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Master Project Schedule Review

Grantee: City and County of Honolulu

Honolulu High-Capacity Transit Corridor
Project

Master Project Schedule Review
June 2009

FINAL DRAFT

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TABLE OF CONTENTS

| | |
|---|----|
| 1. Executive Summary | 1 |
| 2. Project Background / History | 3 |
| 3. Methodology | 5 |
| 4. Review and Assessment of Project Schedule | 6 |
| 4.1. MPS Detail Review | 6 |
| 4.1.1. Overall Review | 6 |
| 4.1.2. Critical Path and Critical Items..... | 7 |
| 4.1.3. Pre-Preliminary Engineering (PE) and Activities Prior to PE..... | 8 |
| 4.1.4. Environmental Assessment to Record-of-Decision (ROD)..... | 8 |
| 4.1.5. Preliminary Engineering (PE)..... | 8 |
| 4.1.6. Final Design (FD) | 8 |
| 4.1.7. Long-Lead Procurement Items | 8 |
| 4.1.8. Right-of-Way (ROW) Acquisition/Utility Relocation | 8 |
| 4.1.9. Civil/Guideways | 8 |
| 4.1.10. Stations..... | 9 |
| 4.1.11. Systems | 9 |
| 4.1.12. Systems Start-up/Testing/Safety/Pre-revenue Operations..... | 9 |
| 4.1.13. Major Milestones/MOS/Revenue Operation Dates | 9 |
| 4.1.14. Maintenance and Storage Facilities (MSF) and Operations Control Center (OCC) | 10 |
| 4.1.15. Vehicles | 10 |
| 4.1.16. Operations and Maintenance | 10 |
| 5. Conclusion | 11 |

LIST OF ACRONYMS

| | |
|------------|---|
| AA | Alternatives Analysis |
| Booz Allen | Booz Allen Hamilton |
| DB | Design-Build |
| DEIS | Draft Environmental Impact Statement |
| DTS | City and County of Honolulu Department of Transportation Services |
| EIS | Environmental Impact Statement |
| FD | Final Design |
| FEIS | Final Environmental Impact Statement |
| FFGA | Full Funding Grant Agreement |
| FTA | Federal Transit Administration |
| GEC | General Engineering Consultant |
| GET | State of Hawai'i General Excise and Use Tax |
| HEC | Hawai'i Electric Company |
| HHCTC | Honolulu High-Capacity Transit Corridor (Project) |
| HDOT | State of Hawai'i Department of Transportation |
| IC | InfraConsult, LLC |
| KKCS | Krishnan Consulting Services, Inc. |
| LONP | Letter of No Prejudice |
| LPA | Locally Preferred Alternative |
| LRT | Light Rail Transit |
| MOS | Minimum Operating Segment |
| MPS | Master Project Schedule |
| MSF | Maintenance and Storage Facility |
| NEPA | National Environmental Policy Act |
| NTP | Notice to Proceed |
| OCC | Operations Control Center |
| O&M | Operations and Maintenance |
| PB | PB Americas, Inc. |
| PDP | Project Development Plan |
| PE | Preliminary Engineering |
| PMO | Project Management Oversight |
| PMOC | Project Management Oversight Contractor |
| PMP | Project Management Plan |
| PMSC | Project Management Support Consultant |
| QA/QC | Quality Assurance / Quality Control |
| QMP | Quality Management Plan |
| ROD | Record of Decision |
| ROW | Right of Way |
| RTD | DTS Rapid Transit Division |
| SCC | Standard Cost Category |
| TOD | Transit Oriented Development |
| UH | University of Hawai'i |
| WBS | Work Breakdown Structure |

1. Executive Summary

Booz Allen Hamilton (Booz Allen), as a Project Management Oversight Contractor (PMOC) under contract with the Federal Transit Administration (FTA), and its subconsultant, Kal Krishnan Consulting Services, Inc. (KKCS), reviewed and assessed the Master Project Schedule (MPS) for the Honolulu High-Capacity Transit Corridor (HHCTC) Project submitted by the City and County of Honolulu (City) as of June 2, 2009. The June 2, 2009 MPS reflects the change to the Minimum Operating Segment (MOS) from the Salt Lake alignment option to the Airport alignment option. The MPS also reflects changes in the delivery of the project.

The objective of the review was to evaluate if the MPS is mechanically sound and is sufficiently developed to function as a Master Project Schedule for the project at this Phase of the Project.

Overall, the MPS provided on June 2, 2009 is mechanically sound and acceptable as a Preliminary Master Project Schedule.

The MPS is still under development and will continue to be so through the Preliminary Engineering (PE) phase of the project. The MPS depicts aggressive revenue service dates for the Waipahu/Leeward and East Kapolei to Pearl Highlands Segments but shows achievable revenue service dates for the Kamehameha, Airport, and Ala Moana Segments. The City is working to fast-track the schedule through a civil/guideway design/build delivery for Segment I in order to achieve its project delivery goals.

The schedule is evolving rapidly and needs further development as the project moves towards and through PE, in order to provide a sound basis to manage the project. Areas of schedule development are:

- The schedule needs to clearly identify relationships among land acquisition, utility relocation, vehicle procurement, civil/systems design-build (DB), station final design, and construction.
- The schedule needs more detailed activities for civil/guideways, systems, and station construction work.
- The schedule needs to more accurately define the design, procurement, construction, and testing activities required for the opening of the Waipahu/Leeward Section in December 2012, including coordination with operations/maintenance activities.
- The schedule needs to further define the activities and durations and critical path at a deeper level, one more commensurate with a project of this size.
- The schedule needs to include activities for long-lead items such as running rail, special trackwork, elevators/ escalators, rail maintenance equipment, etc.

In addition to the ongoing technical development of the MPS, it is suggested that the City work to reduce and mitigate some of the potential risk to the project. Areas that the City needs to review and address are:

- Vehicle and Systems – The combined Vehicle and Systems contract is unusually large, showing a duration of approximately nine years. The size of this package results in risk to all MOS openings if there is a delay from this single design/build contractor.

- Maintenance Facility – the Maintenance and Storage Facility (MSF) will not be fully functional and operational for service by December 2012 for the Waipahu/Leeward MOS-1 alignment.
- Vehicle Production – Delivery of the first production vehicles is scheduled for November 2011, which is aggressive. Vehicle testing and storage assumptions require clarification given that the MSF will not be operational.
- Operations Control Center (OCC) – There are no activities scheduled for the Operations Control Center (OCC); and it is not clear where the facility will be located nor when it will be designed, installed, and tested. Detailed planning of the OCC is necessary, particularly since the grantee is a new operator.
- Staffing – Operations and Maintenance staff training is at risk given that MSF completion is not consistent with Waipahu/Leeward Segment service requirements.

2. Project Background / History

The HHCTC Project is a 29-mile, elevated fixed guideway system along O`ahu's south shore between Kapolei and the University of Hawai`i (UH) at Mānoa, including a spur to Waikīkī.

In July 2005, the state legislation authorized a 0.5-percent General Excise and Use Tax (GET) Surcharge as a source of revenue to build the transit corridor project. The GET surcharge went into effect on January 1, 2007 and has an end date of December 31, 2022. An Alternatives Analysis (AA) was initiated in August 2005 and the AA Report was presented to the Honolulu City Council in October 2006. Public meetings concerning the AA were held in November and December 2006, and on December 22, 2006, the City Council selected the fixed guideway alternative as the Locally Preferred Alternative (LPA). In selecting fixed guideway as the LPA, the City Council left some areas of the alignment open, which will be decided upon as the project progresses. These include West Kapolei, Salt Lake Boulevard versus Airport alignment, and the Waikīkī/UH at Mānoa branches.

On July 1, 2007, the City created the Rapid Transit Division (RTD) within the Department of Transportation Services (DTS) through enactment of the City's Fiscal Year 2008 Executive Operating Budget and Program. The RTD's responsibilities include project development, management and implementation. New staff members continue to be added to the City's organization within RTD and through InfraConsult, LLC (IC), the City's Project Management Support Consultant (PMSC). The City has started advertising the positions currently performed by IC.

On August 24, 2007, the City executed a General Engineering Consultant (GEC) contract for \$85 million with PB Americas, Inc. (PB) to perform National Environmental Policy Act (NEPA) documentation and PE activities. The City combined the activities needed to support NEPA and to conduct PE into the GEC contract with separate Notices to Proceed (NTPs).

On April 17, 2008, the Mayor directed DTS to move forward with steel-wheel on steel-rail technology. On August 1, 2008, the City issued the Administrative DEIS to FTA for review and comment. The DEIS was completed and issued on October 30, 2008. The DEIS includes three fixed guideway build alternatives:

- Salt Lake only
- Airport only
- Airport and Salt Lake

The City requested entry into PE on May 4, 2009 and anticipates approval from the FTA by July 7, 2009.

In 2006, the City Council identified a 19-mile alignment from East Kapolei, through Salt Lake Boulevard and downtown, and with an eastern terminus at the Ala Moana (Shopping) Center as the selected MOS, which would be built first with the current funding/revenue available. The Project did not include the alignment from West Kapolei to East Kapolei, or from Ala Moana Center to Waikīkī or to the UH at Mānoa. However, on January 28, 2009 the City Council voted to revise the MOS alignment to the Airport alignment in lieu of the Salt Lake alignment.

The Airport alignment is approximately a 20-mile portion of the 29-mile LPA, extending from East Kapolei to Ala Moana Center via the Airport. The Airport alignment includes 21 stations. The alignment is elevated, except for an at-grade portion of 1,815 linear feet at the Leeward Community College station. The Airport alignment will average a total of 97,500 boardings at Revenue Operations in the year 2019, 116,000 boardings in the year 2030, and will provide two significant areas with potential for Transit Oriented Development, near the Airport and in the surrounding industrial areas.

It is anticipated that the initial fleet size will be 67 vehicles. There is currently no Full Funding Grant Agreement (FFGA) for this project. The Waipahu/Leeward Section, which is a 1-½-mile portion of the MOS between the Waipahu Transit Center and Leeward Community College Stations, will be the first section scheduled to be in limited operation at the end of 2012. Construction of the Waipahu/Leeward Section is scheduled to begin in April 2010.

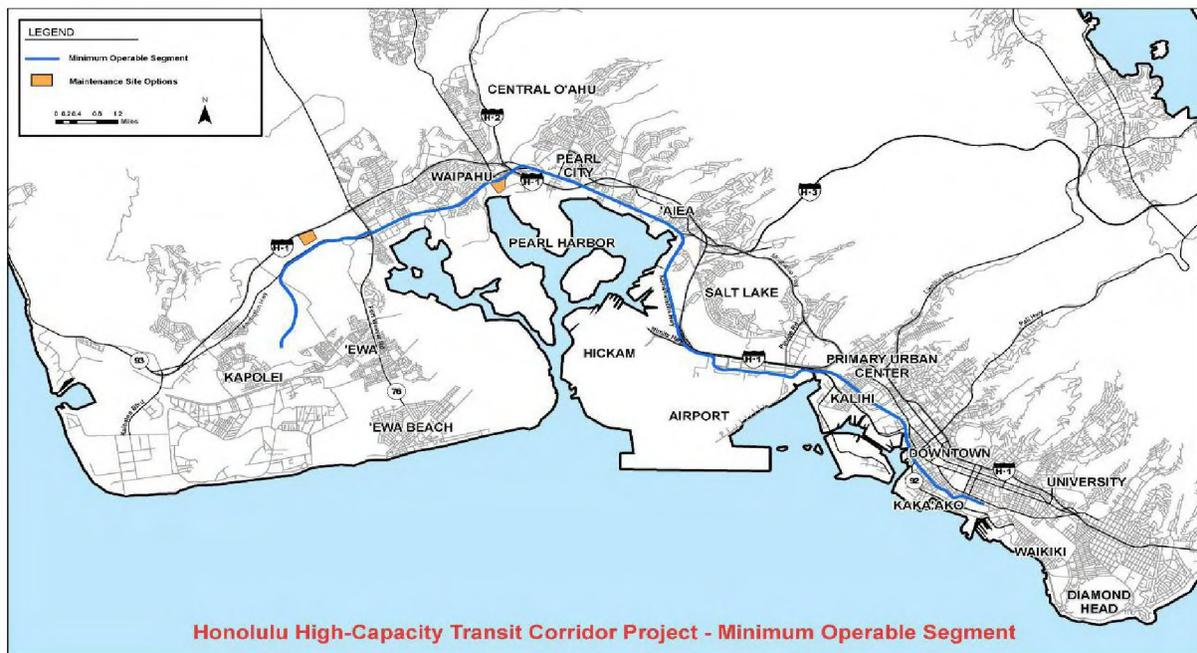


Figure 1. Project Map

3. Methodology

KKCS, as a subconsultant to Booz Allen, reviewed and assessed the MPS for the HHCTC Project submitted by the City as of June 2, 2009. The purpose of the review is to:

- Provide an overview of the MPS prepared by the City
- Assess whether the MPS is sound and technically correct
- Determine if this MPS is acceptable as a Master Schedule for the project
- Determine if this MPS is acceptable for entry into PE.

The following files, provided by the City, were used by KKCS for the schedule review:

1. Master Project Schedule P6 file MS5E (Data Date: 10MAY09)
2. Basis of Master Program Schedule MA5E.xls dated 05JUN09
3. Master Program Schedule 5Apdf.pdf (Data Date: 08FEB09; run date 23MAR09)
4. Honolulu Linear Schedule 25 mar 09.pdf
5. Basis of Schedule 26 Mar 09a.doc
6. SCC Worksheet Airport Alignment FY 2008 03-27-09 rev.pdf

4. Review and Assessment of Project Schedule

The assessment includes a review of the City's schedule components such as activity durations and logic relationships, and provides a professional opinion as to the validity of meeting the operation date of December 24, 2012 for the Waipahu/Leeward Section of Segment I, July 2014 for Segment I from East Kapolei to Pearl Highlands, and March 2019 for the Project alignment. Review comments and recommendations included in this assessment are based on past similar experience including the Los Angeles Eastside Extension LRT, Sacramento South Corridor LRT, SEPTA (Philadelphia) Market Street Elevated Guideway, Seattle Link LRT, and other projects. Scope and construction attributes that are unique to the HHCTC Project are considered as well, including the design/build delivery.

The majority of the review time was focused on the general project flow of the activities from PE through Final Design (FD), Construction, and Systems Start-up/Testing. A cursory review of the technical aspects was also performed including scheduling software, activity coding, and the Work Breakdown Structure (WBS). The technical aspects of the schedule need to be further developed to facilitate a more detailed review.

4.1. MPS Detail Review

KKCS's review of the MPS in the ProjectSolv² website directory indicates that the City needs to review all design, procurement, construction and testing activities required for the opening of the Waipahu/Leeward Section, which will be the first section scheduled to be in operation in December 2012, and coordinate with operations/maintenance staff related to MSF, OCC, and vehicle operations. The construction activities for Civil/Guideways, Stations, and Systems are identified in the schedule as single line items. The City should further refine the construction activities into more detailed activities since the early phase contracts are design-build contracts.

4.1.1. Overall Review

- The MPS should include all FTA Roadmap requirements related to PE, FD, and the FFGA processes. The PMOC recommends that review and approval durations be defined in the MPS.
- The critical path for the project runs through FTA approvals related to PE, FD, and the FFGA processes; the City Center Utility Construction, City Center Guideway, Systems, Integrated Testing and Opening of the Ala Moana Operable Segment milestone. However, the Ala Moana segment is not the first Operable Segment. The PMOC recommends that the schedule be revised to show the critical path running to the first Operable Segment, which is Waipahu/Leeward.
- Schedule requirements for delivery of the first vehicle appear very aggressive to meet the Waipahu/Leeward segment opening date of December 2012. The PMOC recommends that the planning assumptions be clarified to show vehicle readiness for the static and dynamic testing for the Waipahu/Leeward segment in time to meet the service deadline.

- The schedule depicts the Maintenance and Storage Facility (MSF) completion in May 2014, and the start of service on the Waipahu/Leeward segment in December 2012. The PMOC recommends that the grantee's planning assumptions be clarified in terms of operations/maintenance staff training and providing service to the line between September 2011 and February 2012.
- There is no activity identified for the design/installation of the Operations Control Center (OCC). The PMOC recommends the schedule be clarified regarding the OCC location and completion information. The PMOC notes that the OCC facility needs to be complete (with tested and fully functional controls, computers, and equipment) prior to the Waipahu/Leeward segment opening in December 2012.
- The Master Schedule does not identify interface points/requirements between utility relocation, site-work, guideways, stations and park-n-ride facilities, systems installation and testing, MSF, and OCC facilities. The PMOC recommends that these interface points need to be defined in the schedule.
- The long-lead procurement items have not been defined such as the running rail, special trackwork, track maintenance equipment, elevators/escalators, etc. The PMOC recommends that these schedule assumptions be clarified, particularly if the procurement approach will be by segment rather than the entire Project alignment.
- The schedule lacks clarity regarding interfaces with City/State agencies, third party utility agencies, vehicles, systems, guideways, stations, MSF, and OCC. The PMOC recommends that these interfaces be defined during the Design Phase, and responsibility for coordinating this interface be identified.
- The Master Schedule lacks detailed dynamic testing, safety certification, and pre-revenue operations activities. The PMOC recommends that these activities be included in the schedule.
- The construction activities for Civil/Guideways, Stations, and Systems are identified in the schedule as a single line item. The PMOC recommends that construction be broken down into more detailed activities since the early phase contracts are design-build contracts.
- The PMOC recommends that a project-wide coordination team, knowledgeable in rail construction and operations, be implemented to coordinate the project during the design, construction, and start-up phases
- Grantee to conduct regularly scheduled design coordination meetings with the Segment I DB contractors for guideways, stations, systems/vehicles, MSF, Hawaii Electric Company (HEC), and City utility agencies.

4.1.2. Critical Path and Critical Items

- A bar-chart showing critical path activities for the project has been created for reference.
- The MOS revision to the Airport alignment option has extended the Pre-PE activities from the previous Master Schedule.
- There are many components of the project that are critical and have the potential to delay the Waipahu/Leeward segment operations date. However, the highest risk areas that could delay the revenue operations date are the delivery/testing of the vehicles and completion of the MSF and OCC facilities.

- There should be a contingency plan to mitigate cost escalation for materials and labor. Since the project duration is approximately 10 years, there could be a unanticipated increase in materials costs, similar to what happened in 2005 and 2006, and/or a unanticipated shortage of skilled workers due to a surplus of work on the island.
- Due to the aggressive schedule for opening the Waipahu/Leeward alignment, early risk identification and elimination is imperative to the City's ability to achieve the opening date.

4.1.3. Pre-Preliminary Engineering (PE) and Activities Prior to PE

- The MOS revision to the Airport alignment option has extended the Pre-PE activities from the previous Master Schedule.

4.1.4. Environmental Assessment to Record-of-Decision (ROD)

- The City plans to obtain an ROD in October 2009.

4.1.5. Preliminary Engineering (PE)

- The City plans to submit its request for Entry to FD in December 2009.

4.1.6. Final Design (FD)

- The PMOC notes that the schedule shows the City plans to issue a Letter of No Prejudice (LONP) request for one DB package instead of separate LONP requests for design and construction.
- The schedule identifies FD activities as "final design definitions." The final design activities should be detailed and addressed.
- The grantee needs to clarify who will coordinate design issues during FD between guideways, stations, systems, MSF, OCC, vehicles, utility companies, etc.
- The City plans to execute FFGA on June 22, 2011.

4.1.7. Long-Lead Procurement Items

- The schedule does not have line items to detail the long-lead procurement items for the project.

4.1.8. Right-of-Way (ROW) Acquisition/Utility Relocation

- The schedule has an aggressive two-month duration for the purchase of the ROW for the project. In the PMOC's opinion, an eminent domain plan should be developed for ROW acquisitions for the critical facilities.

4.1.9. Civil/Guideways

- The schedule needs to clarify who will coordinate interface issues between the Civil/Guideway, Stations, and Systems contractors during construction.
- The schedule needs to clarify who will be providing track installation and maintenance equipment.
- The schedule needs to depict design/construction interfaces with HEC and City utility agencies during design and construction of the MSF facility.
- In the Linear Schedule, the Kamehameha segment depicts track installation from east to west. The grantee's planning assumptions with regard to staging for this activity require clarification.

4.1.10. Stations

- Planning assumptions regarding who will coordinate interface issues during construction between the Civil/Guideway, Stations, and Systems contractors require clarification.

4.1.11. Systems

- The 13-month duration for Systems Design/Manufacture/Install/Test 1 is very aggressive, since the guideways and stations for the MOS-1 and MSF have to be ready to provide access for system installation.
- It is not clear which contract package will contain the wayside equipment; the schedule needs to be clarified.

4.1.12. Systems Start-up/Testing/Safety/Pre-revenue Operations

- There are no specific line items for safety certification, testing, and start up of the signal and communication systems. These activities should be included in the schedule.

4.1.13. Major Milestones/MOS/Revenue Operation Dates

- A bar chart showing activities for the project sorted by MOS has been created for reference.

| | | |
|--|---------|---------|
| ○ First Vehicle Delivery | 07OCT10 | 20NOV11 |
| ○ Vehicle/System Training (Initial Staff) | 02SEP11 | 18FEB12 |
| ○ Testing and Commissioning (First Vehicles) | 19FEB12 | 16AUG12 |
| ○ Open Waipahu/Leeward Section | 24DEC12 | |
| ○ MSF Contract Completion | 07MAY14 | |
| ○ Open East Kapolei to Pearl Highlands Section | 21JUL14 | |
| ○ Remaining Vehicle Deliveries | 24APR13 | 24MAR15 |
| ○ Open Kamehameha Section | 21JAN17 | |
| ○ Open Airport Section | 22OCT17 | |
| ○ Open to Ala Moana Center | 04MAR19 | |

The PMOC notes that the Kamehameha and Airport Segment opening dates are within nine months of each other and could possibly be combined into a single segment.

4.1.14. Maintenance and Storage Facilities (MSF) and Operations Control Center (OCC)

- The schedule depicts MSF completion in May 2014, and the start of service on the Waipahu/Leeward segment in December 2012. The grantee's planning assumptions in terms of operations/ maintenance staff training and providing service to the line between December 2012 and May 2014 need to be clarified.
- There are no activities for the design/installation of the OCC. The schedule requires clarification regarding the location of the OCC and completion information. The PMOC notes that the OCC facility has to be complete (with tested and fully functional controls, computers, and equipment) prior to the Waipahu/Leeward segment in December 2012.
- The PMOC notes that extensive coordination work will be required with HEC and utility companies.

4.1.15. Vehicles

- The 13-month duration for the First Vehicle Delivery for the Waipahu/Leeward alignment appears aggressive. The planning assumptions with regard to where the first vehicle will be assembled, tested, and stored require clarification.
- The vehicle engineering duration is approximately 10 months, being completed in May 2011; and the first vehicle delivery is in November 2011. This timeline requires clarification, especially with regard to where the vehicles will be stored and how the vehicles will be maintained before operations commence.

4.1.16. Operations and Maintenance

- There is not enough information regarding the grantee's planning assumptions for operations and maintenance. The PMOC notes that, since the grantee is a new transit agency, emphasis should be focused on the hiring and training of operations and maintenance (O&M) staff before the first segment goes into operation in December 2012.

5. Conclusion

Booz Allen, as a PMOC under contract with the FTA and its subconsultant, KKCS, reviewed and assessed the MPS for the HHCTC Project submitted by the City as of June 2, 2009. The June 2, 2009 MPS reflects the change to the MOS from the Salt Lake alignment option to the Airport alignment option. The MPS also reflects changes in the delivery of the project.

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- Staffing – Operations and Maintenance staff training is at risk given that MSF completion is not consistent with Waipahu/Leeward Segment service requirements.