YOE) **Cell: C25**

Summary:
Certainty level is 90.00%
Certainty range is from $652,850,702 to $800,395,537
Entire range is from $569,180,952 to $906,264,742
Base case is $693,614,168
After 10,000 trials, the std. error of the mean is $452,413



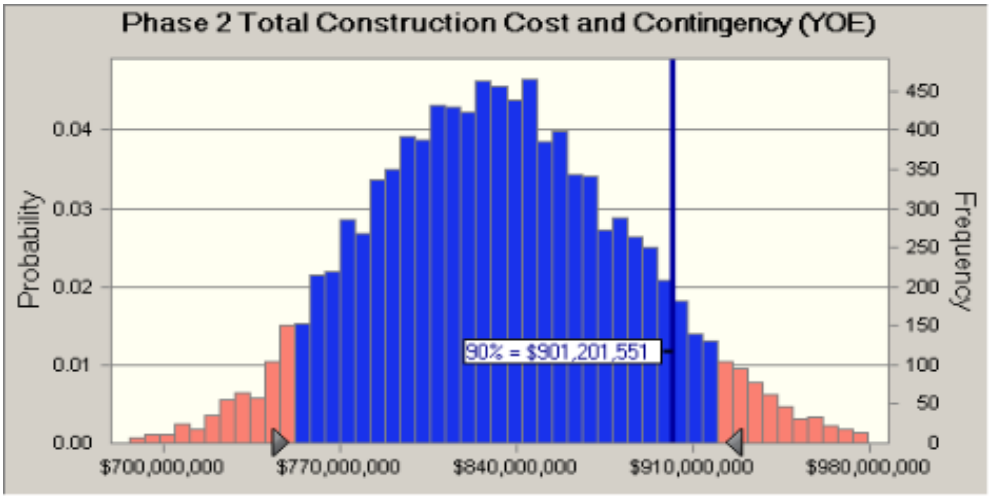
Statistics:	Forecast values
Trials	10,000
Mean	$724,027,662
Median	$722,859,845
Mode	---
Standard Deviation	$45,241,257
Variance	################
Skewness	0.1801
Kurtosis	2.92
Coeff. of Variability	0.0625
Minimum	$569,180,952
Maximum	$906,264,742
Range Width	$337,083,790
Mean Std. Error	$452,413

Forecast: Phase 2 Total Construction Cost (YOE) (cont'd) **Cell: C25**

Percentiles:	Forecast values
0%	$569,180,952
10%	$666,494,341
20%	$685,233,278
30%	$698,870,822
40%	$710,585,498
50%	$722,832,717
60%	$733,917,770
70%	$746,958,626
80%	$762,705,997
90%	$783,213,848
100%	$906,264,742

Forecast: Phase 2 Total Construction Cost and Contingency (YOE) **Cell: C28**

Summary:
Certainty level is 90.00%
Certainty range is from $750,348,998 to $921,134,066
Entire range is from $654,026,575 to $1,040,022,123
Base case is $797,656,293
After 10,000 trials, the std. error of the mean is $522,823



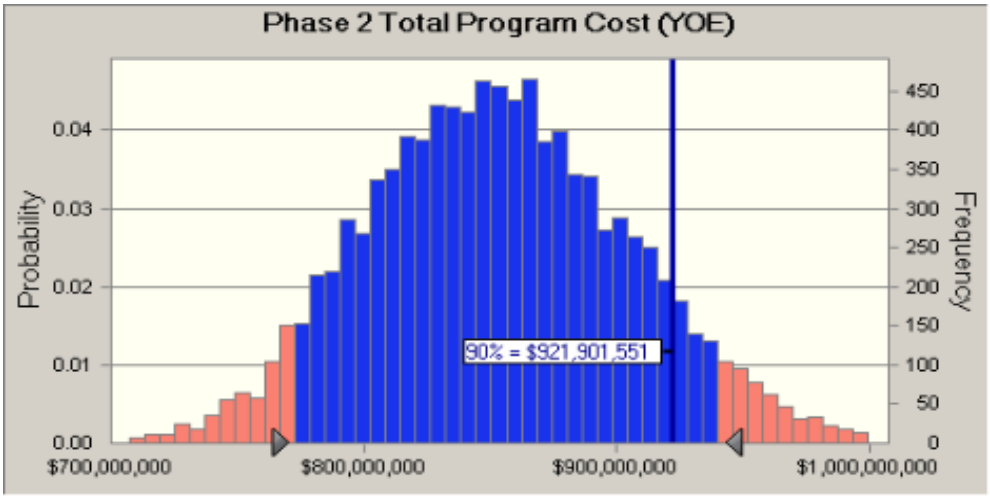
Statistics:	Forecast values
Trials	10,000
Mean	$832,658,573
Median	$831,033,413
Mode	---
Standard Deviation	$52,282,270
Variance	################
Skewness	0.1799
Kurtosis	2.91
Coeff. of Variability	0.0628
Minimum	$654,026,575
Maximum	$1,040,022,123
Range Width	$385,995,548
Mean Std. Error	$522,823

Forecast: Phase 2 Total Construction Cost and Contingency (YOE) (cont'd) **Cell: C28**

Percentiles:	Forecast values
0%	$654,026,575
10%	$766,524,029
20%	$787,356,682
30%	$803,475,613
40%	$817,552,741
50%	$831,024,579
60%	$844,214,665
70%	$858,922,801
80%	$877,472,853
90%	$901,201,551
100%	$1,040,022,123

Forecast: Phase 2 Total Program Cost (YOE) **Cell: E74**

Summary:
Certainty level is 90.00%
Certainty range is from $771,048,998 to $941,834,066
Entire range is from $674,726,575 to $1,060,722,123
Base case is $818,356,293
After 10,000 trials, the std. error of the mean is $522,823



Statistics:	Forecast values
Trials	10,000
Mean	$853,358,573
Median	$851,733,413
Mode	---
Standard Deviation	$52,282,270
Variance	################
Skewness	0.1799
Kurtosis	2.91
Coeff. of Variability	0.0613
Minimum	$674,726,575
Maximum	$1,060,722,123
Range Width	$385,995,548
Mean Std. Error	$522,823

Forecast: Phase 2 Total Program Cost (YOE) (cont'd) **Cell: E74**

Percentiles:	Forecast values
0%	$674,726,575
10%	$787,224,029
20%	$808,056,682
30%	$824,175,613
40%	$838,252,741
50%	$851,724,579
60%	$864,914,665
70%	$879,622,801
80%	$898,172,853
90%	$921,901,551
100%	$1,060,722,123

End of Forecasts

Assumptions

Worksheet: [Crystal Ball Estimate rev5 mean.xls]2-Lane Bridge

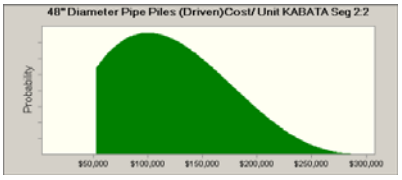
Assumption: 48" Diameter Pipe Piles (Driven)Cost/ Unit KABATA Seg 2:2 **Cell: C8**

FHWA:
Estimate was aggressive; also based on buy/sell of speciality equipment. Potential exposure of equipment availibity.

BetaPERT distribution with parameters:

Minimum	$10,000
Likeliest	$100,000
Maximum	$300,000

Selected range is from $51,885 to $300,000

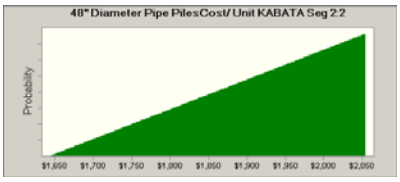


Assumption: 48" Diameter Pipe PilesCost/ Unit KABATA Seg 2:2 **Cell: C7**

FHWA:
Based on American steel galvinized ($19m for gal alone); based on pile lengths; NCG swapped wall thickness for galvinization; used same 100' length; opportunity to use 0.25" thickness less. NCG included associated whale costs and production inefficiencys ($12m; $11m noise attenuation & $1m Watchers); Potential for 8% savings in wall thickness and 10% in economy savings; over estimated margin and profit.

Triangular distribution with parameters:

Minimum	$1,643	(=C7*0.8)
Likeliest	$2,054	(=C7)
Maximum	$2,054	(=C7)

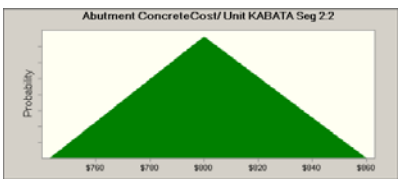


Assumption: Abutment ConcreteCost/ Unit KABATA Seg 2:2 **Cell: C15**

FHWA:
NCG and KABATA range w/avg

Triangular distribution with parameters:

Minimum	$743
Likeliest	$800
Maximum	$860



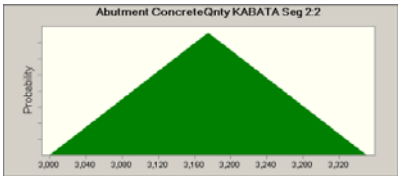

$760
$780
$800
$820
$840
$860

Assumption: Abutment ConcreteQnty KABATA Seg 2:2 **Cell: D15**

FHWA:
NCG and KABATA range w/avg

Triangular distribution with parameters:

Minimum	3,000
Likeliest	3,175
Maximum	3,350

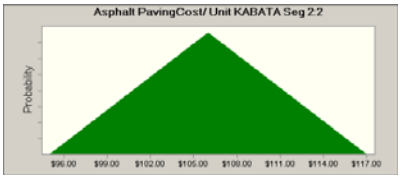


Assumption: Asphalt PavingCost/ Unit KABATA Seg 2:2 **Cell: C25**

FHWA:
These are over estimated by KABATA. Seeng $90 - $100. Using NCG numbers +/- 1%

Triangular distribution with parameters:

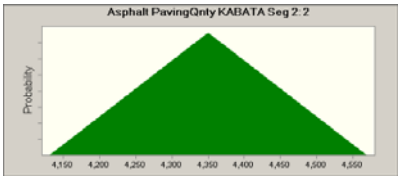
Minimum	$95.00
Likeliest	$106.00
Maximum	$117.00



Assumption: Asphalt PavingQnty KABATA Seg 2:2 **Cell: D25**

Triangular distribution with parameters:

Minimum	4,132
Likeliest	4,350
Maximum	4,568

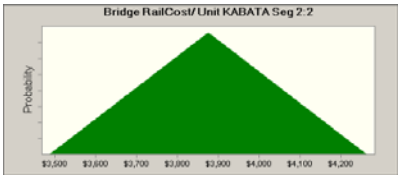


Assumption: Bridge RailCost/ Unit KABATA Seg 2:2 **Cell: C21**

FHWA:
Price bust. Using NCG and Adjusted KABATA as range.

Triangular distribution with parameters:

Minimum	$3,487
Likeliest	$3,875
Maximum	$4,262

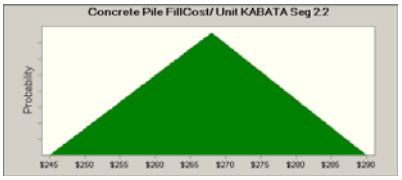


Assumption: Concrete Pile FillCost/ Unit KABATA Seg 2:2 **Cell: C13**

FHWA:
Basic range the KABATA and NCG thought

Triangular distribution with parameters:

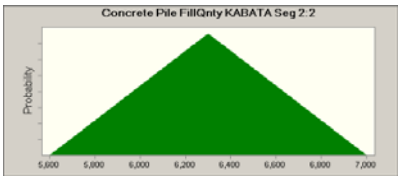
Minimum	$245
Likeliest	$268
Maximum	$290



Assumption: Concrete Pile FillQnty KABATA Seg 2:2 **Cell: D13**

Triangular distribution with parameters:

Minimum	5,600
Likeliest	6,300
Maximum	7,000

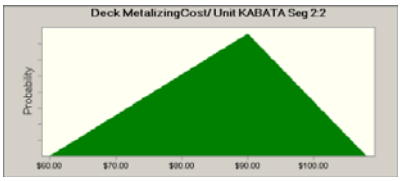


Assumption: Deck MetalizingCost/ Unit KABATA Seg 2:2 **Cell: C22**

FHWA:
KABATA direct expereince with this of $6-$10/sf. Estimater couldn't get any good quotes to make the base case est.

Triangular distribution with parameters:

Minimum	$60.00
Likeliest	$90.00
Maximum	$108.00

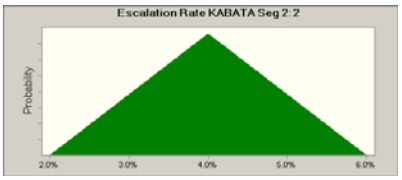


Assumption: Escalation Rate KABATA Seg 2:2 **Cell: E36**

FHWA:
AKDOT Policy 4%; Could go as low as zero; Effect of stimulas is unknown on competition, and bid prices

Triangular distribution with parameters:

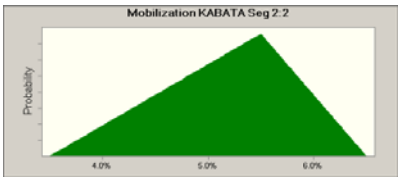
Minimum	2.0%
Likeliest	4.0%
Maximum	6.0%



Assumption: Mobilization KABATA Seg 2:2 **Cell: D31**

Triangular distribution with parameters:

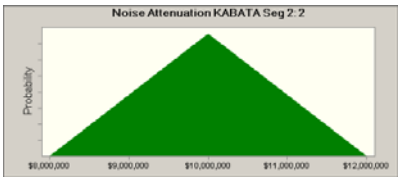
Minimum	3.5%
Likeliest	5.5%
Maximum	6.5%



Assumption: Noise Attenuation KABATA Seg 2:2 **Cell: E10**

Triangular distribution with parameters:

Minimum	$8,000,000
Likeliest	$10,000,000
Maximum	$12,000,000

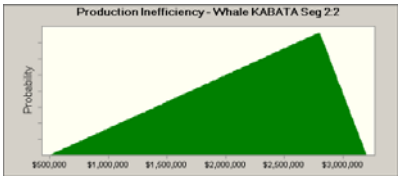


Assumption: Production Inefficiency - Whale KABATA Seg 2:2 **Cell: E11**

FHWA:
Whale watcher in Env. Mit.; KABATA says whale shutdowns are minimal

Triangular distribution with parameters:

Minimum	$500,000
Likeliest	$2,800,000
Maximum	$3,200,000

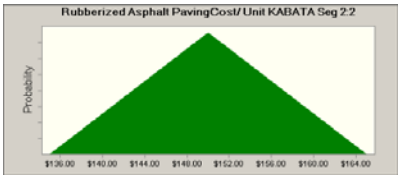


Assumption: Rubberized Asphalt PavingCost/ Unit KABATA Seg 2:2 **Cell: C24**

FHWA:
These are over estimated by KABATA. Seeng $90 - $100. Using NCG numbers +/- 1%

Triangular distribution with parameters:

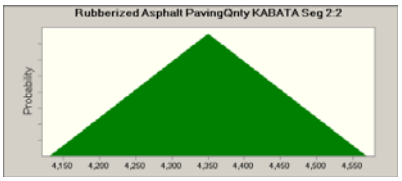
Minimum	$135.00
Likeliest	$150.00
Maximum	$165.00



Assumption: Rubberized Asphalt PavingQnty KABATA Seg 2:2 **Cell: D24**

Triangular distribution with parameters:

Minimum	4,132
Likeliest	4,350
Maximum	4,568

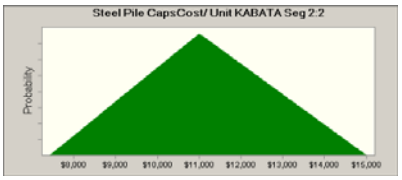


Assumption: Steel Pile CapsCost/ Unit KABATA Seg 2:2 **Cell: C12**

FHWA:
A lot of field cutting, welding and fitting involved with this item, potential instal problems workmenship issues; NCG $6/#; Used base as ML and NCG as WC. ML Avg.

Triangular distribution with parameters:

Minimum	$7,425
Likeliest	$11,000
Maximum	$15,000

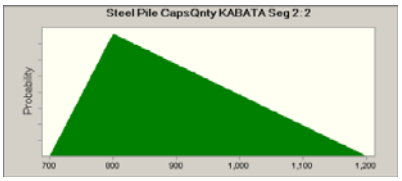


Assumption: Steel Pile CapsQnty KABATA Seg 2:2 **Cell: D12**

FHWA:
Base appears to be a bust. Usw base est as the WC. Quick cacls show less.

Triangular distribution with parameters:

Minimum	700
Likeliest	800
Maximum	1,200



Assumption: Super Structure-Structural SteelCost/ Unit KABATA Seg 2:2 **Cell: C18**

FHWA:
KABATA and NCG Equipment Diff. Buy/Sell vs rent. $2m. Less BC

Steel fabridcated price Diff, 10%; KABATA price BC, based on previouse knowledge of project: $15m BC

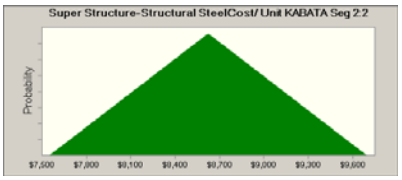
Welding on ribs and deck tolerances cause fabrication problems increasing costs.

Yard storage costs.

Used KABATA's as BC and NCG as WC w/avg as ML

Triangular distribution with parameters:

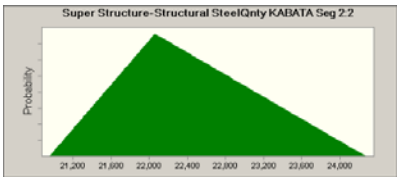
Minimum	$7,553
Likeliest	$8,623
Maximum	$9,692



Assumption: Super Structure-Structural SteelQnty KABATA Seg 2:2 **Cell: D18**

Triangular distribution with parameters:

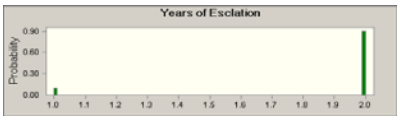
Minimum	20,958	(=D18*0.95)
Likeliest	22,061	(=D18)
Maximum	24,267	(=D18*1.1)



Assumption: Years of Esclation **Cell: E35**

Custom distribution with parameters:

Value	Probability
1.0	0.10
2.0	0.90



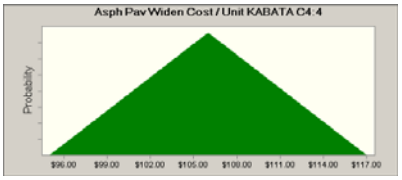
Worksheet: [Crystal Ball Estimate rev5 mean.xls]4-Lane Increment

Assumption: Asph Pav Widen Cost / Unit KABATA C4:4 **Cell: E12**

FHWA:
These are over estimated by KABATA. Seeng $90 - $100. Using NCG numbers +/- 1%

Triangular distribution with parameters:

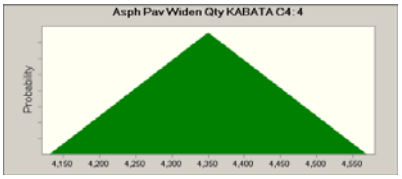
Minimum	$95.00
Likeliest	$106.00
Maximum	$117.00



Assumption: Asph Pav Widen Qty KABATA C4:4 **Cell: F12**

Triangular distribution with parameters:

Minimum	4,132
Likeliest	4,350
Maximum	4,568

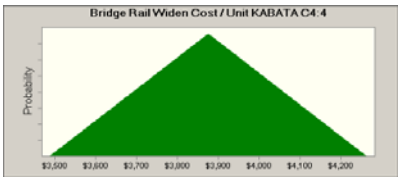


Assumption: Bridge Rail Widen Cost / Unit KABATA C4:4 **Cell: E8**

FHWA:
Price bust. Using NCG and Adjusted KABATA as range.

Triangular distribution with parameters:

Minimum	$3,487
Likeliest	$3,875
Maximum	$4,262

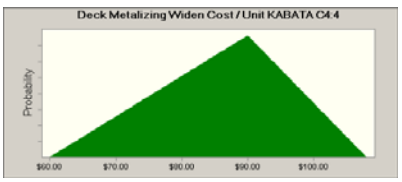


Assumption: Deck Metalizing Widen Cost / Unit KABATA C4:4 **Cell: E9**

FHWA:
KABATA direct expereince with this of $6-$10/sf. Estimater couldn't get any good quotes to make the base case est.

Triangular distribution with parameters:

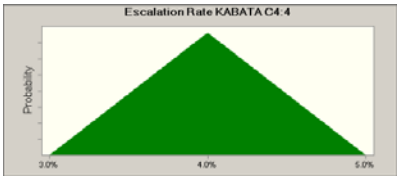
Minimum	$60.00
Likeliest	$90.00
Maximum	$108.00



Assumption: Escalation Rate KABATA C4:4 **Cell: H23**

Triangular distribution with parameters:

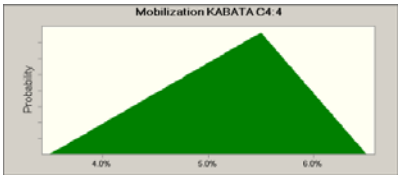
Minimum	3.0%	
Likeliest	4.0%	(=H23)
Maximum	5.0%	



Assumption: Mobilization KABATA C4:4 **Cell: G18**

Triangular distribution with parameters:

Minimum	3.5%
Likeliest	5.5%
Maximum	6.5%

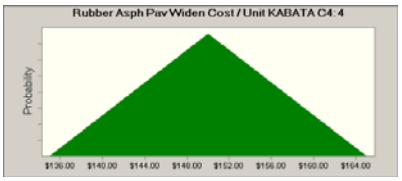


Assumption: Rubber Asph Pav Widen Cost / Unit KABATA C4:4 **Cell: E11**

FHWA:
These are over estimated by KABATA. Seeng $90 - $100. Using NCG numbers +/- 1%

Triangular distribution with parameters:

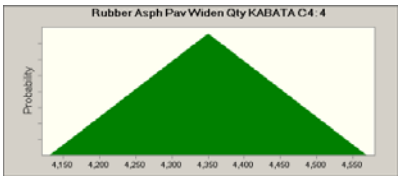
Minimum	$135.00
Likeliest	$150.00
Maximum	$165.00



Assumption: Rubber Asph Pav Widen Qty KABATA C4:4 **Cell: F11**

Triangular distribution with parameters:

Minimum	4,132
Likeliest	4,350
Maximum	4,568



Assumption: Superstr. Steel Widen Cost / Unit KABATA C4:4 **Cell: E5**

FHWA:
KABATA and NCG Equipment Diff. Buy/Sell vs rent. $2m. Less BC

Steel fabridcated price Diff, 10%; KABATA price BC, based on previouse knowledge of project: $15m BC

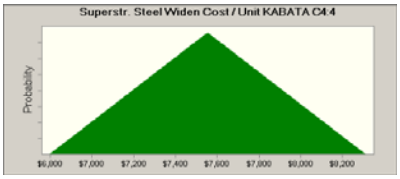
Welding on ribs and deck tolerances cause fabrication problems increasing costs.

Yard storage costs.

Used KABATA's as BC and NCG as WC w/avg as ML

Triangular distribution with parameters:

Minimum	$6,798	(=E5*0.9)
Likeliest	$7,553	(=E5)
Maximum	$8,309	(=E5*1.1)

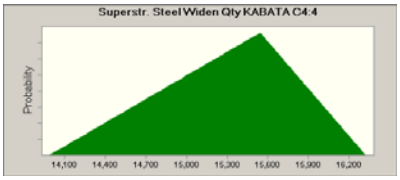


Assumption: Superstr. Steel Widen Qty KABATA C4:4 **Cell: F5**

FHWA:
Opportunity to place more of the steel in Phase 1;

Triangular distribution with parameters:

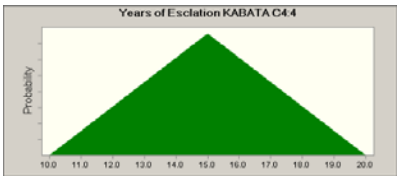
Minimum	13,989	(=F5*0.9)
Likeliest	15,544	(=F5)
Maximum	16,321	(=F5*1.05)



Assumption: Years of Esclation KABATA C4:4 **Cell: H22**

Triangular distribution with parameters:

Minimum	10.0	
Likeliest	15.0	(=H22)
Maximum	20.0	



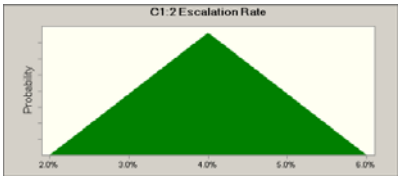
Worksheet: [Crystal Ball Estimate rev5 mean.xls]C1 - 2 lane

Assumption: C1:2 Escalation Rate **Cell: F26**

FHWA:
KABATA opposite of usually 2 bidder situation, because of having 50% chance of winning. Economy making people hungry. ARRA will be doubling the program. Subs may not be needed. LOTS of uncertainity!!! 0%-6% was the original range for this changed to 2% - 4% - 6%.

Triangular distribution with parameters:

Minimum	2.0%
Likeliest	4.0%
Maximum	6.0%

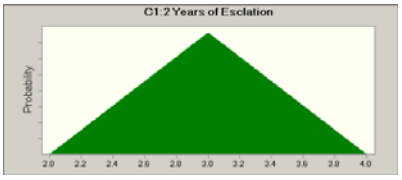


Assumption: C1:2 Years of Esclation **Cell: F25**

FHWA:
The threat modeled here could occur in 2 to 4 years.

Triangular distribution with parameters:

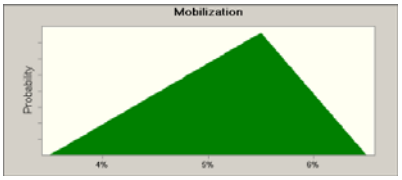
Minimum	2.0
Likeliest	3.0
Maximum	4.0



Assumption: Mobilization **Cell: C22**

Triangular distribution with parameters:

Minimum	4%
Likeliest	6%
Maximum	7%

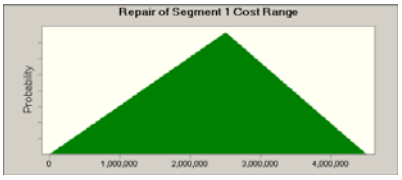


Assumption: Repair of Segment 1 Cost Range **Cell: D23**

FHWA:
Potential cost assuming legal loads hauling

Triangular distribution with parameters:

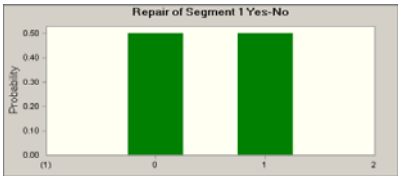
Minimum	0
Likeliest	2,500,000
Maximum	4,500,000



Assumption: Repair of Segment 1 Yes-No **Cell: E23**

FHWA:
50% of pavement items to represent repair after contruction hauling.

Yes-No distribution with parameters:
Probability of Yes(1) 0.5



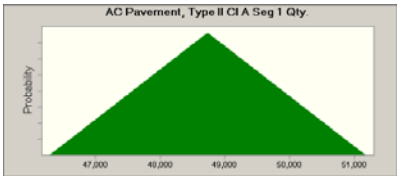
Worksheet: [Crystal Ball Estimate rev5 mean.xls]C1 - 4 lane

Assumption: AC Pavement, Type II Cl A Seg 1 Qty. **Cell: D17**

FHWA:
Farily well known qty.

Triangular distribution with parameters:

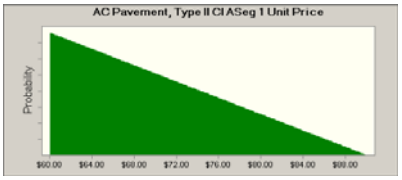
Minimum	46,297	(=D17*0.95)
Likeliest	48,734	(=D17)
Maximum	51,171	(=D17*1.05)



Assumption: AC Pavement, Type II Cl ASeg 1 Unit Price **Cell: E17**

Triangular distribution with parameters:

Minimum	$60.00
Likeliest	$60.00
Maximum	$90.00

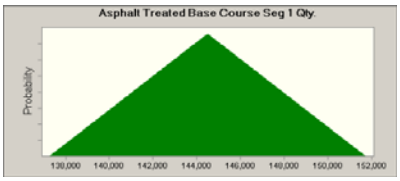


Assumption: Asphalt Treated Base Course Seg 1 Qty. **Cell: D18**

FHWA:
Fairly well known qty

Triangular distribution with parameters:

Minimum	137,270	(=D18*0.95)
Likeliest	144,495	(=D18)
Maximum	151,720	(=D18*1.05)

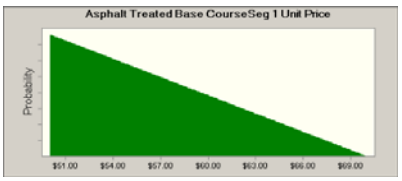


Assumption: Asphalt Treated Base CourseSeg 1 Unit Price **Cell: E18**

FHWA:
Potential for reuse

Triangular distribution with parameters:

Minimum	$50.00
Likeliest	$50.00
Maximum	$70.00

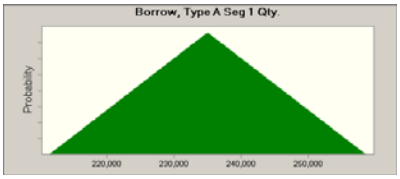


Assumption: Borrow, Type A Seg 1 Qty. **Cell: D13**

FHWA:
=/-10%; includes some reuse

Triangular distribution with parameters:

Minimum	211,500	(=D13*0.9)
Likeliest	235,000	(=D13)
Maximum	258,500	(=D13*1.1)



Assumption: Borrow, Type ASeg 1 Unit Price **Cell: E13**

FHWA:
Conservative; have used $10 - $11; assumed multiple pits; shorter haul distance $13.25 assumed; comparable project $10; reflect higher gas prices but probably not the peak;

Triangular distribution with parameters:

Minimum	$10.00
Likeliest	$12.00
Maximum	$17.50

Assumption: Clearing and Grubbing Seg 1 Qty. **Cell: D8**

FHWA:
=/- 10%

Triangular distribution with parameters:

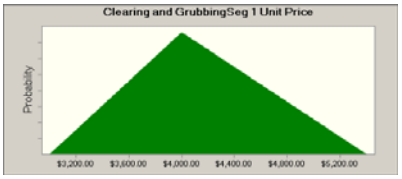
Minimum	187	(=D8*0.9)
Likeliest	208	(=D8)
Maximum	229	(=D8*1.1)

Assumption: Clearing and GrubbingSeg 1 Unit Price **Cell: E8**

FHWA:
Bid prices in the same area

Triangular distribution with parameters:

Minimum	$3,000.00
Likeliest	$4,000.00
Maximum	$5,400.00

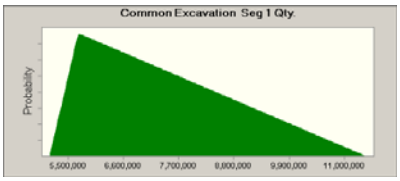


Assumption: Common Excavation Seg 1 Qty. **Cell: D10**

FHWA:
+100%; -10%; Potential for project balancing

Triangular distribution with parameters:

Minimum	5,136,930	(=D10*0.9)
Likeliest	5,707,700	(=D10)
Maximum	11,415,400	(=D10*2)

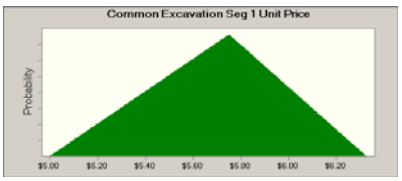


Correlated with:	Coefficient
Excavation (Stockpile) Seg 1 Qty. (D11)	-1.00

Assumption: Common Excavation Seg 1 Unit Price **Cell: E10**

Triangular distribution with parameters:

Minimum	$5.00
Likeliest	$5.75
Maximum	$6.33

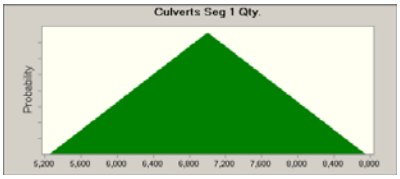


Assumption: Culverts Seg 1 Qty. **Cell: D23**

FHWA:
More uncertaintiy;

Triangular distribution with parameters:

Minimum	5,250	(=D23*0.75)
Likeliest	7,000	(=D23)
Maximum	8,750	(=D23*1.25)

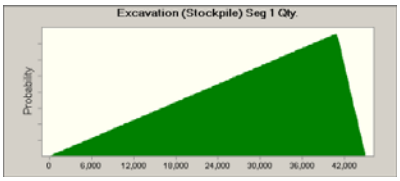


Assumption: Excavation (Stockpile) Seg 1 Qty. **Cell: D11**

FHWA:
Correlated with common excavation

Triangular distribution with parameters:

Minimum	0	(=D11*0)
Likeliest	40,898	(=D11)
Maximum	44,988	(=D11*1.1)



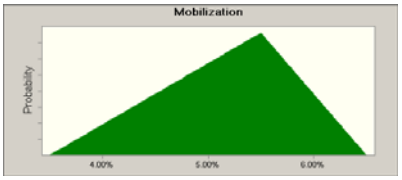
Correlated with:	Coefficient
Common Excavation Seg 1 Qty. (D10)	-1.00

Assumption: Mobilization **Cell: C29**

FHWA:
10% max by spec; One year history shows 3.5 - 6; this history represent a time when contractors where considered to be hungry for work. Most equipment is here; except speciality equipment. Potential limited access on west side. 3.5-5.5-6.5

Triangular distribution with parameters:

Minimum	3.50%
Likeliest	5.50%
Maximum	6.50%



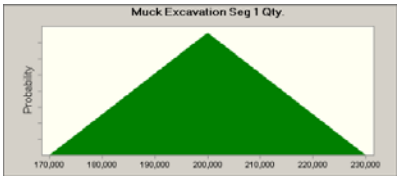
Assumption: Muck Excavation Seg 1 Qty. **Cell: D15**

FHWA:
Muck is a little harder to identify

Triangular distribution with parameters:

Minimum	170,000	(=D15*0.85)
Likeliest	200,000	(=D15)
Maximum	230,000	(=D15*1.15)

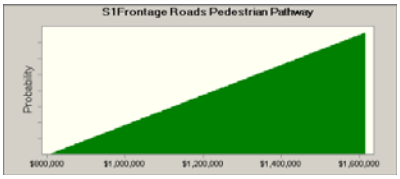
Assumption: Muck Excavation Seg 1 Qty. (cont'd) **Cell: D15**



Assumption: S1Frontage Roads Pedestrian Pathway **Cell: F25**

Triangular distribution with parameters:

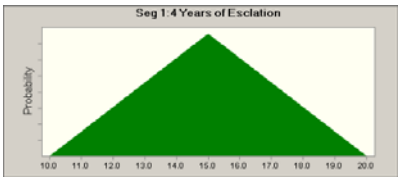
Minimum	$807,528	(=F25*0.5)
Likeliest	$1,615,056	(=F25)
Maximum	$1,615,056	(=F25)



Assumption: Seg 1:4 Years of Esclation **Cell: F32**

Triangular distribution with parameters:

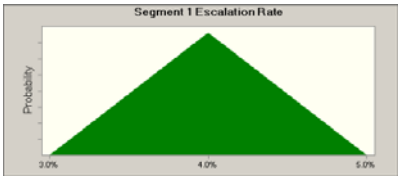
Minimum	10.0
Likeliest	15.0
Maximum	20.0



Assumption: Segment 1 Escalation Rate **Cell: F33**

Triangular distribution with parameters:

Minimum	3.0%
Likeliest	4.0%
Maximum	5.0%

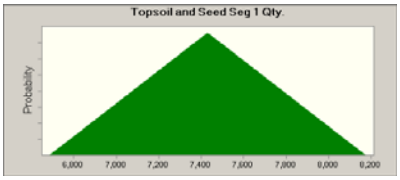


Assumption: Topsoil and Seed Seg 1 Qty. **Cell: D19**

FHWA:

Triangular distribution with parameters:

Minimum	6,687	(=D19*0.9)
Likeliest	7,430	(=D19)
Maximum	8,173	(=D19*1.1)

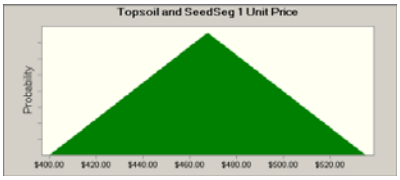


Assumption: Topsoil and SeedSeg 1 Unit Price **Cell: E19**

FHWA:
Based on bib histories

Triangular distribution with parameters:

Minimum	$400.00	
Likeliest	$467.50	(=E19)
Maximum	$535.00	



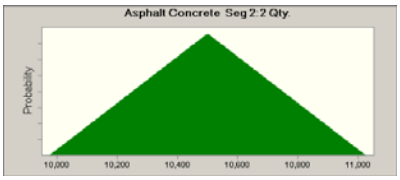
Worksheet: [Crystal Ball Estimate rev5 mean.xls]C2 - 2 lane

Assumption: Asphalt Concrete Seg 2:2 Qty. **Cell: D13**

Triangular distribution with parameters:

Minimum	9,975	(=D13*0.95)
Likeliest	10,500	(=D13)
Maximum	11,025	(=D13*1.05)

Assumption: Asphalt Concrete Seg 2:2 Qty. (cont'd) **Cell: D13**

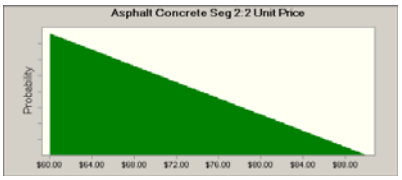


Assumption: Asphalt Concrete Seg 2:2 Unit Price **Cell: E13**

FHWA:

Triangular distribution with parameters:

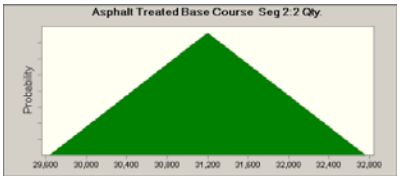
Minimum	$60.00
Likeliest	$60.00
Maximum	$90.00



Assumption: Asphalt Treated Base Course Seg 2:2 Qty. **Cell: D14**

Triangular distribution with parameters:

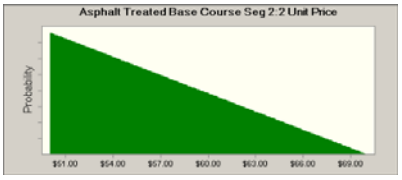
Minimum	29,640	(=D14*0.95)
Likeliest	31,200	(=D14)
Maximum	32,760	(=D14*1.05)



Assumption: Asphalt Treated Base Course Seg 2:2 Unit Price **Cell: E14**

Triangular distribution with parameters:

Minimum	$50.00
Likeliest	$50.00
Maximum	$70.00



Assumption: Borrow - Type A Seg 2:2 Unit Price **Cell: E12**

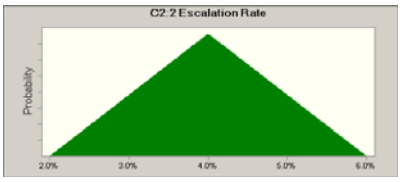
Triangular distribution with parameters:

Minimum	$10.00
Likeliest	$12.00
Maximum	$17.50

Assumption: C2:2 Escalation Rate **Cell: F35**

Triangular distribution with parameters:

Minimum	2.0%
Likeliest	4.0%
Maximum	6.0%

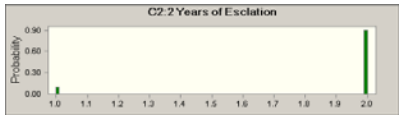


Assumption: C2:2 Years of Esclation **Cell: F34**

FHWA:
Potential for 6mos delay of ROD which turns into 1yr because of missing construction season; 404, potential legal action not any schedule impacts from KABATA's Risk Analysis; and procurment requirements. Potential for fishers people to give indication so the Division can agree on the ROD, estimate at about 10% likeliy; 90% for 2 years.

Custom distribution with parameters:

Value	Probability
1.0	0.10
2.0	0.90



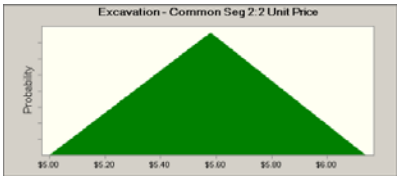
Assumption: Excavation - Common Seg 2:2 Unit Price **Cell: E10**

FHWA:
Same reasoning as Segment 1

Triangular distribution with parameters:

Minimum	$5.00	
Likeliest	$5.58	(=E10)
Maximum	$6.14	(=E10*1.1)

Assumption: Excavation - Common Seg 2:2 Unit Price (cont'd) **Cell: E10**

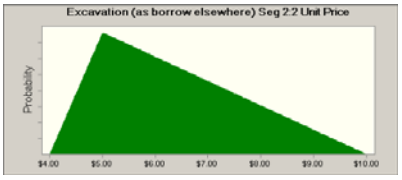


Assumption: Excavation (as borrow elsewhere) Seg 2:2 Unit Price **Cell: E11**

FHWA:
Can be reused or stockpiled on site; ncg assumed haul of 4 miles

Triangular distribution with parameters:

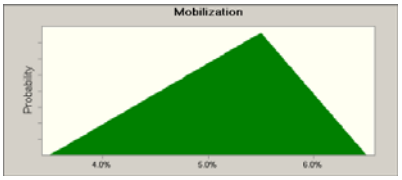
Minimum	$4.00
Likeliest	$5.00
Maximum	$10.00



Assumption: Mobilization **Cell: C29**

Triangular distribution with parameters:

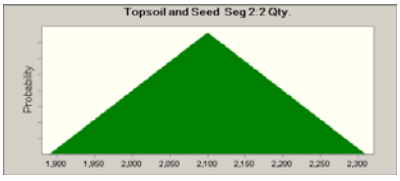
Minimum	3.5%
Likeliest	5.5%
Maximum	6.5%



Assumption: Topsoil and Seed Seg 2:2 Qty. **Cell: D15**

Triangular distribution with parameters:

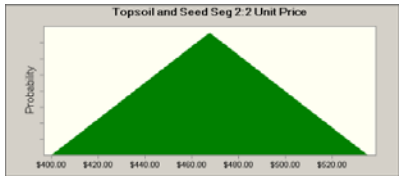
Minimum	1,890	(=D15*0.9)
Likeliest	2,100	(=D15)
Maximum	2,310	(=D15*1.1)



Assumption: Topsoil and Seed Seg 2:2 Unit Price **Cell: E15**

Triangular distribution with parameters:

Minimum	$400.00	
Likeliest	$467.50	(=E15)
Maximum	$535.00	

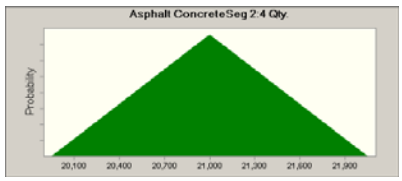


Worksheet: [Crystal Ball Estimate rev5 mean.xls]C2 - 4 lane

Assumption: Asphalt ConcreteSeg 2:4 Qty. **Cell: D13**

Triangular distribution with parameters:

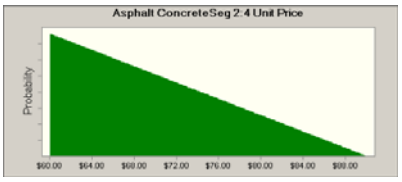
Minimum	19,950	(=D13*0.95)
Likeliest	21,000	(=D13)
Maximum	22,050	(=D13*1.05)



Assumption: Asphalt ConcreteSeg 2:4 Unit Price **Cell: E13**

Triangular distribution with parameters:

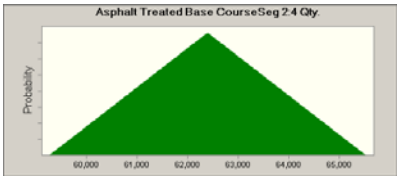
Minimum	$60.00
Likeliest	$60.00
Maximum	$90.00



Assumption: Asphalt Treated Base CourseSeg 2:4 Qty. **Cell: D14**

Triangular distribution with parameters:

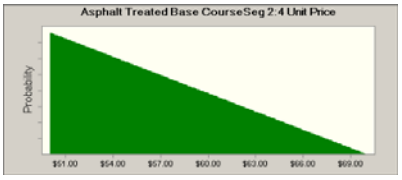
Minimum	59,280	(=D14*0.95)
Likeliest	62,400	(=D14)
Maximum	65,520	(=D14*1.05)



Assumption: Asphalt Treated Base CourseSeg 2:4 Unit Price **Cell: E14**

Triangular distribution with parameters:

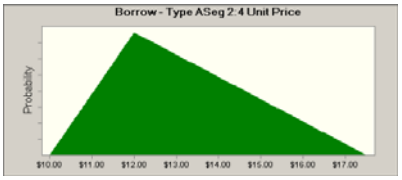
Minimum	$50.00
Likeliest	$50.00
Maximum	$70.00



Assumption: Borrow - Type ASeg 2:4 Unit Price **Cell: E12**

Triangular distribution with parameters:

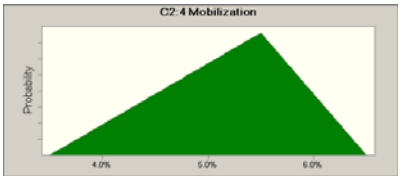
Minimum	$10.00
Likeliest	$12.00
Maximum	$17.50



Assumption: C2:4 Mobilization **Cell: C30**

Triangular distribution with parameters:

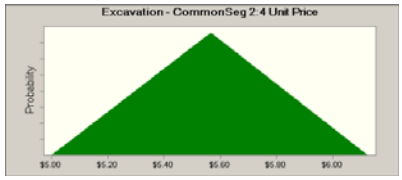
Minimum	3.5%
Likeliest	5.5%
Maximum	6.5%



Assumption: Excavation - CommonSeg 2:4 Unit Price **Cell: E10**

Triangular distribution with parameters:

Minimum	$5.00	
Likeliest	$5.57	(=E10)
Maximum	$6.12	(=E10*1.1)

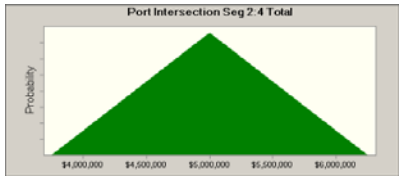


Assumption: Port Intersection Seg 2:4 Total **Cell: F28**

FHWA:
Including some kind of grade separation; Probably undercrossing

Triangular distribution with parameters:

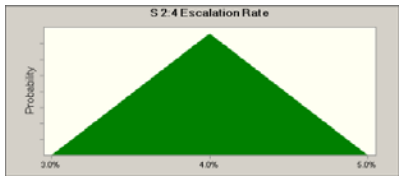
Minimum	$3,750,000	(=F28*0.75)
Likeliest	$5,000,000	(=F28)
Maximum	$6,250,000	(=F28*1.25)



Assumption: S 2:4 Escalation Rate **Cell: F36**

Triangular distribution with parameters:

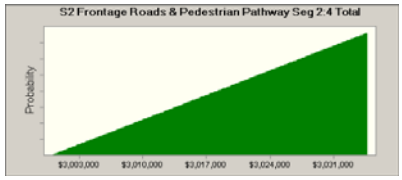
Minimum	3.0%	
Likeliest	4.0%	(=F36)
Maximum	5.0%	



Assumption: S2 Frontage Roads & Pedestrian Pathway Seg 2:4 Total **Cell: F29**

Triangular distribution with parameters:

Minimum	$3,000,000	
Likeliest	$3,034,683	(=F29)
Maximum	$3,034,683	(=F29)



Assumption: Seg 2:4 Unit Price **Cell: F35**

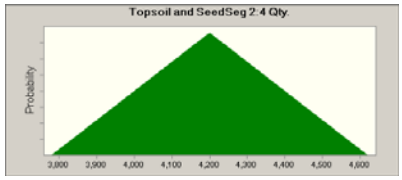
Triangular distribution with parameters:

Minimum	10.0	
Likeliest	15.0	(=F35)
Maximum	20.0	

Assumption: Topsoil and SeedSeg 2:4 Qty. **Cell: D15**

Triangular distribution with parameters:

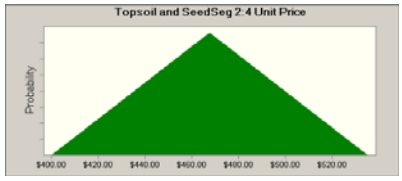
Minimum	3,780	(=D15*0.9)
Likeliest	4,200	(=D15)
Maximum	4,620	(=D15*1.1)



Assumption: Topsoil and SeedSeg 2:4 Unit Price **Cell: E15**

Triangular distribution with parameters:

Minimum	$400.00	
Likeliest	$467.50	(=E15)
Maximum	$535.00	



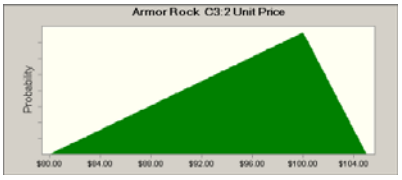
Worksheet: [Crystal Ball Estimate rev5 mean.xls]C3 - 2 lane

Assumption: Armor Rock C3:2 Unit Price **Cell: E13**

FHWA:
Expected to increase because of waste.

Triangular distribution with parameters:

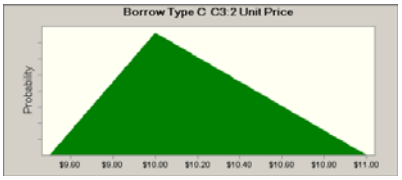
Minimum	$80.00
Likeliest	$100.00
Maximum	$105.00



Assumption: Borrow Type C C3:2 Unit Price **Cell: E11**

Triangular distribution with parameters:

Minimum	$9.50
Likeliest	$10.00
Maximum	$11.00

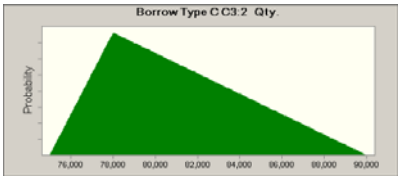


Assumption: Borrow Type C C3:2 Qty. **Cell: D11**

FHWA:
Potential bust in qty; also differnet qty line of calc as in fill below 20

Triangular distribution with parameters:

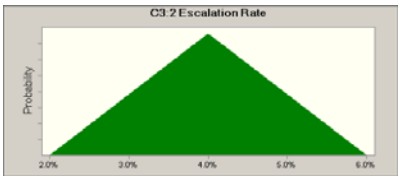
Minimum	75,000
Likeliest	78,000
Maximum	90,000



Assumption: C3:2 Escalation Rate **Cell: F27**

Triangular distribution with parameters:

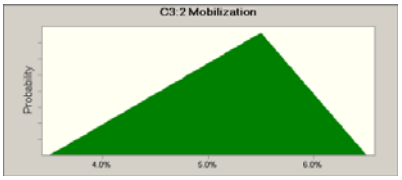
Minimum	2.0%
Likeliest	4.0%
Maximum	6.0%



Assumption: C3:2 Mobilization **Cell: C23**

Triangular distribution with parameters:

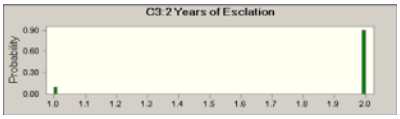
Minimum	3.5%
Likeliest	5.5%
Maximum	6.5%



Assumption: C3:2 Years of Esclation **Cell: F26**

Custom distribution with parameters:

Value	Probability
1.0	0.10
2.0	0.90

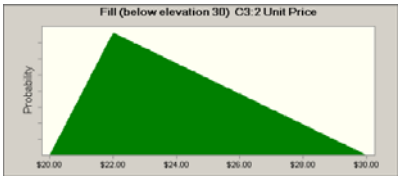


Assumption: Fill (below elevation 30) C3:2 Unit Price **Cell: E12**

FHWA:
Potential different methods to construct. Similar projects to compare with KABATA's different method, represents an opportunity to lower costs. Also opportunity to get staging and off-loading of material area. Tides have big effect. Opportunities depending on Schedule and equipment. Different size armour rock for differnt depths and distances from shore could represent an opportunity. This opportunity could be reduce by "Ice Plucking" action. Potential environmental threat of filling in the water, fish, ...

Triangular distribution with parameters:

Minimum	$20.00
Likeliest	$22.00
Maximum	$30.00

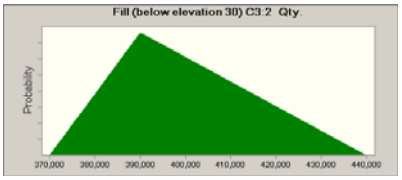


Assumption: Fill (below elevation 30) C3:2 Qty. **Cell: D12**

FHWA:
Potential opportunity to save quantity by using walls or other types of engineered system, reinforced soils slopes in Borrow Type C, the above the water fill, to minimize this fill quantity. Qty range reflect belwo 20 calc.

Triangular distribution with parameters:

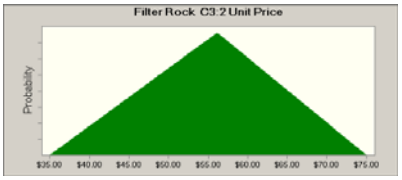
Minimum	370,000
Likeliest	390,000
Maximum	440,000



Assumption: Filter Rock C3:2 Unit Price **Cell: E14**

Triangular distribution with parameters:

Minimum	$35.00
Likeliest	$56.15
Maximum	$75.00

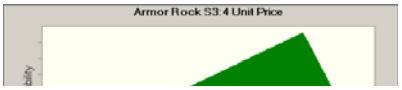


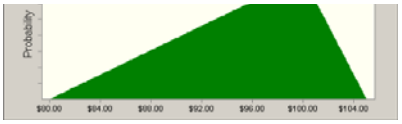
Worksheet: [Crystal Ball Estimate rev5 mean.xls]C3 - 4 lane

Assumption: Armor Rock S3:4 Unit Price **Cell: E12**

Triangular distribution with parameters:

Minimum	$80.00
Likeliest	$100.00

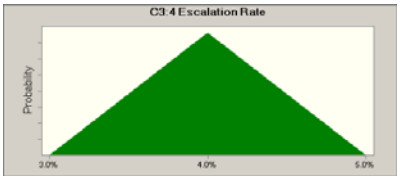


Maximum	$105.00	

Assumption: C3:4 Escalation Rate **Cell: F30**

Triangular distribution with parameters:

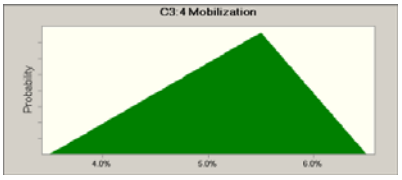
Minimum	3.0%	
Likeliest	4.0%	(=F30)
Maximum	5.0%	



Assumption: C3:4 Mobilization **Cell: C24**

Triangular distribution with parameters:

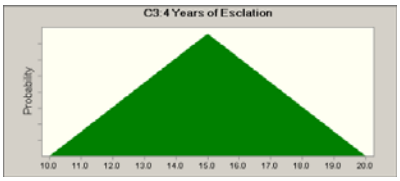
Minimum	3.5%
Likeliest	5.5%
Maximum	6.5%



Assumption: C3:4 Years of Esclation **Cell: F29**

Triangular distribution with parameters:

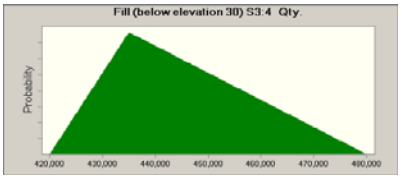
Minimum	10.0	
Likeliest	15.0	(=F29)
Maximum	20.0	



Assumption: Fill (below elevation 30) S3:4 Qty. **Cell: D11**

Triangular distribution with parameters:

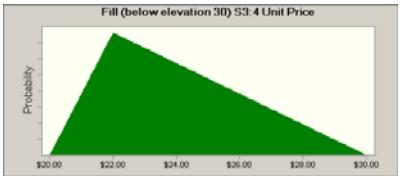
Minimum	420,000
Likeliest	435,000
Maximum	480,000



Assumption: Fill (below elevation 30) S3:4 Unit Price **Cell: E11**

Triangular distribution with parameters:

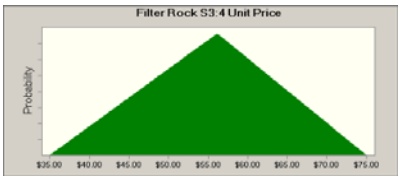
Minimum	$20.00
Likeliest	$22.00
Maximum	$30.00



Assumption: Filter Rock S3:4 Unit Price **Cell: E13**

Triangular distribution with parameters:

Minimum	$35.00
Likeliest	$56.15
Maximum	$75.00

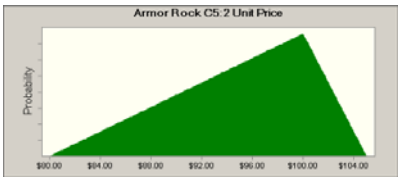


Worksheet: [Crystal Ball Estimate rev5 mean.xls]C5 - 2 lane

Assumption: Armor Rock C5:2 Unit Price **Cell: E11**

Triangular distribution with parameters:

Minimum	$80.00
Likeliest	$100.00
Maximum	$105.00

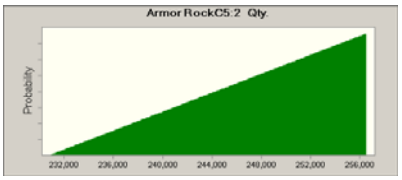


Assumption: Armor RockC5:2 Qty. **Cell: D11**

FHWA:
Potential for shore side starting point change in qty

Triangular distribution with parameters:

Minimum	230,850
Likeliest	256,500
Maximum	256,500



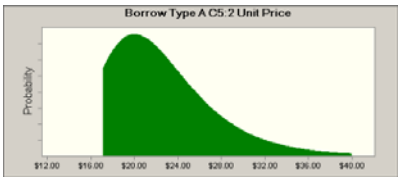
Assumption: Borrow Type A C5:2 Unit Price **Cell: E8**

FHWA:
Potential long haul and lack of access; Potential barging with a lot of handling and Port and Base corrdination; Potential source near site; potential wide range of cost based on potential future agreements with Port or Base. 18-21-28, with these potential arrangements. $55 included processing and somthing else thats not needed.

Maximum Extreme distribution with parameters:

Likeliest	$20.00
Scale	$4.02

Selected range is from $17.00 to $40.00

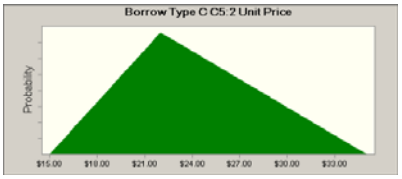


Assumption: Borrow Type C C5:2 Unit Price **Cell: E9**

FHWA:
Adjusted up from C3; Bottom end of the range expects to find this material on Base, and coordination necessary. Top end is w/o Port or Base coordination. Opportunity to land barges on Northside of the Port. Opportunity for KABATA to Get Permits for to temporary work within the footprint the perminent work.

Triangular distribution with parameters:

Minimum	$15.00
Likeliest	$22.00
Maximum	$35.00

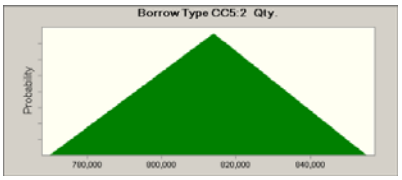


Assumption: Borrow Type CC5:2 Qty. **Cell: D9**

FHWA:
Kabata 814000; compenstae for fill below 20 change: 612000

Triangular distribution with parameters:

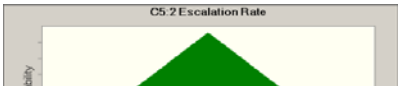
Minimum	770,000
Likeliest	814,000
Maximum	855,000

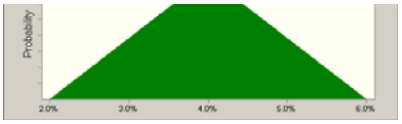


Assumption: C5:2 Escalation Rate **Cell: F26**

Triangular distribution with parameters:

Minimum	2.0%
Likeliest	4.0%

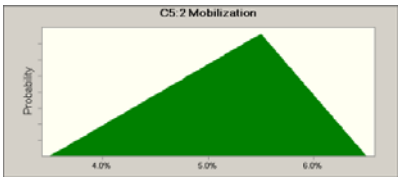


Maximum	6.0%	

Assumption: C5:2 Mobilization **Cell: C22**

Triangular distribution with parameters:

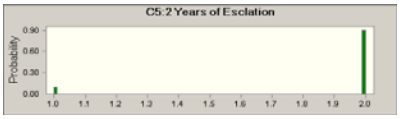
Minimum	3.5%
Likeliest	5.5%
Maximum	6.5%



Assumption: C5:2 Years of Esclation **Cell: F25**

Custom distribution with parameters:

Value	Probability
1.0	0.10
2.0	0.90

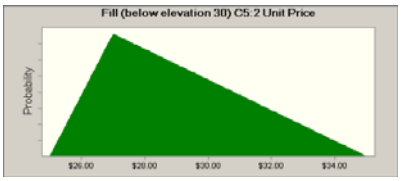


Assumption: Fill (below elevation 30) C5:2 Unit Price **Cell: E10**

FHWA:
Increase in Material cost from C3.

Triangular distribution with parameters:

Minimum	$25.00
Likeliest	$27.00
Maximum	$35.00

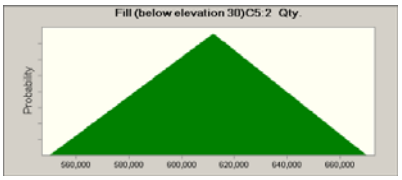


Assumption: Fill (below elevation 30)C5:2 Qty. **Cell: D10**

FHWA:
Qty represent fill below elev 20

Triangular distribution with parameters:

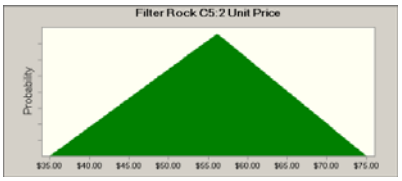
Minimum	550,000
Likeliest	612,000
Maximum	670,000



Assumption: Filter Rock C5:2 Unit Price **Cell: E12**

Triangular distribution with parameters:

Minimum	$35.00
Likeliest	$56.15
Maximum	$75.00

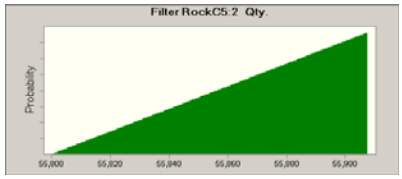


Assumption: Filter RockC5:2 Qty. **Cell: D12**

FHWA:
Same as Armor Rock

Triangular distribution with parameters:

Minimum	55,800	(=62000*0.9)
Likeliest	55,908	(=D12)
Maximum	55,908	(=D12)



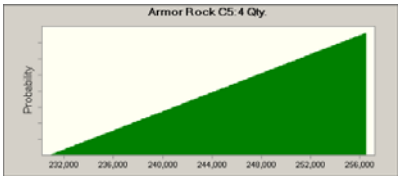
Worksheet: [Crystal Ball Estimate rev5 mean.xls]C5 - 4 lane

Assumption: Armor Rock C5:4 Qty. **Cell: D11**

FHWA:
Potential for shore side starting point change in qty

Triangular distribution with parameters:

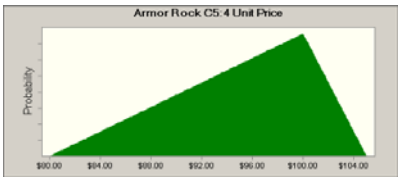
Minimum	230,850
Likeliest	256,500
Maximum	256,500



Assumption: Armor Rock C5:4 Unit Price **Cell: E11**

Triangular distribution with parameters:

Minimum	$80.00
Likeliest	$100.00
Maximum	$105.00

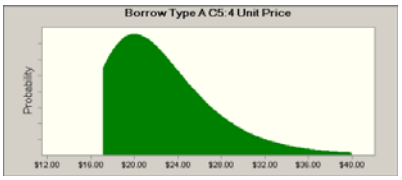


Assumption: Borrow Type A C5:4 Unit Price **Cell: E8**

Maximum Extreme distribution with parameters:

Likeliest	$20.00
Scale	$4.02

Selected range is from $17.00 to $40.00

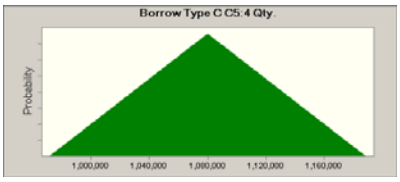


Assumption: Borrow Type C C5:4 Qty. **Cell: D9**

FHWA:
KABATA Qty 1080000 for updated of fill below 20 qty calc

Triangular distribution with parameters:

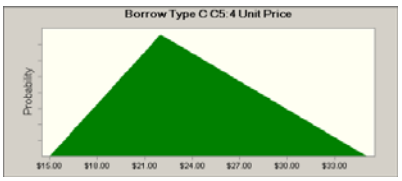
Minimum	972,000	(=1080000*0.9)
Likeliest	1,080,000	
Maximum	1,188,000	(=1080000*1.1)



Assumption: Borrow Type C C5:4 Unit Price **Cell: E9**

Triangular distribution with parameters:

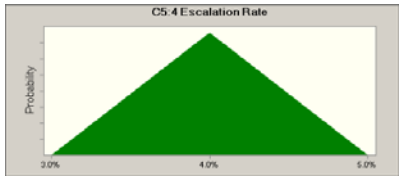
Minimum	$15.00
Likeliest	$22.00
Maximum	$35.00



Assumption: C5:4 Escalation Rate **Cell: F29**

Triangular distribution with parameters:

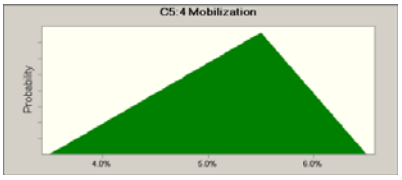
Minimum	3.0%	
Likeliest	4.0%	(=F29)
Maximum	5.0%	



Assumption: C5:4 Mobilization **Cell: C23**

Triangular distribution with parameters:

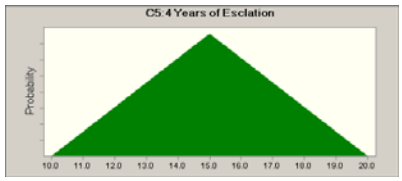
Minimum	3.5%
Likeliest	5.5%
Maximum	6.5%



Assumption: C5:4 Years of Esclation **Cell: F28**

Triangular distribution with parameters:

Minimum	10.0	
Likeliest	15.0	(=F28)
Maximum	20.0	

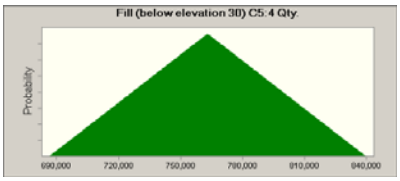


Assumption: Fill (below elevation 30) C5:4 Qty. **Cell: D10**

FHWA:
763000 for updating of fill below 20 qty calc

Triangular distribution with parameters:

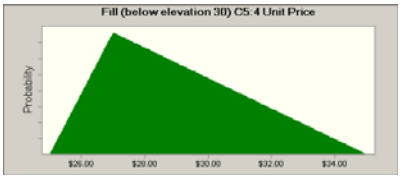
Minimum	686,700	(=763000*0.9)
Likeliest	763,000	
Maximum	839,300	(=763000*1.1)



Assumption: Fill (below elevation 30) C5:4 Unit Price **Cell: E10**

Triangular distribution with parameters:

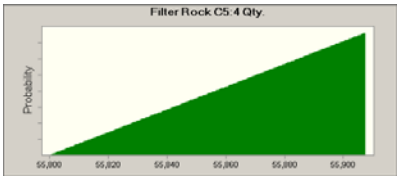
Minimum	$25.00
Likeliest	$27.00
Maximum	$35.00



Assumption: Filter Rock C5:4 Qty. **Cell: D12**

Triangular distribution with parameters:

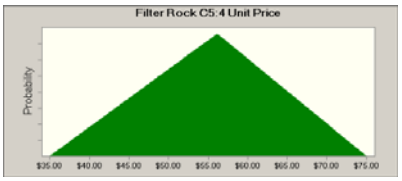
Minimum	55,800	(=62000*0.9)
Likeliest	55,908	(=D12)
Maximum	55,908	(=D12)



Assumption: Filter Rock C5:4 Unit Price **Cell: E12**

Triangular distribution with parameters:

Minimum	$35.00
Likeliest	$56.15
Maximum	$75.00



Worksheet: [Crystal Ball Estimate rev5 mean.xls]C6 - 2 lane

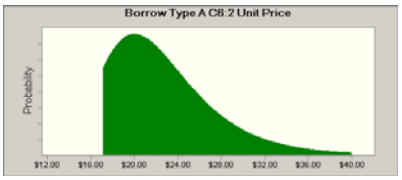
Assumption: Borrow Type A C6:2 Unit Price **Cell: E8**

FHWA:
Curve taken from C5

Maximum Extreme distribution with parameters:

Likeliest	$20.00
Scale	$4.02

Selected range is from $17.00 to $40.00

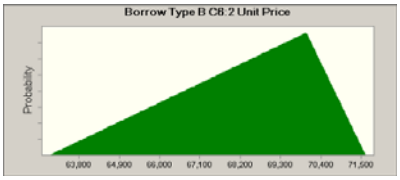


Assumption: Borrow Type B C6:2 Unit Price **Cell: D9**

FHWA:
Some uncertaintiy around this qty, therefore -10%, +5%.

Triangular distribution with parameters:

Minimum	63,000	
Likeliest	70,000	
Maximum	71,615	(=D9*1.05)

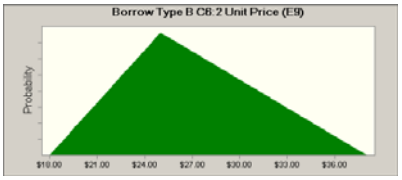


Assumption: Borrow Type B C6:2 Unit Price (E9) **Cell: E9**

FHWA:
Curve taken from C5:2

Triangular distribution with parameters:

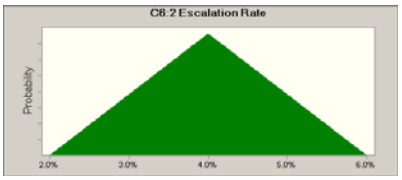
Minimum	$18.00
Likeliest	$25.00
Maximum	$38.00



Assumption: C6:2 Escalation Rate **Cell: F25**

Triangular distribution with parameters:

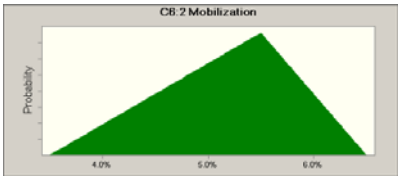
Minimum	2.0%
Likeliest	4.0%
Maximum	6.0%



Assumption: C6:2 Mobilization **Cell: C21**

Triangular distribution with parameters:

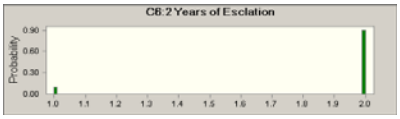
Minimum	3.5%
Likeliest	5.5%
Maximum	6.5%



Assumption: C6:2 Years of Esclation **Cell: F24**

Custom distribution with parameters:

Value	Probability
1.0	0.10
2.0	0.90



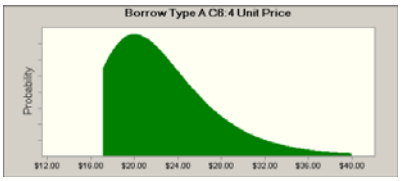
Worksheet: [Crystal Ball Estimate rev5 mean.xls]C6 - 4 lane

Assumption: Borrow Type A C6:4 Unit Price **Cell: E8**

Maximum Extreme distribution with parameters:

Likeliest	$20.00
Scale	$4.02

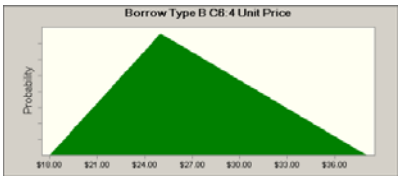
Selected range is from $17.00 to $40.00



Assumption: Borrow Type B C6:4 Unit Price **Cell: E9**

Triangular distribution with parameters:

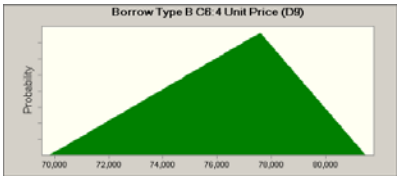
Minimum	$18.00
Likeliest	$25.00
Maximum	$38.00



Assumption: Borrow Type B C6:4 Unit Price (D9) **Cell: D9**

Triangular distribution with parameters:

Minimum	69,824	(=D9*0.9)
Likeliest	77,582	(=D9)
Maximum	81,461	(=D9*1.05)

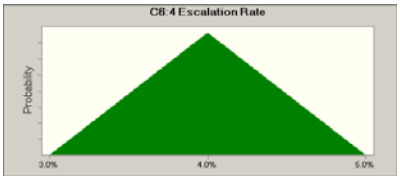


Assumption: C6:4 Escalation Rate **Cell: F27**

Triangular distribution with parameters:

Minimum	3.0%	
Likeliest	4.0%	(=F27)
Maximum	5.0%	

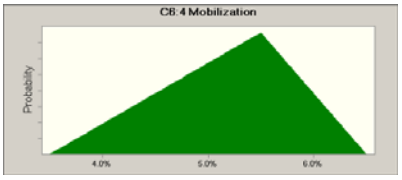
Assumption: C6:4 Escalation Rate (cont'd) **Cell: F27**



Assumption: C6:4 Mobilization **Cell: C21**

Triangular distribution with parameters:

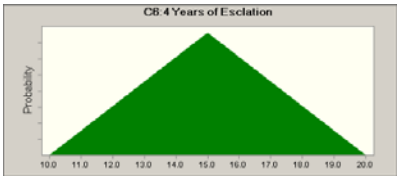
Minimum	3.5%
Likeliest	5.5%
Maximum	6.5%



Assumption: C6:4 Years of Esclation **Cell: F26**

Triangular distribution with parameters:

Minimum	10.0	
Likeliest	15.0	(=F26)
Maximum	20.0	



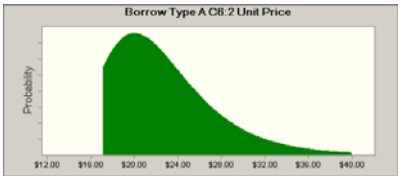
Worksheet: [Crystal Ball Estimate rev5 mean.xls]C8 - 2 lane

Assumption: Borrow Type A C6:2 Unit Price **Cell: E12**

Maximum Extreme distribution with parameters:

Likeliest	$20.00
Scale	$4.02

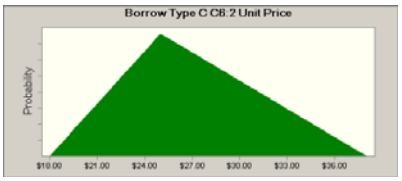
Selected range is from $17.00 to $40.00



Assumption: Borrow Type C C6:2 Unit Price **Cell: E13**

Triangular distribution with parameters:

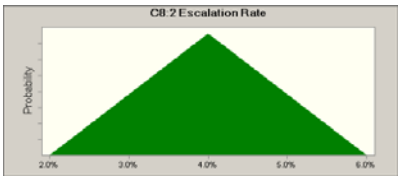
Minimum	$18.00
Likeliest	$25.00
Maximum	$38.00



Assumption: C8:2 Escalation Rate **Cell: F32**

Triangular distribution with parameters:

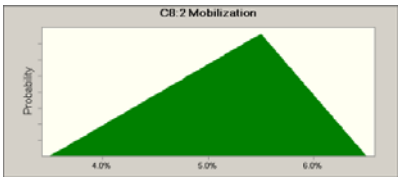
Minimum	2.0%
Likeliest	4.0%
Maximum	6.0%



Assumption: C8:2 Mobilization **Cell: C28**

Triangular distribution with parameters:

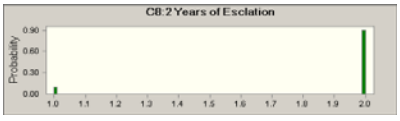
Minimum	3.5%
Likeliest	5.5%
Maximum	6.5%



Assumption: C8:2 Years of Esclation **Cell: F31**

Custom distribution with parameters:

Value	Probability
1.0	0.10
2.0	0.90



Assumption: Sheet Pile (Open Cell and Cantilever) C6:2 Total **Cell: F14**

FHWA:
$28m material;

Opportunity to cut slope back and eliminates some wall qty; $30-$40 /sf;

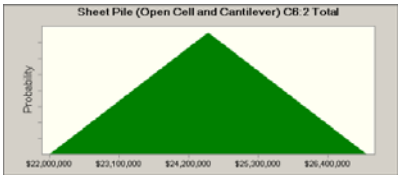
Opportunity to use MSE Wall and save costs ($Potentail to be $10m)

Opportunity to remove Galvanizing requirement ($4m)

$22m - $27m

Triangular distribution with parameters:

Minimum	$22,000,000
Likeliest	$24,500,000
Maximum	$27,000,000

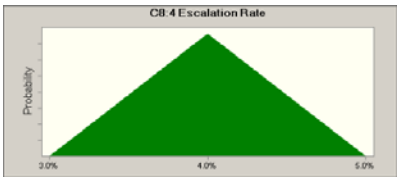


Worksheet: [Crystal Ball Estimate rev5 mean.xls]C8 - 4 lane

Assumption: C8:4 Escalation Rate **Cell: F19**

Triangular distribution with parameters:

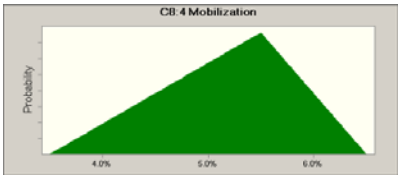
Minimum	3.0%	
Likeliest	4.0%	(=F19)
Maximum	5.0%	



Assumption: C8:4 Mobilization **Cell: C15**

Triangular distribution with parameters:

Minimum	3.5%
Likeliest	5.5%
Maximum	6.5%



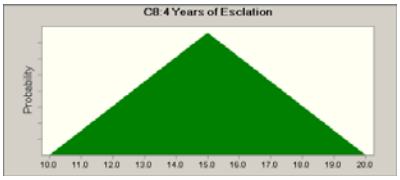
Assumption: C8:4 Years of Esclation **Cell: F18**

Triangular distribution with parameters:

Minimum	10.0

Likeliest	15.0	(=F18)
Maximum	20.0	

Assumption: C8:4 Years of Esclation (cont'd) **Cell: F18**



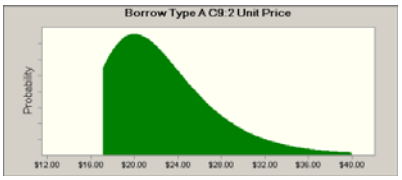
Worksheet: [Crystal Ball Estimate rev5 mean.xls]C9 - 2 lane

Assumption: Borrow Type A C9:2 Unit Price **Cell: E11**

Maximum Extreme distribution with parameters:

Likeliest	$20.00
Scale	$4.02

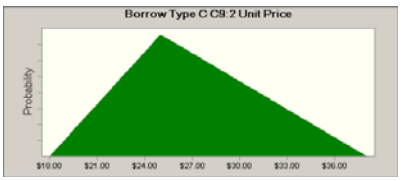
Selected range is from $17.00 to $40.00



Assumption: Borrow Type C C9:2 Unit Price **Cell: E12**

Triangular distribution with parameters:

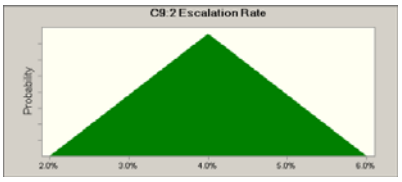
Minimum	$18.00
Likeliest	$25.00
Maximum	$38.00



Assumption: C9:2 Escalation Rate **Cell: F32**

Triangular distribution with parameters:

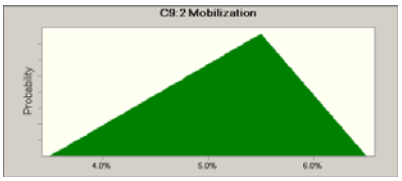
Minimum	2.0%
Likeliest	4.0%
Maximum	6.0%



Assumption: C9:2 Mobilization **Cell: C28**

Triangular distribution with parameters:

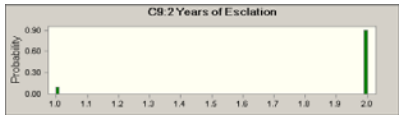
Minimum	3.5%
Likeliest	5.5%
Maximum	6.5%



Assumption: C9:2 Years of Esclation **Cell: F31**

Custom distribution with parameters:

Value	Probability
1.0	0.10
2.0	0.90

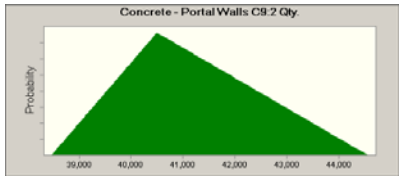


Assumption: Concrete - Portal Walls C9:2 Qty. **Cell: D24**

FHWA:
Potentially more complicated than as estimated by NCG; Found an extra wall.

Triangular distribution with parameters:

Minimum	38,475	(=40500*0.95)
Likeliest	40,500	
Maximum	44,550	(=40500*1.1)

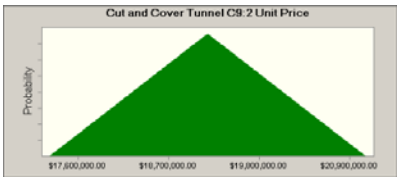


Assumption: Cut and Cover Tunnel C9:2 Unit Price **Cell: E25**

FHWA:
NCG 100% Designed; number good used +/- 10%

Triangular distribution with parameters:

Minimum	$17,257,500.00	
Likeliest	$19,175,000.00	(=E25)
Maximum	$21,092,500.00	

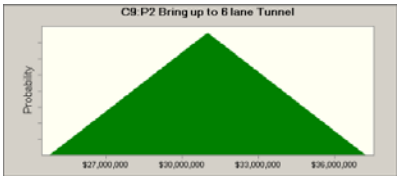


Worksheet: [Crystal Ball Estimate rev5 mean.xls]C9 - Phase 2

Assumption: C9:P2 Bring up to 6 lane Tunnel **Cell: C9**

Triangular distribution with parameters:

Minimum	$24,800,000	(=C9*0.8)
Likeliest	$31,000,000	(=C9)
Maximum	$37,200,000	(=C9*1.2)



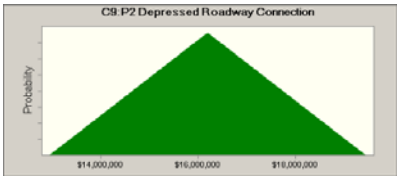
Assumption: C9:P2 Depressed Roadway Connection **Cell: C6**

FHWA:
20% Design Contingency

Triangular distribution with parameters:

Minimum	$12,960,000	(=C6*0.8)
Likeliest	$16,200,000	(=C6)
Maximum	$19,440,000	(=C6*1.2)

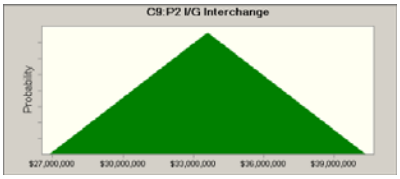
Assumption: C9:P2 Depressed Roadway Connection (cont'd) **Cell: C6**



Assumption: C9:P2 I/G Interchange **Cell: C8**

Triangular distribution with parameters:

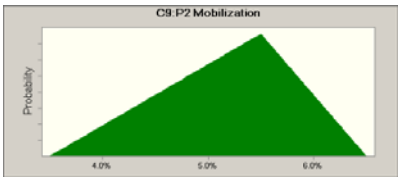
Minimum	$26,880,000	(=C8*0.8)
Likeliest	$33,600,000	(=C8)
Maximum	$40,320,000	(=C8*1.2)



Assumption: C9:P2 Mobilization **Cell: B11**

Triangular distribution with parameters:

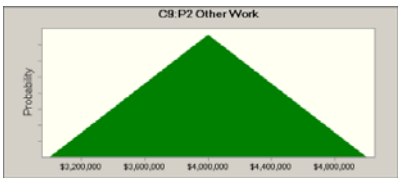
Minimum	3.5%
Likeliest	5.5%
Maximum	6.5%



Assumption: C9:P2 Other Work **Cell: C10**

Triangular distribution with parameters:

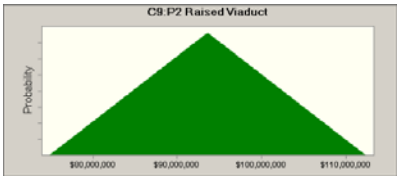
Minimum	$3,000,000
Likeliest	$4,000,000
Maximum	$5,000,000



Assumption: C9:P2 Raised Viaduct **Cell: C7**

Triangular distribution with parameters:

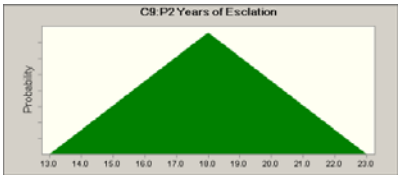
Minimum	$74,880,000	(=C7*0.8)
Likeliest	$93,600,000	(=C7)
Maximum	$112,320,000	(=C7*1.2)



Assumption: C9:P2 Years of Esclation **Cell: C14**

Triangular distribution with parameters:

Minimum	13.0
Likeliest	18.0
Maximum	23.0

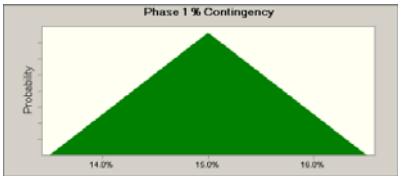


Worksheet: [Crystal Ball Estimate rev5 mean.xls]Exec Summary

Assumption: Phase 1 % Contingency **Cell: D26**

Triangular distribution with parameters:

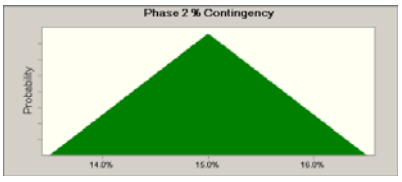
Minimum	13.5%
Likeliest	15.0%
Maximum	16.5%



Assumption: Phase 2 % Contingency **Cell: E26**

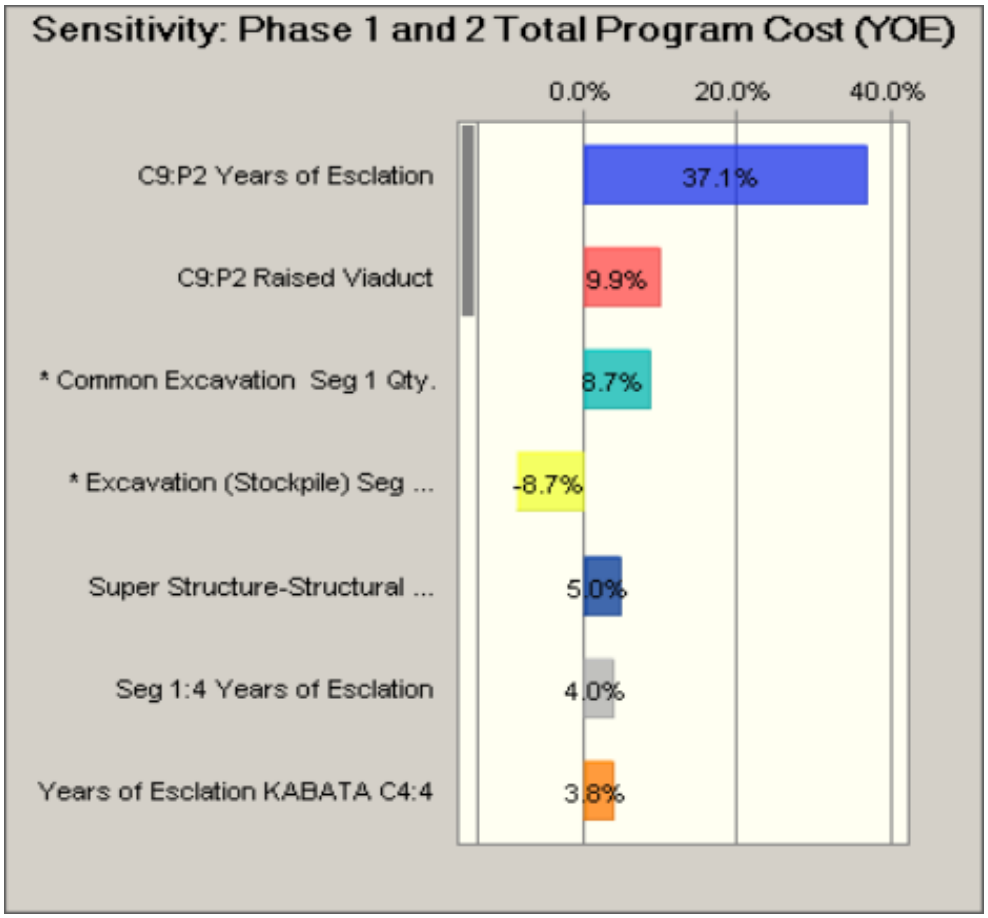
Triangular distribution with parameters:

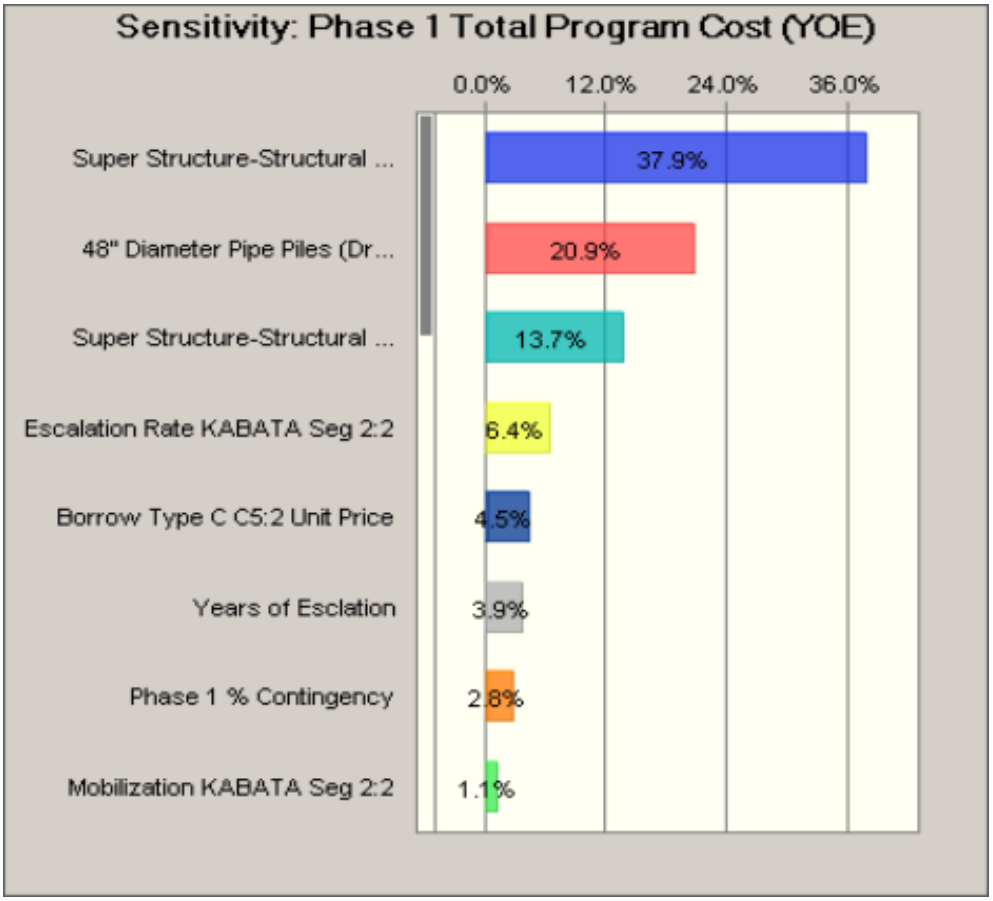
Minimum	13.5%
Likeliest	15.0%
Maximum	16.5%

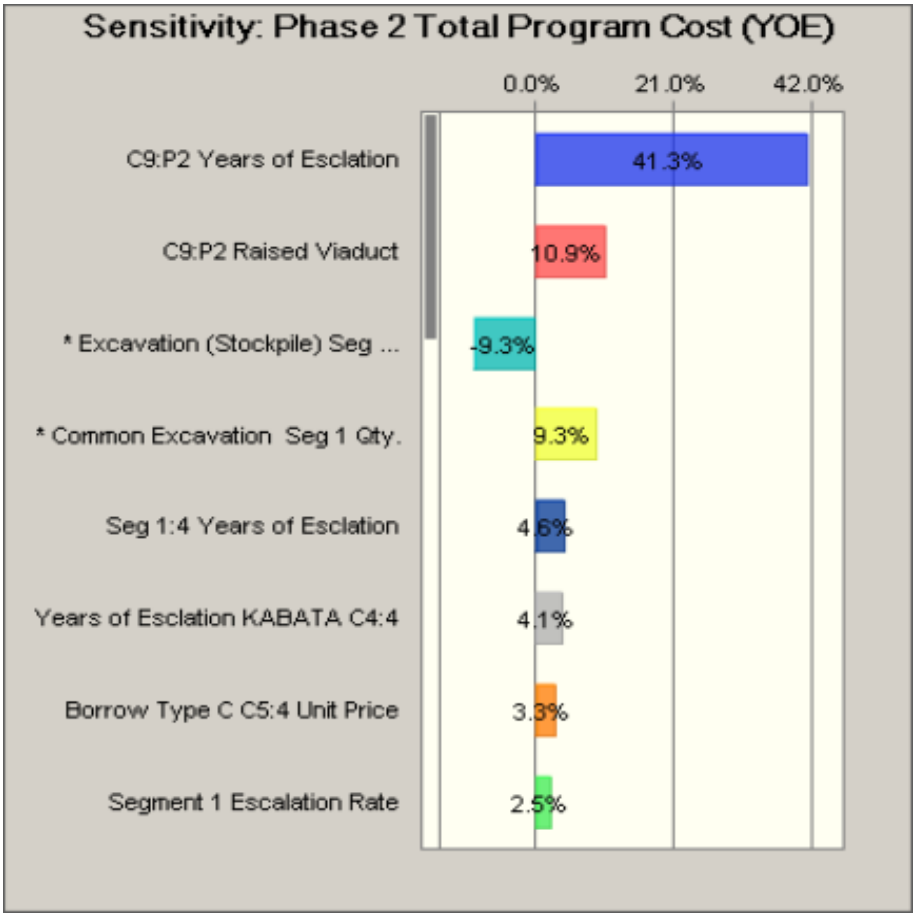


End of Assumptions

Sensitivity Charts




Sensitivity: Phase 1 Total Program Cost (YOE)
0.0%
12.0%
24.0%
36.0%
Super Structure-Structural ...
37.9%
48" Diameter Pipe Piles (Dr...
20.9%
Super Structure-Structural ...
13.7%
Escalation Rate KABATA Seg 2:2
6.4%
Borrow Type C C5:2 Unit Price
4.5%
Years of Esclation
3.9%
Phase 1 % Contingency
2.8%
Mobilization KABATA Seg 2:2
1.1%



End of Sensitivity Charts

Table 1 - West Approach Conceptual Construction Cost Estimate Summary

Segment Description	Phase 1	Phase 2
West Approach		
Segment No. 1	$1,312,341	$84,322,163
Segment No. 2	$12,839,905	$33,137,878
Segment No. 3	$27,584,753	$8,122,191
Subtotal	**$41,737,000**	**$125,582,232**

SEGMENT 4	**Phase 1**	**Phase 2**
	$309,435,731	**$122,805,070**

Table 2 - East Approach Conceptual Construction Cost Estimate Summary

Segment Description	Phase 1	Phase 2		
East Approach				
Segment No. 5	$84,816,874	$25,044,798		$ 560,000,000
Segment No. 6	$4,418,513	$1,631,572		
Segment No. 8	$42,125,843	$2,560,135		
Segment No. 9	$36,702,176	$ 380,078,292	0.02	$ 7,601,565.85
Subtotal	**$168,063,406**	**$409,314,797**		

Concession Preliminary Engineering	$ 9,000,000	$14,000,000			
Concession Construction Engineering	$ 21,000,000	$14,000,000			
TOTAL CONCESSION CONTRACT	$549,236,137	$685,702,099	Phase 1 %	Phase 2 %	$1,234,938,237
Contingency			15.0%	15.0%	
			$82,385,421	$102,855,315	
Total Construction and Contingency	$631,621,558	$788,557,414			$1,420,178,972

SUPPORT COSTS	Costs Phase 1	Costs Phase 2	
AK DOT/KABATA Expenditures 2003 to 2009	$ 44,800,000	$ -	
AK DOT / KABATA Expenditures (Non-Participating)	$ 2,000,000	$ -	
AK DOT Preliminary engineering,	$ -	$ -	Need back up for this item
KABATA Preliminary engineering	$ -	$ -	Need back up for this item
AK DOT Construction engineering	$ -	$ -	Need back up for this item = 7.5%?
KABATA Construction engineering	$ 4,000,000	$ 4,000,000	Need back up for this item = 7.5%?
Public Involvement	$ 2,000,000	$ 2,000,000	Need back up for this item
Permit costs - NOAA/ACE/ State NDPES Under Negotiations.	$ 3,000,000	$ 1,000,000	Need back up for this item
KABATA Program manager costs (KABATA)	$ 4,500,000	$ 2,000,000	Need back up for this item ($3 million per year?)
Third Party costs and agreements (e.g. police, railroad, military base)	$ -	$ -	Need back up for this item
Navigation control costs	$ -	$ -	Need back up for this item
Landscaping	$ -	$ -	Need back up for this item
Project Utilities	$ -	$ -	Need back up for this item
Tolling and ITS costs	$ 3,700,000	$ -	Need back up for this item
Contract incentives, stipends	$ 2,000,000	$ -	Need back up for this item
Changes during construction (e.g. differing site conditions, scope changes)	$ -		Need back up for this item
Right-of-way - Phase 1	$ 6,500,000		Needs to be Escalated?
Right-of-way - Phase 2	$ -	$ 11,700,000	Needs to be Escalated?
TOTAL SUPPORT COSTS	$ 72,500,000	$ 20,700,000	
Total Program Cost	$704,121,558	$809,257,414	**$1,513,378,972**

Bid Item Schedule
Segment No. 1 - Knik Arm Crossing
Two-Lane Configuration
BOP to Sta. 517

Bid Item No.	Description	Unit	Qty.	Unit Price	Total
1	Clearing and Grubbing	acre	81	$5,400.00	$437,400
2	Clearing	acre	46	$5,500.00	$253,000
3	Excavation - Waste	cy	289,000	$5.10	$1,473,900
4	Excavation - Muck	cy	100,000	$7.35	$735,000
5	Excavation - Embankment	cy	249,000	$6.40	$1,593,600
6	Borrow - Type A	cy	71,840	$22.25	$1,598,440
7	Asphalt Concrete	ton	28,680	$90.00	$2,581,200
8	Asphalt Treated Base Course	ton	98,145	$70.00	$6,870,150
9	Topsoil and Seed	ls	1	$500,000.00	$500,000
10	Temporary Erosion Control	ls	1	$100,000.00	$100,000
11	Striping	lf	156,000	$0.80	$124,800
12	Signs	ls	1	$50,000.00	$50,000
13	Culverts	ls	1	$300,000.00	$300,000
14	Traffic Control	ls	1	$125,000.00	$125,000
15	C1:2 Mobilization	5%	**Cost Range**	**Yes-No**	$865,029
	Repair of Segment 1		2,333,333	1	**$1,166,667**

Bid Item Schedule
Segment No. 1 - Knik Arm Crossing
Four-Lane Configuration
BOP to Sta. 517

Bid Item No.	Description	Unit	Seg 1 Qty.	Seg 1 Unit Price	Total
1	Clearing and Grubbing	Acre	208	$4,133.33	$859,733
2	Clearing	Acre	46	$5,500.00	$253,000
3	Common Excavation	CY	3,377,337	$5.69	$19,222,678
4	Excavation (Stockpile)	CY	83,466	$5.10	$425,678
5	Excavation (Waste)	CY			$0
6	Borrow, Type A	CY	235,000	$13.17	$3,094,167
7	Borrow, Type C	CY	0	$6.50	$0
8	Muck Excavation	CY	200,000	$7.35	$1,470,000
9	Stone Mastic	TN	48,734		$0
10	AC Pavement, Type II Cl A	TN	48,734	$70.00	$3,411,380
11	Asphalt Treated Base Course	TN	144,495	$56.67	$8,188,050
12	Topsoil and Seed	MSF	7,430	$467.51	$3,473,590
13	Intersection	LS	1	$75,000.00	$75,000
14	Striping	LF	405,504	$0.80	$324,403
15	Signs	SF	1,300	$75.00	$97,500
16	Culverts	LF	7,000	$150.00	$1,050,000
17	Surveying - All	All			$0
18	S1Frontage Roads Pedestrian Pathway	All			$2,325,680
19	Traffic Control	All	1	$150,000.00	$150,000
20	Silt Fence/ Erosion Protection	All	1	$100,000.00	$100,000
21	Cost per Mile (millions)				$0
22	C1:4 Mobilization	5.17%			$2,300,244
	Total				**$46,821,104**

Bid Item Schedule
Segment No. 2 - Knik Arm Crossing
Two-Lane Configuration
Port Mackenzie Industrial - North Route (Sta. 517+00 to Sta. 703+00 = 18,600 lf)

Bid Item No.	Description	Unit	Seg 2:2 Qty.	Seg 2:2 Unit Price	Total
1	Clearing and Grubbing	acre	60	$6,350.00	$381,000
2	Clearing	acre	17	$6,475.00	$110,075
3	Excavation - Common	cy	350,000	$5.60	$1,961,483
4	Excavation (as borrow elsewhere)	cy	480,000	$6.33	$3,040,000
5	Borrow - Type A	cy	107,500	$13.17	$1,415,417
6	Asphalt Concrete	ton	10,500	$70.00	$735,000
7	Asphalt Treated Base Course	ton	31,200	$56.67	$1,768,000
8	Topsoil and Seed	msf	2,100	$467.51	$981,772
9	Temporary Erosion Control	ls	1	$200,000.00	$200,000
10	Striping	lf	74,300	$0.80	$59,440
11	Signs	sf	200	$75.00	$15,000
12	Culverts	lf	3,000	$150.00	$450,000
13	Traffic Control	ls	1	$25,000.00	$25,000
14	**Maintenance Facility**	sf	**0**	$500.00	$0
15	**Sand Storage Building**	sf	**0**	$100.00	$0
16	**Administration Facility**	sf	**0**	$600.00	$0
17	**Toll Booth**	ea	**0**	$50,000.00	$0
18	**Open Road Toll Road**	ls	**0**	$500,000.00	$0
19	**Facility Pavement**	sf	**0**	$5.00	$0
20	**Traffic Turnaround**	sf	**0**	$5.00	$0
	Port Intersection	ls			$200,000
21	C2:2 Mobilization	5.2%			$575,680
	Total				**$11,917,866**

Bid Item Schedule
Segment No. 2 - Knik Arm Crossing
Four-Lane Divided Highway
Port Mackenzie Industrial - North Route (Sta. 517+00 to Sta. 703+00 = 18,600 lf)

Bid Item No.	Description	Unit	Seg 2:4 Qty.	Seg 2:4 Unit Price	Seg 2:4 Total
1	Clearing and Grubbing	acre	77	$6,350.00	$488,950
2	Clearing	acre	17	$6,475.00	$110,075
3	Excavation - Common	cy	1,100,000	$5.58	$6,134,222
4	Excavation (as borrow elsewhere)	cy	226,245	$12.70	$2,873,312
5	Borrow - Type A	cy	218,000	$13.17	$2,870,333
6	Asphalt Concrete	ton	21,000	$70.00	$1,470,000
7	Asphalt Treated Base Course	ton	62,400	$56.67	$3,536,000
8	Topsoil and Seed	msf	4,200	$467.51	$1,963,543
9	Temporary Erosion Control	ls	1	$200,000.00	$200,000
10	Striping	lf	111,500	$0.80	$89,200
11	Signs	sf	200	$75.00	$15,000
12	Culverts	lf	6,500	$150.00	$975,000
13	Traffic Control	ls	1	$25,000.00	$25,000
14	**Maintenance Facility**	sf	**0**	$500.00	$0
15	**Sand Storage Building**	ls	**0**	$100.00	$0
16	**Administration Facility**	sf	**0**	$600.00	$0
17	**Toll Booth**	ea	**0**	$50,000.00	$0
18	**Open Road Toll Road**	ls	**0**	$500,000.00	$0
19	**Facility Pavement**	sf	**0**	$5.00	$0
20	**Traffic Turnaround**	sf	**0**	$5.00	$0
	Port Intersection	ls			**$5,000,000**
	S2 Frontage Roads & Pedestrian Pathway	All			$3,078,037
21	C2:4 Mobilization	5.2%			$1,489,481
	Total				**$30,318,153**

Bid Item Schedule
Segment No. 3 - Knik Arm Crossing
Two-Lane Configuration
West Approach - Sta. 703+00 to Sta. 725+70 = 2,270 lf

Bid Item No.	Description	Unit	C3:2 Qty.	C3:2 Unit Price	Total
1	Excavation	cy	65,000	$6.45	$419,250
2	Borrow Type A	cy	16,000	$23.95	$383,200
3	Borrow Type C (From Segment 2)	cy	396,000	$6.50	$2,574,000
	Borrow Type C	cy	81,000	$10.17	$823,500
4	Fill (below elevation 30)	cy	400,000	$24.00	$9,600,000
5	Armor Rock	cy	78,000	$95.00	$7,410,000
6	Filter Rock	cy	20,200	$55.38	$1,118,743
7	Asphalt Concrete	ton	1,450	$90.00	$130,500
8	Asphalt Treated Base Course	ton	4,350	$70.00	$304,500
9	Topsoil and Seed	msf	500	$535.00	$267,500
10	Guard Rail	lf	4,540	$32.00	$145,280
11	Striping	lf	9,100	$0.80	$7,280
12	Signs	sf	100	$75.00	$7,500
13	Culverts	lf	500	$150.00	$75,000
14	Temporary Erosion and Sediment Control	ls	1	$10,000.00	$10,000
15	C3:2 Mobilization	5.2%			$2,327,625
	Total				**$25,603,879**

Bid Item Schedule
Segment No. 3 - Knik Arm Crossing
Four-Lane Configuration
West Approach - Sta. 703+00 to Sta. 725+70 = 2,270 lf

Bid Item No.	Description	Unit	S3:4 Qty.	S3:4 Unit Price	Total
1	Excavation	cy	100,000	$7.30	$730,000
2	Borrow Type A	cy	23,500	$25.00	$587,500
3	Borrow Type C (226,000 cy from Segment 2)	cy	541,000	$6.50	$3,516,500
4	Fill (below elevation 30)	cy	445,000	$24.00	$10,680,000
5	Armor Rock	cy	78,000	$95.00	$7,410,000
6	Filter Rock	cy	20,200	$55.38	$1,118,743
7	Asphalt Concrete	ton	24,000	$90.00	$2,160,000
8	Asphalt Treated Base Course	ton	7,100	$70.00	$497,000
9	Topsoil and Seed	msf	500	$535.00	$267,500
10	Guard Rail	lf	4,541	$32.00	$145,312
11	Concrete Barrier	lf	2,270	$70.00	$158,900
12	Striping	lf	9,082	$0.80	$7,266
13	Signs	sf	100	$75.00	$7,500
14	Culverts	lf	500	$150.00	$75,000
15	Temporary Erosion Sediment Control	ls	1	$15,000.00	$15,000
16	C3:4 Mobilization	5.2%			$2,737,622
	Total				**$30,113,843**

Bid Item Schedule
Segment No. 5 - Knik Arm Crossing
Two-Lane Configuration
East Approach - Sta. 807+75 to Sta. 910+00 = 10,225 lf

Bid Item No.	Description	Unit	C5:2 Qty.	C5:2 Unit Price	Total
1	Borrow Type A	cy	71,700	$23.09	$1,655,420
2	Borrow Type C	cy	813,000	$24.00	$19,512,000
3	Fill (below elevation 30)	cy	610,667	$29.00	$17,709,333
4	Armor Rock	cy	247,950	$95.00	$23,555,250
5	Filter Rock	cy	56,042	$55.38	$3,103,788
6	Asphalt Concrete	ton	6,650	$90.00	$598,500
7	Asphalt Treated Base Course	ton	19,800	$70.00	$1,386,000
8	Topsoil and Seed	msf	3,000	$535.00	$1,605,000
9	Guard Rail	lf	20,380	$75.00	$1,528,500
10	Security Fence (CLF)	lf	7,920	$21.50	$170,280
11	Striping	lf	40,800	$0.80	$32,640
12	Signs	sf	500	$75.00	$37,500
13	Culverts	lf	2,500	$150.00	$375,000
14	Temporary Erosion and Sediment Control	ls	1	$300,000.00	$300,000
15	C5:2 Mobilization	5.2%			$7,156,921
	Total				**$78,726,133**

Bid Item Schedule
Segment No. 5 - Knik Arm Crossing
Four-Lane Configuration
East Approach - Sta. 807+75 to Sta. 910+00 = 10,225 lf

Bid Item No.	Description	Unit	C5:4 Qty.	C5:4 Unit Price	Total
1	Borrow Type A	cy	100,000	$23.09	$2,308,815
2	Borrow Type C	cy	1,080,000	$24.00	$25,920,000
3	Fill (below elevation 30)	cy	763,000	$29.00	$22,127,000
4	Armor Rock	cy	247,950	$95.00	$23,555,250
5	Filter Rock	cy	56,042	$55.38	$3,103,788
6	Asphalt Concrete	ton	10,700	$90.00	$963,000
7	Asphalt Treated Base Course	ton	31,700	$70.00	$2,219,000
8	Topsoil and Seed	msf	3,000	$535.00	$1,605,000
9	Guard Rail	lf	20,380	$32.00	$652,160
10	Concrete Barrier Rail	lf	10,190	$70.00	$713,300
11	Security Fence (CLF)	lf	7,920	$21.50	$170,280
12	Striping	lf	61,100	$0.80	$48,880
13	Signs	sf	500	$75.00	$37,500
14	Culverts	lf	3,250	$150.00	$487,500
15	Temporary Erosion and Sediment Control	ls	1	$300,000.00	$300,000
16	C5:4 Mobilization	5.2%			$8,421,147
	Total				**$92,632,620**

Bid Item Schedule
Segment No. 6 - Knik Arm Crossing
Two-Lane Configuration
MOA Future Port Expansion - Sta. 910+00 to Sta. 940+00 = 3,000 lf (Constructed on Port Embankment)

Bid Item No.	Description	Unit	Qty.	C6:2 Unit Price	Total
1	Borrow Type A	cy	19,500	$23.09	$450,219
2	Borrow Type B	cy	68,206	$27.00	$1,841,549
3	Asphalt Concrete	ton	1,800	$90.00	$162,000
4	Asphalt Treated Base Course	ton	5,300	$70.00	$371,000
5	Topsoil and Seed	msf	250	$535.00	$133,750
6	Guard Rail	lf	6,350	$32.00	$203,200
7	Security Fence (CLF)	lf	6,350	$21.50	$136,525
8	Lighting	lf	3,200	$50.00	$160,000
9	Striping	lf	12,670	$0.80	$10,136
10	Signs	sf	500	$75.00	$37,500
11	Drainage	lf	750	$150.00	$112,500
12	Temporary Erosion and Sediment Control	ls	1	$100,000.00	$100,000
13	Traffic Control	ls	1	$10,000.00	$10,000
14	C6:2 Mobilization	5.2%			$372,838
	Total				**$4,101,217**

Bid Item Schedule
Segment No. 6 - Knik Arm Crossing
Four-Lane Configuration
MOA Future Port Expansion - Sta. 910+00 to Sta. 940+00 = 3,000 lf (Constructed on Port Embankment)

Bid Item No.	Description	Unit	C6:4 Qty.	C6:4 Unit Price	Total
1	Borrow Type A	cy	33,000	$23.09	$761,909
2	Borrow Type B	cy	80,234	$27.00	$2,166,329
3	Asphalt Concrete	ton	3,300	$90.00	$297,000
4	Asphalt Treated Base Course	ton	9,800	$70.00	$686,000
5	Topsoil and Seed	msf	250	$535.00	$133,750
6	Guard Rail	lf	6,350	$32.00	$203,200
7	Concrete Barrier	lf	3,175	$70.00	$222,250
8	Security Fence (CLF)	lf	6,350	$21.50	$136,525
9	Lighting	lf	3,200	$50.00	$160,000
10	Striping	lf	19,010	$0.80	$15,208
11	Drainage	lf	1,500	$150.00	$225,000
12	Temporary Erosion and Sediment Control	ls	1	$100,000.00	$100,000
13	Traffic Control	ls	1	$10,000.00	$10,000
14	C6:4 Mobilization	5.2%			$511,717
	Total				**$5,007,171**

Bid Item Schedule

Segment No. 8 - Knik Arm Crossing

Two-Lane Configuration (with Retaining Wall & Reduce Affected Port)

Cherry Hill Station - Sta. 940+00 to Sta. 973+60 = 3,360 lf

Bid Item No.	Description	Unit	Qty.	C6:2 Unit Price	C6:2 Total
1	Clearing and Grubbing	acre	35	$5,400.00	$189,000
2	Clearing	acre	5	$5,500.00	$27,500
3	Common Excavation	cy	8,830	$7.50	$66,225
4	Excavation (waste)	cy	125,000	$6.75	$843,750
5	Borrow Type A	cy	45,500	$23.09	$1,050,511
6	Borrow Type C	cy	217,000	$27.00	$5,859,000
7	Sheet Pile (Open Cell and Cantilever)	ls	484,500		$24,500,000
8	Asphalt Concrete	ton	1,900	$90.00	$171,000
9	Asphalt Treated Base Course	ton	5,650	$70.00	$395,500
10	Topsoil and Seed	msf	31	$535.00	$16,585
11	Curb and Gutter	lf	3,360	$27.00	$90,720
12	Security Fence (CLF)	lf	6,760	$21.50	$145,340
13	Guard Rail	lf	3,360	$32.00	$107,520
14	Concrete Barrier	lf	3,360	$70.00	$235,200
15	Drainage	lf	2,000	$150.00	$300,000
16	Temporary Erosion and Sediment Control	ls	1	$200,000.00	$200,000
17	Striping	lf	13,500	$0.80	$10,800
18	Signs	sf	100	$75.00	$7,500
19	Egress Interchange	ls	1	$1,100,000.00	$1,100,000
20	Relocate 10" Gas Line	ls	1	$230,000.00	$230,000
21	C8:2 Mobilization	5.2%			$3,554,615
	Total				**$39,100,766**

Bid Item Schedule
Segment No. 8 - Knik Arm Crossing
Four-Lane Configuration
Cherry Hill Station - Sta. 940+00 to Sta. 973+60 = 3,360 lf

Bid Item No.	Description	Unit	Qty.	Unit Price	Total
1	Subgrade Preparation	sy	13,440	$2.50	$33,600
2	Asphalt Concrete	tons	2,100	$90.00	$189,000
3	Asphalt Treated Base Course	tons	6,000	$70.00	$420,000
4	Curb and Gutter	lf	3,360	$27.00	$90,720
5	Concrete Barrier Rail	lf	6,760	$70.00	$473,200
6	Striping	lf	13,500	$0.80	$10,800
7	Signs	sf	1,000	$75.00	$75,000
8	C8:4 Mobilization	5.2%			$129,232
	Total				**$1,421,552**

Bid Item Schedule
Segment No. 9 - Knik Arm Crossing
Two-Lane Configuration with Two-Lane Cut-and-Fill
Government Hill Sta. 973+60 to EOP

Bid Item No.	Description	Unit	C9:2 Qty.	C9:2 Unit Price	Total
1	Common Excavation	cy	30,000	$10.00	$300,000
2	Excavation Special (Contaminated Material)	cy	30,000	$35.00	$1,050,000
3	Excavation Waste	cy	45,000	$8.00	$360,000
4	Borrow Type A	cy	20,000	$23.09	$461,763
5	Borrow Type C	cy	100,000	$27.00	$2,700,000
6	Asphalt Concrete	ton	4,000	$90.00	$360,000
7	Asphalt Treated Base Course	ton	8,000	$70.00	$560,000
8	Guard Rail	lf	14,400	$32.00	$460,800
9	Topsoil and Seed	msf	100	$535.00	$53,500
10	Security Fence (CLF)	lf	500	$21.50	$10,750
11	Striping	lf	6,000	$0.80	$4,800
12	Signs	sf	250	$75.00	$18,750
13	Drainage	lf	500	$150.00	$75,000
14	Lighting Interior	ls	1	$175,000.00	$175,000
15	Temporary Erosion and Sediment Control	ls	1	$125,000.00	$125,000
16	Traffic Control	ls	1	$150,000.00	$150,000
17	Concrete - Portal Walls	sf	41,175	$110.00	$4,529,250
18	Cut and Cover Tunnel	ls	1	$19,175,000.00	$19,175,000
19	Intersection Reconstruction	ls	1	$250,000.00	$250,000
20	Connection to AC	ls	1	$150,000.00	$150,000
21	C9:2 Mobilization	5.2%			$3,096,961
	Total				**$34,066,574**

		2006 Dollars
C9:P2 Depressed Roadway Connection		$ 16,200,000
C9:P2 Raised Viaduct		$ 93,600,000
C9:P2 I/G Interchange		$ 33,600,000
C9:P2 Bring up to 6 lane Tunnel		$ 31,000,000
C9:P2 Other Work		$ 4,000,000
C9:P2 Mobilization	5.2%	$ 9,217,333
Construction Total		$ 187,617,333
C9:P2 Years of Esclation		18.0
C9:P2 Escalation Rate		4.0%
Escalation Cost		$192,460,959
		$ 380,078,292

Bridge

Construction Cost Estimate **KABATA Seg 2:2**

2008 Dollars

Item	Unit	Cost/ Unit	Qnty		Total Cost
Overall Length	**Miles**		**1.55**		
48" Diameter Pipe Piles	Tons	$2,358	12454	$	29,366,824
48" Diameter Pipe Piles (Driven)	EA	$127,685	156	$	19,918,813
48" Diameter Pipe Field Splices	EA	$3,375	312	$	1,053,000
Noise Attenuation				$	10,000,000
Production Inefficiency - Whale				$	2,166,667
Steel Pile Caps	Tons	$11,142	900	$	10,027,500
Concrete Pile Fill	CY	$268	6,300	$	1,686,300
Abutment Concrete	CY	$801	3,175	$	2,543,175
Abutment Concrete Reinforcing	Tons	$2,295	200	$	459,000
Super Structure-Structural Steel	Tons	$8,623	21,344	$	184,039,854
Curb Reinforced Concrete	CY	$270	1,430	$	386,100
Curb Reinforcing Steel	Tons	$2,363	100	$	236,250
Bridge Rail	Tons	$3,875	1,200	$	4,649,600
Deck Metalizing	SY	$86.00	40,000	$	3,440,000
Rubberized Asphalt Paving	Tons	$150.00	4,350	$	652,500
Asphalt Paving	Tons	$106.00	4,350	$	461,100
Lighting	LF	$83.03	16,500	$	1,369,913
Signs & Miscellaneous	All			$	270,000
10' Diameter Energy Absorbers	EA	$28,350.00	12	$	340,200
Small Rubber Energy Absorbers	All	$37,800		$	37,800
Mobilization	All		5.2%	$	14,110,404
			Total	**$**	**287,214,999**
		Total Construction Cost			$287,214,999
		Years of Esclation			1.9
		Escalation Rate			4.0%
		Escalation Cost			$22,220,732
		Total Escalated Cost			$309,435,731

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Furnish Orthotropic Deck Section	lbs	23,328,000	$4.22	$98,444,160
Furnish Structural Steel Box Girder	lbs	17,253,000	$3.76	$64,871,280
Furnish Catwalk	sf	32,400	$31.30	$1,014,120
Erect Deck Sections	ea	30	$415,207.88	$12,456,236
Erect Catwalk	sf	32,400	$2.94	$95,256
Furnish/Erect Bearings	ea	124	$62,596.56	$7,761,973
Furnish/Erect Expansion Joints	lf	384	$2,879.30	$1,105,651
Furnish Synthetic Soffit Material	sf	202,500	$15.65	$3,169,125
Deck Metalizing	sf	388,800	$2.78	$1,080,864
Concrete Curb	cy	1,650	$591.02	$975,183
Reinforcing Steel - Epoxy Curb	lbs	247,500	$1.85	$457,875
Steel Bridge Railing (145 lbs/ft)	lbs	2,400,000	$1.88	$4,512,000
Asphalt Concrete (2" thick)	tons	4,350	$106.41	$462,884
Rubberize Asphalt Concrete (1" thick)	tons	2,175	$150.22	$326,729
Electrical Conduit, Boxes, and Wire	lf	16,500	$18.78	$309,870
Luminaries	ea	54	$4,381.55	$236,604
Traffic Signs	ls	1	$764,267.38	$764,267
Traffic Striping	lf	24,600	$0.94	$23,124
Structual Steel Coatings	lbs	40,581,000	$0.40	$16,232,400
Subtotal				**$214,299,601**

Increment to Build Bridge to full width

2008 Dollars

	44-ft Roadway	66-ft Roadway		KABATA C4:4 Widen Cost / Unit	Widen Qty				
Superstr. Steel	$141,245,775	$211,491,000	66.8%	$7,553	16,075	50.0%	$	60,708,894	
Curb Reinf Concrete				$270	1,430	50.0%	$	193,050	
Curb Reinf St				$2,363	100	50.0%	$	118,125	
Bridge Rail				$3,875	1,200	20.0%	$	929,920	
Deck Metalizing	$7,020,000	$10,530,000	66.7%	$86.00	40,000	50.0%	$	1,720,000	
Rubber Asph Pav	$1,411,425	$2,134,350	66.1%	$150.00	4,350	50.0%	$	326,250	
Asph Pav	$1,715,850	$2,573,775	66.7%	$106.00	4,350	50.0%	$	230,550	
Lighting				$83.03	16,500	25.0%	$	342,478	
Signs & Misc							$	270,000	
10' Diam Ener Abs				$28,350.00	12	0.0%	$	-	
Small Rub En Abs				$37,800		0.0%	$	-	
Mobilization						5.2%	$	3,350,029	
Subtotal	$151,393,050	$226,729,125					$	68,189,296	90.51%

Increment	$75,336,075	Years of Esclation	15.0
Total Construction Cost	$75,336,075	Escalation Rate	4.0%
Years of Esclation	1.0		
Escalation Rate	5.0%	Escalation Cost	$ 54,615,774
		Total Escalated Cost	$ 122,805,070
Escalation Cost	$3,766,804		