

# **PORTLAND AERIAL TRAM RISK ASSESSMENT REPORT**

**Prepared for the  
Portland Development Commission**

**01 February 06**



**Pinnell ♦ Busch**

6420 SW Macadam Ave., Suite. 330, Portland, Oregon 97239 ♦ Phone: 503.293.6280 Fax: 503.293.6284

# PORTLAND AERIAL TRAM RISK ASSESSMENT REPORT

This report was prepared by Pinnell/Busch, Inc. under a contract with the Portland Development Commission (PDC) to examine and report on the cost, schedule, project management procedures, project exposure, and risk management control of the Portland Aerial Tram project. Our work started on 3Jan06 and this, our first report, is due on 01Feb06. Two additional reports will be prepared when the project is 50% and 75% complete.

The project will connect the North Macadam development area with the Oregon Health Sciences University (OHSU) complex with a 3,300 foot aerial tram. Construction was approximately 35% complete as of mid-January, 2006. Design is essentially complete, steel fabrication is well under way, and the City of Portland Office of Transportation (PDOT) is managing the two prime construction contracts: (1) construction of the upper and lower stations and the tower by Kiewit Pacific Company and (2) fabrication and installation of the cables, equipment, and tram cars by Doppelmayr CTEC, Inc.

## 1. Summary of Risks

The Portland Aerial Tram, when complete, will be a dramatic, one-of-a-kind facility that will become a Portland landmark – easily overshadowing its earlier history of budget and schedule problems. It is also a difficult public works project to build and has some exposure to risk, which may increase construction duration and costs. Minimizing these risks is contingent on full implementation of the recommendations below.

The project is too far along now to stop or even slow down, as the biggest risk for increased cost is delay. In fact, a moderate acceleration effort may be possible, which could begin as soon as the proposed changes outlined below are in place and a clear picture is available of how best to reduce the remaining cost and time.

Specifically, the primary risk factors for delay and additional cost include:

- \* A very tight construction schedule with two separate contracts that does not allow much room for unanticipated delay.
- \* A unique design that is architecturally exciting but difficult to construct. Erection of the tall, thin, complex Tower and the tall, heavily loaded Upper Station must be within very tight tolerances.
- \* An extremely restricted site for construction of the Upper Station.
- \* Integration of a complex, European mechanical/electrical system with a sophisticated American steel structure and infrastructure in a way that achieves the interface tolerances. This requires integrating the simultaneous completion of erection and closeout of the structures by Kiewit with the finish of the Upper Station by subcontractors and the installation and startup of the Tram by Doppelmayr, while avoiding possible conflicts between different business cultures and management procedures.
- \* Installation of the tramway cables over an interstate highway and two state highways (Barbur Boulevard and Terwilliger Boulevard), and down a city street. This is being addressed by Doppelmayr, but still has inherent risks that need detailed scheduling and close tracking.

- \* Dependence on the Upper Station and Tower reacting as mathematically modeled when loaded with one million pounds of cable tension, gusting winds on the tram cars, and thermal expansion of the structures. The Upper Station is asymmetrical and modeled to rotate as cable tension is applied. The Tower is subject to twisting from solar heating, which will be minimized by a reflective paint. If the models are off, the track saddles may not have enough adjustment for proper alignment. Although the City has checked the results with an independent third-party review, and has retained another surveyor during erection, there could still be a major delay and additional cost for retrofit if the models don't match actual site built conditions. Additional detailed reviews may be warranted.
- \* The previous suspension of design by the Portland Aerial Tram, Inc. (PATI) board and the subsequent acceleration by the City in an attempt to meet the agreed completion date, which could result in increased project costs for labor overtime premium, double shifting, expedited materials procurement, and other cost impacts of delay and acceleration.
- \* Unanticipated problems with permits to be issued by various regulatory agencies. The City has in place staff to assist and expedite the review and issuance of permits, but some could still be missed or delayed.
- \* Possible functionality and operational problems occurring after startup, causing shutdown and additional costs for retrofitting. This risk could be minimized by an immediate and careful analysis, including the timely hiring of a Tram operator for their input, before it is too late to make changes.
- \* The possibility that the bridge from the Patient Care Facility to the Upper Station will not fit after tensioning the cables.
- \* The need to retain the current project teams, especially the City's and Kiewit's, and to immediately augment their resources with additional personnel – at the earliest possible date. Continued teambuilding efforts are needed to ensure the highest level of communication and cooperation, and achievement of the currently forecast budget and schedule.
- \* The need to finalize a formal agreement with the Oregon Department of Transportation (ODOT) for crossing I-5, Barbur Boulevard, and Terwilliger Boulevard that would document the preliminary concurrence by ODOT and the Federal Highway Administration (FHWA).
- \* Limited information on the details of Doppelmayr's schedule and whether they can adjust to the new dates. As soon as a revised, integrated construction schedule is completed by Kiewit, the City can reaffirm with Doppelmayr that installation crews are available and that the schedule can be met.

Attached as background information is the Risk Identification and Assessment Register (Exhibit #1) prepared by our project team in conjunction with the City, PDC, Kiewit, Doppelmayr, and OHSU. In order to help manage project costs and schedule, the register and the previously prepared responsibility matrix need to be updated as new risks are identified, tracked at least monthly, and checked off by the City as the work is completed.

## 2. Projected Completion Date

Our review of the project status and current efforts indicates that the work is progressing satisfactorily and should finish by December 1, 2006 – if the recommendations in this report are implemented and the risk factors above are addressed. In addition, Doppelmayr is recommending a two-week “soft start” to allow time to rectify any mechanical issues prior to the formal public opening.

However, the 1Dec06 date is dependent upon:

1. The full-time efforts of an experienced scheduler for Kiewit to expand the onsite construction schedule and fully integrate procurement and shop drawing approvals with site construction and Tram fabrication and installation. This has already been initiated.
2. Review and expansion of the responsibility matrix integrating Doppelmayr's work with Kiewit's, which should be undertaken by the City in conjunction with Kiewit, Doppelmayr, and the architect/engineer.
3. The continued full cooperation of all project teams (the City, Kiewit, Doppelmayr, the steel detailer and fabricator, the electrical design/build contractor, the architect and the engineer).
4. The immediate assignment of additional personnel by the City and Kiewit, as noted below.
5. The absence of a major, unforeseen condition, design conflict, or accident.
6. Closure of Upper Campus Drive by OHSU not later than 5Feb06 as agreed, and continued close coordination between OHSU, PDOT, and the contractors to expedite material deliveries and develop an improved Upper Station staging area.

A summary of the project schedule will be provided by Kiewit's scheduler as soon as he has completed his initial review and prepared an updated and expanded project schedule that fully integrates steel fabrication, cable pulling, and equipment installation with Kiewit's construction activities. This is expected to be complete by mid-February, 2006.

The primary factors driving the need for early completion are: (1) the daily overhead cost of the project teams, which is currently estimated at \$5,200 per calendar day for Kiewit, not including possible extended subcontractor overhead costs; \$4,000 per day for the City, Portland Aerial Tram, Inc. (PATI) and the architect/engineer; and an undetermined amount for Doppelmayr depending on the circumstances; (2) the possibility of additional costs by the subcontractors if their work is extended or accelerated; (3) the possibility that a delay of the structures and infrastructure will push Doppelmayr's work outside of the window of time for which their installation experts are available; and (4) impacts on the operation of Building One, OHSU's new medical office building at the Lower Station.

Fortunately for the City, OHSU's Building One occupancy date has been delayed until 15Nov06. It is essential that the schedules for both the Tram and Building One be improved so that their completion dates are in tandem and are more reliable. In addition, a first-level 'cost-time tradeoff analysis' is recommended to determine the optimum completion date for the Tram – after a revised, integrated Kiewit and Doppelmayr schedule and detailed Kiewit cost review are completed and reviewed by the City. Otherwise, the City could spend acceleration costs unnecessarily.

#### Acceleration and Cost-Time Tradeoff Analysis

Although it would be difficult to accelerate steel fabrication, our scheduler believes that Kiewit's concrete and steel erection work can probably be completed more quickly. However, he did not have enough information to evaluate whether Doppelmayr's schedule could be accelerated. This analysis can be done by Kiewit's new scheduler. After updating the schedule and cost data, which should be accomplished within the next 30 days, and obtaining any revisions to the completion date for Building One, an acceleration plan can be developed that minimizes total project costs by balancing the indirect cost savings for earlier completion with the increased

direct cost of acceleration. This may or may not indicate that additional acceleration is needed beyond that already implemented. The City and OHSU can make a decision at that time on how to proceed.

Kiewit is already examining the possibility of using two shifts for part of the work at the Upper Station. A decision can be made whether to implement this change after the scheduler has completed his initial review and prepared the expanded schedule.

### 3. Estimated Final Cost

At this time, the best available estimate of the final project cost is \$50,000,000, plus a contingency of \$5,000,000, for a total of \$55,000,000. We believe that the \$55,000,000 budget will be adequate, if the recommendations in this report are followed. The budget excludes:

1. The cost for the pedestrian bridge over I-5, the public plaza, and other public improvements underway in North Macadam, which are all separate projects.
2. Unanticipated project delays of more than three weeks past the forecast completion date of December 1, 2006.
3. Possible changes requested by the Tram operator after they are retained. These could include better security at the Lower Station and improved rain and wind protection at both stations.
4. The possible consequences of late completion that affect the use of Building One.

A summary of the currently estimated project cost is attached as background information (Exhibit #2). Within 20 to 30 days after the City and Kiewit provide the additional staffing recommended in this report, the project team should be able to (1) develop an updated and detailed project cost estimate with tracking and forecasting procedures that will provide a more reliable picture of final costs and (2) reevaluate the extent of outstanding risks. Depending on these analyses, the final budget and contingency may be reduced.

#### Needed Changes

The estimated final cost is contingent upon implementation of the recommended changes described below, including obtaining written assurance from all of Kiewit's subcontractors that their current contract amounts include all acceleration, delay or impact costs to date. In addition, a firm not-to-exceed cap needs to be set for Kiewit's time-and-materials contract work. Both should be done immediately. The budget and contingency can probably be reduced after full implementation of the recommendations below, when better data is available.

#### Value Engineering Cost Reductions

It is too late for additional value engineering changes. The Lower Station shelter was recently deleted, which saved \$457,000. Most other work is too far along to change and the savings from changes would be exceeded by the cost of delays. However, there are some limited opportunities for scope reductions, such as reductions in the landscaping design and elimination of the lower portion of the Upper Station cladding, subject to design review, public expectations and engineering evaluation. Immediate resolution of these items is needed to avoid impacting the project schedule.

### Contingency

The contingency can be reduced after completion of the initial scheduling and cost control efforts and implementation of the 'Needed Changes' noted above. These should all be completed by late February, 2006, assuming that the additional staffing is added next week. Further reductions in the contingency can be made after: (1) the Tram operator is selected and has an opportunity to evaluate the need for changes to minimize operating costs, (2) the Tower is erected and found to be within tolerance, and (3) the cables are tensioned and the cars are installed. These milestones will be checked at the 50% and 75% project completion reviews and incorporated in our follow-up reports.

### Contract Liability

We suggest a legal review of the City's contracts with Kiewit and Doppelmayr, the intergovernmental agreement between OHSU and the City, and the Development Agreement for the South Waterfront project. This would ensure that all parties are fulfilling their contract obligations and would determine if there are opportunities for improved delivery of the Tram project to help avoid any contractual liabilities.

### Impracticality of Risk Sharing with Kiewit

We strongly recommend against changing the construction contract to share contingency savings with the contractor. This is due to the project being too far along, the form of their contract (Construction Management with a Guaranteed Maximum Price), the extent of self-performed time and materials construction, pending revisions to their current cost tracking procedures, the uncertainty of the scheduled completion date, and the difficulty of assessing the responsibility for and cost impact of delays.

## **4. Recommended Changes**

We recommend additional staffing and some changes to procedures by both Kiewit and the City project teams – some of which are already being implemented. The other changes need to be made immediately in order to ensure success.

### **a. changes already made**

The City and Kiewit have already made significant changes in staffing and procedures over the past several months. The City has hired a new project manager, who started on 8Nov05, and added supporting staff in early Dec05, and has also implemented some procedural improvements. Kiewit has also recently added staffing: an experienced scheduler in mid-January and more recently an office engineer to improve their submittal tracking and other procedures, plus two field superintendents for the work at the Upper and Lower Stations. These changes have already resulted in improvements, but a few more changes are needed to ensure success.

### **b. additional staffing**

The existing project teams are competent to excellent, although there is a serious need for additional resources. Individual team members are overloaded, working late at night or on weekends, and are hard pressed to accomplish all of the tasks needed while also seeing the big picture and planning for possible problems. The recommended additional staffing will enable the project team to move beyond a reactive mode and into a proactive planning mode.

Kiewit

Kiewit needs to take full responsibility for the entire schedule by including in their schedule the remaining shop drawing reviews and other design milestones, a more detailed fabrication schedule, a quality assurance/control plan, a detailed installation plan that includes cable pulling and startup, permits, etc. Given the daily cost of extended jobsite overhead and the possibility of delay damages to OHSU if the Tram is not operating when Building One is occupied, a more detailed schedule is highly recommended.

Kiewit has recently added a senior full-time scheduler, who should continue working full-time until the City is satisfied that all scheduling issues have been addressed. These include the master schedule, weekly short-interval scheduling procedures, shop drawing and fabrication schedules, detailed erection schedules for the Tower and Upper Station, and a detailed Tram installation and startup schedule that is integrated with Kiewit's final erection tasks. This will require a significant commitment by Kiewit managers and supervisors to provide details of their plans and progress. Eventually, subject to City approval, the position can revert to part-time (but no less than two weeks per month).

Kiewit has recently added two field superintendents from a different project to supervise the Upper and Lower Station sites. These changes will help improve the team's ability to proactively plan the work. The additional field superintendents should remain on the project at least until the work is substantially complete.

Kiewit needs a full-time, experienced cost engineer immediately, for at least two months and until the City is satisfied with cost control, and then continue at least one week per month until the end of the project. This will provide reliable cost tracking and control, and a more accurate forecast of the cost to complete. If Kiewit does not have an experienced cost engineer available, they should either hire one or bring in a consultant.

Kiewit has recently added an assistant project engineer to develop a detailed submittal schedule, to link it to the construction schedule, and to track progress. After the submittals are adequately scheduled (in a month or so) the cost engineer may also be able to perform this function.

City

The City recently hired a senior-level project architect with experience in submittals, scheduling, tracking progress, etc. An additional mid-level project engineer is also needed to assist with this work and to track the project schedule. A cost tracking engineer/manager is also needed for at least two months, full time, to ensure a better level of cost control. This person should continue to work for one or two weeks per month to review expenditures and forecasts. This should ensure that the City has a reliable budget and that it stays on track.

Architect/Engineer

We understand that funds have been budgeted for a weekly site visit by the architect and/or structural engineer. A structural engineer will be needed more often than an architect and should be on site regularly during construction of the Upper Station, and full-time during Tower erection and pulling and tensioning of the cables.

Doppelmayr

We don't have enough data at this time to determine whether Doppelmayr's projected installation team is sufficient. Kiewit's scheduler should closely examine Doppelmayr's detailed cable pulling and equipment installation schedules and verify that their schedules and staffing are adequate. The scheduler should also verify – and track accomplishment of – Doppelmayr's fabrication and shipping milestones to ensure against delivery delays. When complete, Kiewit's revised, integrated schedule should be reaffirmed by Doppelmayr.

**c. procedures**

Suggested changes to procedures, much of which are being implemented, include:

- \* Progress Schedule: Kiewit's schedule should include all activities needed for successful project completion. In addition to Kiewit's construction activities, the schedule should include Doppelmayr's delivery and installation, the electrical design/build work, permits, submittals, fabrication and other procurement. The schedule should be updated weekly and should compare planned versus actual progress each week in order to identify any schedule slippage. This will ensure that timely corrective action can be implemented if necessary.
- \* Submittal Schedule: A separate, detailed submittal schedule is needed. It must show both planned and actual submittal dates for structural steel shop drawings and other submittals, review and approval times, with an allowance for some revisions, and priorities for review. It must be correlated with the fabrication schedule and Kiewit's construction schedule, with the most critical items shown on the construction schedule. Although it would normally be maintained by both the contractor and the architect, in this case the responsibility has been assigned to Kiewit, with verification by the City.
- \* Fabrication Schedule: A separate, detailed fabrication schedule should be maintained by the two fabricators and tied to the submittal schedule and Kiewit's construction schedule. This should be maintained by the fabricators with a current, duplicate copy at the City and Kiewit. In addition, Kiewit needs to integrate the fabrication schedule into their construction schedule, determine the priorities and delivery dates, and monitor progress.
- \* Detailed Erection, Equipment Installation, Cable Pulling, and Startup Schedules: More detailed schedules need to be prepared by the steel erector for steel erection, jointly by Kiewit and Doppelmayr for the integration of their efforts in completion of steel erection and equipment installation, and by Doppelmayr for cable pulling and for testing and startup. Kiewit needs to correlate these schedules with their master schedule.
- \* Cost Tracking and Forecasting: A more detailed review of the project costs, especially the costs of the time and materials work, is needed along with monthly forecasts to complete. The principal task should be undertaken by Kiewit with close, independent review by the City. The monthly forecasts need to list actual costs to date, the basis for estimating the cost to complete, the estimated cost to complete, the estimated total cost, and a comment on assumptions and any exclusions. This needs to be accomplished as soon as possible, as the current procedures need improvement, so that a more reliable budget can be provided.

\* Conversion of Kiewit's Time & Materials Contract to a Not To Exceed Contract: We recommend that the City review all of Kiewit's time and materials subcontracts to determine whether they can be converted to not to exceed subcontracts under Kiewit's GMP contract. We also recommend immediately implementing closer tracking of those subcontracts. This would be by establishing an estimated material costs and unit labor rates for each line item and comparing those to actual productivity on a weekly basis, with contractor supervision and City oversight efforts focused on those items that are over budget.

Establishing a not to exceed limit to all time and materials contracts and tighter tracking of time and materials costs are critical to providing the City with better cost control, the ability to forecast final costs, and the data to evaluate possible acceleration efforts.

\* Cost-Time Tradeoff Analysis and Acceleration: After more detailed cost forecasting and scheduling procedures are implemented, Kiewit and the City can make a cost-time tradeoff analysis to determine what activities should be accelerated to minimize total project costs. This tradeoff should be closely tied to the scheduled completion date of OHSU's Building One.

### **c. other actions**

We recommend that Kiewit confirm with all of their subcontractors that their subcontract amounts include all costs for the revised completion date, all currently scheduled activity durations, and all other changes to date.

More detailed recordkeeping should be implemented by both the City and Kiewit to identify potential delays and impacts so that timely action can be taken to preclude any cost disputes at the end of the project. In addition, the City should examine Kiewit's subcontracts, including the electrical design/build subcontract and the pending landscaping subcontract, to confirm whether there are other contractual risks not included in the cost forecast.

As soon as a revised project schedule is established, Doppelmayr should be asked to reaffirm that they can meet all critical milestones, and that no additional costs are anticipated. This should be done before reduction of the contingency.

Depending upon the recommendations of Doppelmayr and the City's tram expert, it might be advisable to re-review the cable saddle alignment issues and possibly prepare a contingency plan in case problems are encountered.

## **5. Comments on Functionality and Operations**

As part of our contract requirement to examine life cycle costs, our Tram expert and others have identified some potential concerns with Tram functionality and operations. The City should move forward immediately to retain the Tram Operator and review any concerns, including those noted below. Prompt review of these items now could result in near-term retrofit work that would have less impact to the budget than waiting to modify any items near to or after completion. In addition to the potential financial impact, these issues could damage the reputation of the Tram and detract from an otherwise very successful project.

The items identified for concern are:

- \* Inadequate weather protection from wind and rain, especially at the Upper Station but also at the Lower Station, which would make using the Tram an unpleasant experience in inclement weather.
- \* The psychological impact of the great heights and openness at the Upper Station and within the cars, which may prevent some people from using the Tram.
- \* The lack of guides at the Tower, which may require reducing the speed to such an extent as to reduce the capacity of the system below the demand.
- \* The possibility that the Tram will become such a popular tourist attraction in good weather that it could conflict with the use of the Tram by OHSU personnel.
- \* The need for surface transportation when the Tram is out of service for maintenance, bad weather, or other reasons. This should include plans for rapid implementation in response to unexpected Tram shutdowns, availability of drivers, route designations, parking, drop off points, etc.
- \* The open design of the Lower Station and the limited area at the Upper Station, which may hamper operations and crowd control and may require additional security features to prevent vandalism.
- \* The operating budget and reserve fund for repair/replacement.

## **6. Conclusions**

We believe that if all of the recommendations in this report are fully implemented, the risk factors above are addressed, and sufficient funds are allocated, the project team will complete the project successfully within the revised \$55 million budget and revised December 1, 2006 completion date as noted above.

The above findings and recommendations are based on the project status as of mid-January, 2006, when construction was approximately 35% complete. In accordance with our contract with PDC, we will be performing a follow-up review when the project is 50% and 75% complete.

## **7. Contributions to the Report**

We would like to compliment the project teams, and especially the Kiewit and City teams, for the improvements they have recently made and their willingness to set aside valuable time to work with us. In spite of a nearly overwhelming work load, they are doing a fine job and only need additional resources and a few procedural changes to bring the project to successful completion. Key individuals who provided information for this report include:

- \* Dave Obern, Portland Development Commission
- \* Rob Barnard, City of Portland, Office of Transportation
- \* Karl Schulz, OHSU
- \* Bruce Patterson, Kiewit
- \* Kevin Young, Doppelmayr

The Pinnell/Busch team members and their primary roles include:

- \* Steve Pinnell, Pinnell/Busch, team leader: costs, schedules, procedures, and recommendations
- \* Mike Morrison, Value Management Consulting: costs
- \* Dave Place, retired General Manager of Hamilton Construction, Pinnell/Busch Associate: costs, schedules, concrete placement, and steel erection
- \* Chuck Peterson, Tramway Engineering Ltd.: tram design, costs, schedules, and operation
- \* Kent Pothast, retired chief scheduler of Hoffman Construction: schedules
- \* Blake Marchand, Pinnell/Busch: schedules
- \* Cathy Hastie, Pinnell/Busch: team coordinator

P2591FinalReport

# **EXHIBITS**

**EXHIBIT #1**  
**PORTLAND AERIAL TRAM RISK ASSESSMENT REPORT**  
**RISK IDENTIFICATION AND ASSESSMENT REGISTER – 18Jan06**

[First we list concerns, then we assess risks and identify action to be taken]

No.	Risk Identification	Risk Assessment	Action to be taken (who, when, etc)
1.	ODOT Overhead Permit	Must have permit prior to pulling the cable	<b>Art Pearce</b> is handling this item. Art is waiting for Doppelmayr to give him information. Dwg. to be delivered (in two weeks?)
2.	Doppelmayr Schedule	Doppelmayr needs firm dates to be able to schedule their work and mobilize staff from other projects around the world. Project completion date needs clarification. There are costs associated with any further schedule changes for availability and mobilization of the Doppelmayr folks.	Master schedule to be developed that integrates the Doppelmayr activities with the Kiewit schedule for erection. <b>Bruce, Kevin and Dick</b> to follow up. Day is now on-board to assist with this schedule.
3.	Interface between erection and installation	Shifting of primary "lead" for any location US, LS, Tower. Need clarity about who has the "right-of-way". What is the cost associated with any delay, or acceleration.	Develop an interface schedule for the interaction of the Kiewit work and the Doppelmayr work at the site. <b>Bruce and Kevin</b> have begun this activity. Completion of detailed schedule by 15Feb06.
4.	Tolerance of tower fabrication and erection	The tolerance is 100mm (4-inches) in any direction. The bronze saddles must be aligned for the rope to "track" properly. The Doppelmayr equipment has some ability to make ONLY minor changes. The clearances are very critical.	Engineering studies and modeling underway by Thompson. Thermal analysis has been done. <b>Bruce</b> will track the completion of this activity. Smith, Monroe and Grey are doing this work as a sub-consultant to Thompson. Pre-assembly is being done by Thompson. Thompson and W&H (for the City) is providing the surveying. Steve noted that quality control during fabrication and erection is vital (see erection plan).
5.	Any additional reviews	Some details are still being clarified.	Reviews and clarification are being handled by

**EXHIBIT #1**  
**PORTLAND AERIAL TRAM RISK ASSESSMENT REPORT**  
**RISK IDENTIFICATION AND ASSESSMENT REGISTER – 18Jan06**

[First we list concerns, then we assess risks and identify action to be taken]

No.	Risk Identification	Risk Assessment	Action to be taken (who, when, etc)
	needed by the architects and/or engineers for the Doppelmayr equipment		<b>Art Pearce.</b> Approval by the City Engineer is required for the Doppelmayr drawings.
6.	City's schedule for undergrounding utilities on Gibbs	Must be done prior to the placing of the cables by Doppelmayr.	<b>Gary</b> is handling this item. [Note: Contingency plan is for the lines to be de-energized and dropped to the ground to eliminate the interference in the air.]
7.	Protect the overhead lines that stay overhead	Safety concerns during the erection of the temporary supports for the cable pulling	<b>Gary</b> is handling this item.
8.	O & M plan and needs	Field requirements for Doppelmayr and for the residual O & M requirements needs to be identified. Operator needs to be on-board by Mid-March to become part of the team. RFP to be issued. Gary is concerned about the potential cost of this item.	<b>Rob and Art</b> are following this item.
9.	Hiring the operator	See above (RFP pending) by the City	<b>Art</b> is handling this item.
10.	Cable pulling issues beyond those listed above.	Security? Tree cutting and the environmental impacts. Traffic control and permits required for I-5 shutdown. Final rope pulling document is under development. Bogie line over I-5 will be used for getting the first rope pulled. [Idea of a spare track rope was discussed and the experts believe that this is not required. Rob reminded the group that a 12-week delay might have impact costs of \$9 million.	<b>Art and Gary</b> are the leads for this activity. There is a 20 page document for the rope pulling. <b>Kevin</b> will examine the minimum time required to get 4 additional ropes in the event that they are needed.
11.	Completing the electrical	Doppelmayr has electrical requirements that	<b>Jeff</b> is working to get this additional design work covered. Completion is due in

**EXHIBIT #1**  
**PORTLAND AERIAL TRAM RISK ASSESSMENT REPORT**  
**RISK IDENTIFICATION AND ASSESSMENT REGISTER – 18Jan06**

[First we list concerns, then we assess risks and identify action to be taken]

No.	Risk Identification	Risk Assessment	Action to be taken (who, when, etc)
	design	were not included in the existing Kiewit bid.	approximately two weeks. The Kiewit subcontractor has the contract in hand now. The contractor is now working under a letter of intent.
12.	Structural design issues	The tower has some issues associated with the interface of the Doppelmayr equipment with the structural work on the tower and the lower and upper stations.	<b>Kevin and Jeff</b> will follow up on resolving this issue.
13.	Security Plan	Required for the installation and after the installation of the cables. Security for the completed project must also be addressed.	<b>Gary</b> will take the lead for the security plan for the installation and work with <b>Kevin. Rob, and Jeff Houle</b> will address the post installation security issues.
14.	Concern about the privacy of the car design	Mock up of the car is being done to examine the film to provide privacy and the use of sandblasting possibly with the addition of louvers to reduce the “exposure” to the neighborhood.	<b>Rob and Art</b> are following up. Decision must be made and the decision conveyed to Doppelmayr during the visit to the factory in February.
15.	Sub-contractor risks associated with the impact of schedule change(s)	The full costs of Time and Material subcontracts are not fully known.	Upon establishing an integrated Kiewit/Doppelmayr schedule, <b>Bruce</b> should reaffirm cost with all subcontractors.
16.	Permits for Doppelmayr.	Traffic permits are required. Electrical are also pending. Port of Portland permits for importing material.	<b>Gary</b> will be working with Doppelmayr for resolution of the issue. <b>Art</b> is working on the electrical. Doppelmayr has a custom broker to expedite the importing of the equipment.
17.	Inspection of work necessary for the	Clearances, conduits, embeds, etc. placed by Kiewit need to be re-verified by Doppelmayr.	<b>Kevin</b> comes to the site once per month now. Development of the Master Schedule should

**EXHIBIT #1**  
**PORTLAND AERIAL TRAM RISK ASSESSMENT REPORT**  
**RISK IDENTIFICATION AND ASSESSMENT REGISTER – 18Jan06**

[First we list concerns, then we assess risks and identify action to be taken]

No.	Risk Identification	Risk Assessment	Action to be taken (who, when, etc)
	Doppelmayr work (e.g. embeds)		assist the timely scheduling of Kevin's trips. City has a third-party to verify the requirements for Doppelmayr. <b>Gary, Kevin, and Joe</b> will follow up.
18.	Testing and startup of Doppelmayr equipment	Rob explained the occupancy of the new tower at the bottom may provide a need for the intermittent use of the Tram. Joe explained that the Tram cannot be used until the system has completed acceptance testing (7 days). Soft opening cannot include any use prior to the acceptance. A two-week soft opening can occur after the acceptance testing.	<b>Rob</b> will follow-up with OHSU and reaffirm the Building One completion date.
19.	Fabrication and delivery of Doppelmayr equipment	Delivery dates will be checked.	<b>Gary and Bill Meyer</b> have this information now. Information to be added to master schedule.
20.	Impact on Terwilliger Parkway due to restrictive environmental permit	Tree cutting may impact this environmental permit. Clearance should be OK.	<b>Gary and Kevin</b> will review the rope pull plan and any impacts to trees.
21.	Any additional permits required by any agencies outside the City of Portland, Inspection by any agency outside of the City of Portland; Inspection of the elevator	State of Oregon through the Building Department has some requirements for the elevator and electrical board. In Oregon, since all of the ski areas are located on U. S. Forest Service land, the state defers to the federal government. The City of Portland is the authority of record for this project with concurrence with independent inspection.  What about fuel storage for the standby	<b>Gary</b> will find out about the potential fuel issue and verify that the elevator permit is not a problem.

**EXHIBIT #1**  
**PORTLAND AERIAL TRAM RISK ASSESSMENT REPORT**  
**RISK IDENTIFICATION AND ASSESSMENT REGISTER – 18Jan06**

[First we list concerns, then we assess risks and identify action to be taken]

No.	Risk Identification	Risk Assessment	Action to be taken (who, when, etc)
		<p>generator at the lower station?</p> <p>The state will be the lead inspector for this elevator.</p>	
22.	Resolution of the aluminum cladding and other significant VE items	Decisions on final VE savings must be made soon to avoid any impacts to schedule.	<b>Rob</b> is working on getting final direction on VE savings.
23.	Access of the upper station and providing alternate access during construction for OHSU, adequate site laydown area	<p>Building One is confined but workable for Bruce. The upper station is very confined. The plan is to utilize the roof of the existing garage for the forms. The garage is not designed to take the load of the rebar cages.</p> <p>OHSU needs to know when the closing of the road will be required. Road closure requires the use of shuttle buses to provide service for the new building. Deliveries to the new building will require access to the loading dock prior to the opening of the building. Kiewit needs to set a large crane on Campus to move resteel cages. Between now and April/May will require use of campus. Later Kiewit will need greater access.</p>	<p>No issue at the lower station. Real problems exist at the upper station. Waiting for outcome of Karl's meeting today.</p> <p>Kiewit is now drafting a plan to route a bus on an alternate route to provide for movement of staff and patients during the closure of Campus for use by Kiewit. <b>Kiewit will provide a plan to Rob shortly.</b> The plan needs to be given to Karl for consideration and then any changes in bus routes and timing must be given to the hospital users by 30 day notice. The decision can be made in about two weeks. Karl also stated that the notification might be reduced to two weeks. Steve noted that this should be expedited – suggest that <b>Rob</b> and <b>Bruce</b> follow up.</p>
24.	Skyway installation to the building	Karl Schulz states that the building is now ready to accept the skybridge.	<b>Rob</b> is coordinating this issue.

**EXHIBIT #1**  
**PORTLAND AERIAL TRAM RISK ASSESSMENT REPORT**  
**RISK IDENTIFICATION AND ASSESSMENT REGISTER – 18Jan06**

[First we list concerns, then we assess risks and identify action to be taken]

No.	Risk Identification	Risk Assessment	Action to be taken (who, when, etc)
25.	Building One	Power, emergency power, security, and communications connectivity are issues with the lower Tram station. The City staff and Kiewit will provide EC the information they need to complete the design-build work for the connections of the building with the lower station.	<b>Jeff Houle</b> is managing this issue.
26.	Interface with OHSU on the hill	The upper station has requirements for support from OHSU on the hill. The building project is providing emergency power for lighting, and other requirements.	<b>Karl</b> is coordinating this issue with <b>Bruce</b> .
27.	Schedule issues	Need a baseline schedule for the project. See also item #2.	<b>Dick Day</b> is on-board to develop a Master Schedule. Blake says that a short-interval schedule is needed and should be incorporated into the Master Schedule. Steve mentioned that the Thompson schedule shows that some of the drawings are behind. The architect needs to provide a submittal schedule.
28.	Design team participation	If the design team abandons this project, there will be serious problems.	Architectural interaction with RFI, shop drawings, submittals, etc. may require that the design team have a person on-site. Steve also suggested a third party. <b>Rob</b> will follow-up on this issue.
29.	Structural steel erection	Rob is concerned about the \$10 million of work that is still outstanding here.	Get the drawings coordinated and complete to the fabricator. <b>Jeff</b> is leading this effort.

**EXHIBIT #1**  
**PORTLAND AERIAL TRAM RISK ASSESSMENT REPORT**  
**RISK IDENTIFICATION AND ASSESSMENT REGISTER – 18Jan06**

[First we list concerns, then we assess risks and identify action to be taken]

No.	Risk Identification	Risk Assessment	Action to be taken (who, when, etc)
30.	Concrete core for the tower	Embeds, rate of completion and the development of as-builts as the tower is completed.	<b>Bruce</b> is working on the erection plans and schedule for this work.
31.	Completion date	This is not firmly established at this time.	<b>Dick Day</b> will assist <b>Bruce</b> in the development of the completion schedule including the prioritization of the finishes to decide what <b>MUST</b> be done prior to the “opening” to the public versus those activities that can be done after the Tram is open to the public.
32.	Deceleration versus acceleration	What is the impact of completion of the project later than the current acceleration might provide.	Team believes deceleration would not result in any significant cost savings. Acceleration of some items may be possible after integrated schedule is complete. <b>Rob</b> will track this item.
33.	Projection of the costs to complete	Need to develop more reliable cost expenditure ands cost forecasting data.	<b>Bruce</b> and <b>Kathy Henrickson (Kiewit)</b> will develop a “first cut” of the projection. <b>Rob</b> is leading this item.
34.	Remaining contract awards	Landscaping, site furnishing. Only \$1.6M left to bid.	No additional work here related to item 22 VE savings.
35.	Paint system	Type and reflectivity of paint.	Resolved.

Facilitator: Mike Morrison – Pinnell/Busch, Inc.  
Attendees: Steve Pinnell – Pinnell/Busch, Inc.  
Blake Marchand – Pinnell/Busch, Inc.  
Chuck Peterson – Pinnell/Busch, Inc.  
Dave Place – Pinnell/Busch, Inc.  
Cathy Hastie – Pinnell/Busch, Inc.  
Rob Barnard – City of Portland  
Gary Hopkins – City of Portland  
Art Pearce – City of Portland  
Dave Obern – Portland Development Commission  
Bruce Patterson – Kiewit Pacific  
Kevin Young – Doppelmayr CTEC  
Joe Gmuender – Gmuender Engineering  
Karl Schulz – OHSU Representative/Ethos Project Management

**EXHIBIT #2**  
**PORTLAND AERIAL TRAM RISK ASSESSMENT REPORT**  
**Budget Estimate**

**Opinion of Probable Project Cost as of 24Jan06**

No.	Item	%	Totals	Rounded Totals
1	City Staff		\$ 1,134,586.09	
2	City Materials and Services		\$ 452,816.66	
3	City Overhead on PDC Billings		\$ 6,195.44	
4	Tri-Met		\$ 359,161.21	
5	OHSU		\$ 283,645.80	
6	PATI		\$ 1,200,610.00	
7	Other Soft Cost		\$ 1,167,023.83	
8	Pre-Construction Items		\$ 829,334.36	
9	AGPS (architect/engineer)		\$ 3,308,464.00	
10	AGPS Projected Pending Change Orders		\$ 539,816.20	
11	Art Budget (Part of bridge plaza work)		\$ -	
12	Doppelmayr		\$ 10,059,730.83	
13	Kiewit's SOV (schedule of values)		\$ 30,389,314.70	
14	Subtotal Unmitigated		\$ 49,730,699.12	
15	Estimated Acceleration		\$ 400,000.00	
16	Subtotal with Acceleration		\$ 50,130,699.12	
17	Cost Reduction Items Pending		\$ (457,000.00)	
18	Subtotal with VE Cost Reductions		\$ 49,730,699.12	\$50,000,000
18	Contingency		\$ 5,350,000.00	\$ 5,000,000
	Unassigned Management Reserve Contingency	2	\$ 1,000,000.00	
	Construction Contingency	8	\$ 4,000,000.00	
	Engineering Contingency	0.5	\$ 350,000.00	
19	Total Project Cost with Contingency		\$ 55,023,699.12	\$55,000,000

**NOTES:**

1. Values shown for line numbers 1 through 12 come from the City of Portland 17Jan06 spreadsheet.
2. Value for Line 13 Kiewit Schedule Of Values (SOV) was developed from written material received from Kiewit on 20Jan06 and subsequent conversations.
3. Values shown for line number 14 come from the City of Portland 17Jan06 spreadsheet.
4. Line 15 is the total for acceleration is from the City of Portland 17Jan06 spreadsheet.
5. Line 16 shows a new total that reflects the changes in the Kiewit amount on Line 13.

This opinion of probable construction cost is based on the information available to Pinnell/Busch at the time of compilation. Since Pinnell/Busch has no contractual relationship with the organizations responsible for the completion of this project, and has no ability to predict actual changes in productivity, labor costs, material costs or change orders, there is no guarantee implied or given as part of this report.