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## AGS Feasibility Study Meeting Notes

**Meeting Type & Number:** PLT Meeting #11  
**Meeting Date:** June 11, 2013  
**Meeting Time:** 1:00 PM to 4:00 PM  
**Location:** Silverthorne Library, 651 Center Circle, Silverthorne, CO  
**Prepared by:** Mike Riggs  
**Date published:** July 22, 2013 (Revised August 30, 2013)  
**Attendees:**

<b>Attendees ( * - PLT Member, ** - PLT Alternate)</b>		
Terri Binder, Club 20*	Mary Jane Loevlie, I-70 Coalition*	Flo Raitano, Summit County*
Maria D'Andrea, Jefferson County*	Jim Bemelen, CDOT*	Tom Breslin, Clear Creek County*
Cynthia Neely, Clear Creek County**	David Krutsinger, CDOT DTR*	Mike Riggs, AZTEC/TYPESA*
Tim Mauck, Clear Creek County*	Angie Drumm, CDOT*	Don Ulrich, CH2M Hill
Randy Jensen, FHWA*	Peter Lombardi, CDOT*	Tracey MacDonald, CDOT DTR
Nick Farber, HPTE	Dylan Grabowski, CDOT	Tom Underwood, Jacobs
Andy Mountain, GBSM	Beth Vogelsang, OV Consulting	Don Ulrich, CH2M Hill
Carol Kruse, USFS	Margaret Bowes, I-70 Coalition	Craig Bannister, Colorado Ski County
Dick Marshall, NV5	Jeff Callicott, AZTEC/TYPESA	Frank Sherkow, AZTEC/TYPESA
Miller Hudson, CMG	Belinda Arbogast, CDOT	
Brad Doyle, Parsons		Henry Hollender, Representing Rep. Max Tyler

### **1. Introduction to the Meeting**

David Krutsinger opened the meeting and welcomed the PLT. All attendees introduced themselves.

Andy Mountain reviewed the meeting agenda and outlined the meeting objectives, which included:

- Review and Discuss Capital Cost Estimates
- Discuss Operations & Maintenance Cost Estimating Methodology
- Review and Discuss Ridership Estimates
- Update on Discuss Request for Financial Information (RFFI)
- Discuss Funding
- Update on AGS/ICS/Co-Development Project Coordination
- Discuss Steps Leading Up to Project Conclusion

### **2. Public Comment**

None.

### **3. Capital Cost Estimates**

Mike Riggs presented the three alignment/technology alternatives considered. They are:

- High Speed Steel Wheel on Steel Rail (HSR) – Greenfield Alignment
- High Speed Maglev – Greenfield Alignment
- 120 mph Maglev – Hybrid Alignment (Combo of I-70 ROW and Greenfield)

Mike pointed out that the 120 mph Maglev - Inside I-70 Right of Way (ROW) Alignment was not carried forward. American Maglev indicated that speeds would not be sufficient to meet performance guidelines.

Mike explained that the cost estimating teams took a bottom up approach to estimating. Each team developed gross quantities for:

- Dual and Single Guideways
- Bridges/Structures
- Tunnels

Gross quantities were then “deconstructed” to individual elements. For example, maglev guideway includes girders, pier caps, columns/footings, propulsion system, etc.

For maglev, guideway dimensions were provided by the technology providers. For HSR, TYPASA developed preliminary designs for various bridges and structures. For each element, material quantities such as reinforcing steel, concrete, forms and drilling for foundations was determined. The AGS Team then had a local Colorado based contractor provided unit prices based on quantities. The unit prices included costs from a precasting facility for elements like girders and pier caps and prices also took into account building the system in the mountains.

Tunnel costs were developed using an experienced tunnel estimator from the AGS Team. The tunnel estimates were detailed and recognized actual geological conditions at tunnel sites. The estimates included drill and blast tunnels as well as tunnels constructed using a Tunnel Boring Machine (TBM).

Mike pointed out that for maglev it was assumed that dual direction travel would be in a single bore. For HSR, twin tubes with connecting galleries were assumed.

Mike made important note that all civil infrastructure costs were estimated by the AGS Team. They did not rely on technology provider’s cost.

For non-civil elements, AGS Team used:

- Past estimates from Southern California maglev and Anaheim to Las Vegas maglev projects
- Data based on TYPASA’s experience on costs on worldwide HSR projects
- Estimates provided by technology providers
  - Small percentage of overall costs
  - Use does not have significant impact on overall costs
- Non-civil elements include:

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- Vehicles
- Propulsion system
- Energy supply and operation control technology
- Communication/Control technology
- Stations
- Operation and maintenance (O&M) facilities
- Construction support, such as precasting facilities and special construction equipment and techniques
- Right of way (ROW)

The estimates also included indirect costs. Most of these were assumed to be a percentage of the civil/non-civil construction costs. They are arranged under the following categories

- Professional Services
- Utility Relocation
- Environmental Mitigation

The percentages assumed by the AGS Team match those used by the ICS Team in their estimates.

Contingencies were applied to recognize the very preliminary nature of the design. They included:

- 10% “mountain” factor applied to all civil infrastructure and systems
- 30% contingency to all tunnel costs
- 30% contingency applied to all design and construction costs (consistent with ICS methodology)

Mike then presented the preliminary capital cost estimates (Golden to Eagle County Regional Airport (ECRA)) for each technology and alignment.

- High Speed Steel Wheel on Steel Rail (HSR) – Greenfield Alignment - \$31.92 Billion
  - Includes \$14.57 Billion for tunnels
- High Speed Maglev – Greenfield Alignment - \$25.04 Billion
  - \$9.55 Billion for tunnels
- 120 mph Maglev – Hybrid Alignment (Combo of I-70 ROW and Greenfield) - \$10.98 Billion
  - \$3.71 Billion for tunnels

Mike then presented costs for a Minimum Operating Segment (MOS) from Golden to Breckenridge for the three alternatives:

- High Speed Steel Wheel on Steel Rail (HSR) – Greenfield Alignment - \$18.65 Billion
  - 58% of total costs due to more tunnels east of Continental Divide
- High Speed Maglev – Greenfield Alignment - \$13.52 Billion
  - 54% of total costs due to more tunnels east of Continental Divide
- 120 mph Maglev – Hybrid Alignment (Combo of I-70 ROW and Greenfield) - \$5.76 Billion
  - 52% of total costs

Mike completed the capital cost presentation by reminding the PLT that final costs would likely be reduced as design was refined due to:

- Better topographic mapping (AGS Team used USGS mapping)
- Refining alignment to minimize tunneling

Comments and questions from PLT/others:

Was Kevin Coates or Dr. John Harding consulted regarding costs?

1. Mike responded that they were not as their area of expertise does not include cost estimating.

Why do prices vary so much between the technologies/alignments?

- Different amount of tunneling. As length of tunneling increases, so does cost and the impact of the contingencies compounds this
- Different number of stations, although unit price per station does not change
- Guideway costs are similar between all alignments. Difference is mostly due to tunnels.

Additional tasks to be completed

- Right of way requirements are being refined to define percentages of public versus private land
- Utility costs are being refined as using a percent of construction costs clearly over estimates costs as most of I-70 will not have utilities within alignment
- For the two maglev alternatives, costs for propulsion systems differ greatly. AGS Team to investigate further as it is due to type of propulsion system

Requests from PLT include:

- Splitting out contingencies separately
- Package cost estimates, ridership and operating plans to three major segments; DIA to Golden, Golden to Breckenridge and Breckenridge to ECRA

The Colorado Maglev Group representative stated that their costs were within 3% of the costs developed by the AGS Team for the 120 mph Maglev – Hybrid alignment.

#### **4. Operations & Maintenance (O&M) Cost Estimating**

Mike shared the O&M costs for the Golden to ECRA segment that were developed as part of Level 2 work in the ICS project:

- HSR - \$81.5 to \$115.1 Million per year (depending on operating scenario)
- HS Maglev - \$63.0 to \$89.0 Million per year
- 120 mph Maglev - \$75.1 to \$106.1 Million per year

The reason that 120 mph maglev O&M costs are higher than HS maglev is due mostly to the need to have additional vehicles due to longer cycle times (lower speed).

Mike explained that Level 3 (using ICS nomenclature) O&M estimates will be developed using a bottom up methodology.

The basic operating scenario of 18 hours of operation per day with 12 hours having one hour headways and 6 hours having 30 minute headways will be used. Cost categories for development of O&M costs will be:

- Personnel
- Materials and consumables
- Power consumption
- Miscellaneous support, marketing, insurance, etc.

Mike explained that different types of jobs will be influenced by different operating characteristics:

- Wayside maintenance staff influenced by system length and system use
- Vehicle maintenance staff influenced by number of vehicles
- Security staff influenced by number of stations and trips

Administrative staff will generally remain at a constant level. Salary plus benefits need to be included in developing personnel costs. Union versus non-union can cause cost differences.

For materials and consumables unit costs will be developed. This will include power, materials and other consumables.

Mike pointed out that based on initial indications from Xcel, they will be expanding their power transmission capacity and AGS will not need to pay for any capital expansion of their facilities. AGS would simply be a customer for that power.

Mike pointed out that personnel and power is usually the largest contributor to O&M costs. Typically wayside/track maintenance and vehicle maintenance costs are higher for HSR than maglev.

Mike then presented some topics the AGS/ICS Teams will be exploring in the next phase:

- Should each consist have attendants?
- Will a driver be required even if technology does not require it?
- Should baggage handlers be included?
- How many security personnel should be provided and where?

The AGS PLT indicated they generally do not want to get into these details, but prefer that the AGS Team provide their professional opinion and explain/document those in upcoming meetings and reports.

## **5. Preliminary Ridership**

David presented an overview of the history of I-70 transit ridership estimates. It varied from 1,740,000 riders per year in the 2000 Major Investment Study up to 8,271,000 from the 2010 RMRA (estimated). The 2004 PEIS had yearly ridership estimate of 4,160,000 for AGS and

3,775,750 for HSR. The RMRA and PEIS ridership was estimated from daily to annual or resulted from other factored numbers.

Mike explained that four scenarios have been done to date:

- HSR with ICS System (including spur to Breckenridge)
- HS maglev with ICS system
- 120 mph maglev with ICS system
- HSR as a standalone (Golden to ECRA) including spur to Breckenridge

Mike explained where stations would be located for each scenario. He also explained the operating scenarios. The modeling has generally been done using the basic operating scenario of 18 hours of operation per day with 12 hours having one hour headways and 6 hours having 30 minute headways.

Mike then presented the preliminary ridership estimates for the AGS:

- HSR with ICS System (including spur to Breckenridge) – 3.43 million riders per year
- HS maglev with ICS system – 3.32 million riders per year
- 120 mph maglev with ICS system – 2.88 million riders per year
- HSR as a standalone (Golden to ECRA) including spur to Breckenridge – 2.99 million riders per year

Mike explained the additional ridership modeling that will be done. It will include additional full corridor and phasing model runs as well as sensitivity analysis to test fare elasticity, impact of more or fewer stations and other operating plans.

Comments/questions from PLT/others included:

- The AGS PLT would like to see more discussion and assumption of latent demand assumptions in the current forecasting
- The AGS PLT would like to see more documentation about the ridership relative to other data such as percentage of traffic or person trips
- The Colorado Maglev Group representative commented that ridership of under 10,000 passengers per day would be unlikely to garner private sector or federal funding support
- A PLT member asked how fares were determined and what we know about comparable fares. David responded:
  - New Mexico Rail Runner charges \$0.15 to \$0.20 per mile but has had to cut back on service indicating fare recovery is not sufficient to sustain service.
  - Utah Front Runner charges \$0.25 to \$0.35 per mile and is doing well. This suggests a price floor for high speed inter-city service.
  - Amtrak's Northeast Corridor (Acela Service) charges \$0.65 per mile but is not a reasonable comparison for a western state in a non-urban corridor.
  - Federal auto reimbursement rates have been \$0.50 to \$0.56 per mile in recent years.
  - Stated Preference Survey results, both for ICS and for RMRA, have shown that \$0.35 per mile seems to be an acceptable fare to Colorado citizens.
  - In next phase, sensitivity tests will be done to test impact on lower/higher fares.
- An AGS PLT member pointed out that SUV rentals were about \$100 to \$150 per day, likely resulting in a cost of about \$0.50 per person per mile.

- The AGS PLT questioned why ridership isn't higher when connected to the Front Range system. Data shows people are willing to drive to Golden Station if the Front Range section is not in place. With it in place, they will go to nearest station to travel to mountains.
- An AGS PLT member asked if it was true that no maglev models have been run. The response was that both 120 mph and high speed maglev has been modeled for the DIA to ECRA segment but that the north-south has not been modeled with maglev. Also, SDG is modeling a variant of the high speed maglev that has a different alignment and stations.
- The AGS PLT thought that more information is needed about transfer assumptions and station dwell time assumptions.

Mike and David explained next steps for modeling include doing one or two more full-corridor runs, then looking closely at minimum operating segments/starter system options.

## **6. Request for Financial Information Update**

Mike Riggs presented an update on the RFFI. He reminded the PLT that questions were to be received by June 10 and that the RFFI's are due on June 28, 2013.

He then outlined the process by which the RFFI's would be reviewed:

- Statements of Financial Information (SOFI) will be reviewed by Funding and Financial Task Force members
- Summaries of responses will be prepared
- Summary will be presented to PLT at July meeting

## **7. AGS/ICS/Co-Development Project Coordination**

Don Ulrich gave an update on the ICS project. He stated:

- Level 2 Tasks have been completed
- Alignments north and south of Denver Metro area have been defined
- Alignments within Denver Metro area will be narrowed to two east-west and two north-south alignments
- Public meetings were held in Front Range locations over past two weeks
- Last public meeting will be tonight, June 11, in Silverthorne

Jim Bemelen talked about the I-70 Traffic and Revenue (T&R) Study. Louis Berger Group was selected and they are anticipated to be under contract by July. PLT #3 meeting will be held on June 26 from 1:00 to 5:00 PM. Ernst & Young will be providing review on the T&R Study as well as on the AGS SOFI's.

Jim also updated the PLT on the I-70 Peak Period Shoulder Lanes project. The concept is to only use the shoulders as traffic lanes about 5% of the time and they would only be eastbound between Empire Junction and Twin Tunnels.

## **8. Steps Leading to Project Completion**

Mike gave an overview of the steps expected in the next four months as the project is completed. They include:

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- SOFI Review
- Determination of Operations and Maintenance Costs
- Determination of Financial Feasibility
- Last Round of Station and Land Use Meetings
- Development of Phasing/Implementation Plan with ICS including Recommended MOS
- Draft AGS Report
- Final AGS Report

There will be PLT meetings in July, August, September and October.

An AGS PLT member suggested a social event be included in project completion checklist.

### **9. Conclusion, Final Remarks & Next Steps**

Next PLT Meeting will be July 10 in Eagle County. Exact location to be determined. Topics will include ridership estimates and preliminary cost estimates.