SUBJECT: Consider Receiving a Report on the Potential Use of Dual Door Buses for the Bus Rapid Transit (BRT) Project

RECOMMENDED ACTION:

☒ Information Only ☐ Briefing Item ☐ Recommended Motion

Consider Receiving Report on the Potential Use of Double-Sided Buses for BRT, Including How Much Parking is Saved and the Eugene, Oregon and Cleveland, Ohio experiences

Fiscal Impact:
Not at this time.

Background/Discussion:
Dual door buses have the potential to lower infrastructure-related capital costs and parking impacts of Bus Rapid Transit systems. Dual Door buses have doors on both sides permitting passenger access/egress from either side. Additionally, these vehicles provide for the potential to reduce impacts on both parking loss and traffic compared to standard right-side buses.

In January 2010, the Board supported a funding application for the Federal Transit Administration's Urban Circulator program to be used for the purchase of dual sided door buses for use on the BRT project. Subsequently, this issue was presented and discussed with the BRT Policy Steering Committee (PSC) in February, 2010. Attachment A is the staff memo presented to the PSC and providing staff's then-understanding of the decision-making process and how dual door buses would be studied. At the time, the PSC showed great interest in the exploration of use of these buses due to the potential reduced impacts to parking loss along the corridor and the preservation of existing medians in the Elmwood and Fruitvale Districts of Oakland.
Attachment B is a memorandum developed by the District's environmental consultant, Cambridge Systematics, that provides further detail about elements associated with dual door buses that include:

- Pros and Cons of this vehicle type
- Implications of:
  - Design
  - Vehicle-Type
  - Operations
  - Parking
  - Cost

The overview by Cambridge Systematics is intended to provide general information until the issue can be studied with more rigor and should not be looked at as a definitive document. Further detailed review of all of the subject areas, including safety implications and other relevant issues will be completed as part of the Final Environmental Impacts Report/Statement (FEIR/S) process. As such, forecast parking loss savings are anecdotal until the final analysis work is complete.

As stated previously, the memorandum to the PSC (Attachment A) reflected staffs then-understanding of the process for study of dual door buses. Attachment C is recent correspondence between the District and Federal Transit Administration (FTA) that proposes a process for adequate study and disclosure of the potential use of dual door buses. FTA has subsequently approved the proposed process and the use of this style of bus will be considered as a part of the FEIR/S.

Staff has not yet received any information on the success of the grant application.

**Prior Relevant Board Actions/Policies:**

GM Memo 10-035: Consider The Adoption of Resolution 10-004 Authorizing the Interim General Manger or her Designee, to File an Application for Federal Transit Administration (FTA) Section 5309 Discretionary Grants for an Urban Circulator System for the East Bay Bus Rapid Transit Project (BRT), Committing the Necessary Local Match Funds for the Project, and Stating the Assurance of Alameda-Contra Costa Transit District To Complete The Project.

**Attachments:**

Attachment A: BRT Policy Steering Committee – Decision Making Regarding Dual Door Buses, February 22, 2010
Attachment B: Memo from Cambridge Systematics – East Bay Bus Rapid Transit Dual Door Buses, June 2010
Attachment C: Cambridge Systematics Memorandum – Disclosure of Possible Dual Door Bus Design
MEMORANDUM

TO: Policy Steering Committee
FROM: Tina Spencer, Long Range Planning Manager
SUBJECT: AGENDA ITEM 8: Request for Information – Decision Making Regarding Dual Door Buses

SUMMARY

This memorandum is in response to a request by the PSC for information regarding decision-making aspects relative to the proposal to seek funds for dual side door buses, and how such decisions may impact the BRT project.

Introduction

At the January 20, 2010 Policy Steering Committee, the issue of dual side door buses was raised as the result of a grant proposal from AC Transit to investigate the purchase of new and different vehicles for the BRT corridor. This memo is intended to provide an explanation of how decisions related to the BRT project—such as the consideration of dual door buses or other technological advancements—are integrated into the overall decision making that the cities will be involved with over the next few months and years.

BRT Decision Making

It is important to note that decisions made by the cities and Caltrans only begin with the selection of the Locally Preferred Alternative (LPA). Throughout the project development process to construction, the cities’ and Caltrans’ input is not only crucial, it is required as part of the federal process. To help explain the anticipated city and Caltrans decision points, AC Transit has developed a graphic depiction that explores the types of review and decision-making by BRT development phase (Attachment A).

Below is a summary, by phase of the major decision points, recognizing that the city-sponsored process may be slightly different from city to city; and recognizing that actions involving Caltrans may be slightly different than the cities, due to the federal requirements for participation.

FEIS/FEIR

As stated earlier, city and Caltrans input and decision making does not end with the selection of the LPA; it is only the beginning of the joint decision-making process between AC Transit and its local jurisdictions.

The major action after the selection of the LPA will be the development and adoption of a Memorandum of Understanding (MOU). In some cases, the cities may want to have a “master MOU” for the project to ensure that all related negotiated items are captured in one master document. This approach was taken with the “Smart Corridor” project that included cities along...
the San Pablo, Telegraph, International and E.14th Street corridors. The MOU for the BRT project should lay out the following:

- Selection of the project for the Record of Decision (ROD) in order for the project to proceed into Preliminary Engineering
- Roles and Responsibilities of the Cities/Caltrans and AC Transit relative to the further development of the BRT project

**Design (Preliminary Engineering and Final Design):**

Because the Design Phase includes both Preliminary Engineering (P.E.) and Final Design (F.D.), there are a number of very important decision points that cities will be making throughout the process. Most notably, this phase will include Design Review and Concurrence of station location and streetscape features. Also during this phase, the cities and Caltrans will be negotiating and adopting a “Joint Use Agreement” that identifies items such as: how the roadway and stations will be maintained; how the investments will be recapitalized in the long range plan; or other functional areas that need agreement between the parties. Additionally, during F.D., cities will be reviewing and concurring on construction phasing plans and more refined design features of the stations and streetscape.

However, early in P.E. there is a need for consideration of Technological Innovations that could improve the BRT project or increase the District’s ability to mitigate impacts. The timing of these decisions is dependent on the timing and availability of funding, project schedule, current information about and readiness of available technologies. The approach in the environmental evaluation has always been to use conservative assumptions in the technology area so that impacts are not underestimated and benefits are not overestimated.

These Technological Innovations include:

- Buses with doors on both sides;
- Alternative propulsion such as hybrids or non-petroleum-fueled vehicles
- Electronic guidance

Each of these elements could improve the project by reducing costs, reducing parking and traffic impacts and improving emissions. In all these instances, however, there are circumstances that make it impossible to evaluate these technologies in the EIS/R. Because of their potential benefits, it is important to allow for these technologies to be evaluated or implemented at the appropriate time in the decision-making process.

**Dual Side Buses**

Dual side door buses and alternative propulsion both refer to characteristics of the vehicle. Dual side door buses have the potential to reduce BRT infrastructure costs and reduce parking impacts. Hybrid or alternative fuel vehicles have the potential to reduce air pollution and gases that contribute to climate change. Because of the constraints of Federal Small Starts funding, the BRT was designed to use existing vehicles and then transition to a new fleet as current buses are retired. This allows use of available funding for the infrastructure, and replacement of buses using conventional sources. However, a recent announcement of unallocated Bus Discretionary funds raised the possibility of purchasing buses with doors on both sides. These buses may also be powered with hybrid drives. If the District is successful in its application for these funds (unknown at present), the BRT design could be modified to utilize these vehicles. Because the more impactful project would already have been environmentally cleared, a late improvement like this could be incorporated into the project during the P.E. phase. This
decision will likely be made after a ROD has been issued in the Fall 2010. Currently, staff cannot conclude that the buses would be available and that the benefits could be accounted for in the FEIS.

**Electronic Guidance**
The District has faced a similar situation regarding the use of electronically guided buses. There are two electronic guidance technologies (GPS & magnets) currently being evaluated by AC Transit in cooperation with UC Berkeley Partners for Advanced Transit & Highways, Caltrans, Lane County Transit and several private companies. A real-world test of the technology was conducted in 2008 along East 14th Street in San Leandro. AC Transit intends to test the technology in revenue service in 2010-2011. This technology promises to allow narrower bus lanes, potentially freeing up road space to accommodate traffic, bike lanes, wider sidewalks or parking. It could also provide a smoother, more rail-like ride for passengers and increase safety. However, there are no firms that are offering market-ready products that use this technology. Consequently, staff cannot conclude that the guidance technology would be available and that the benefits could be accounted for in the FEIS. Other guidance technologies, such as those in used in Cleveland and other cities, will need to be discussed during the early P.E. phase.

**Construction:**
By the time the project reaches the construction phase, many of the decisions regarding the project will be negotiated and agreed upon. However, there still is an important role for the cities: on-going construction consultation. During this phase, construction permits are issued for improvements based on the construction phasing plan. Additionally, there will be consultation with the cities and Caltrans on minor issues and project features that arise during construction.
Memorandum

TO: Tina Spencer, Cory LaVigne, Jim Cunradi, AC Transit
FROM: Andrew Tang
DATE: 17 June 2010
RE: East Bay Bus Rapid Transit

Dual-Door Buses

The East Bay Bus Rapid Transit (BRT) project as currently designed assumes the use of buses with passenger entry and exit doors only on the right side of the vehicle. This memorandum describes the implications of modifying the design to use buses with doors on both sides of the vehicle, as is currently done in Cleveland, Ohio (HealthLine BRT) and in Eugene, Oregon (Emerald Express BRT). The Van Ness Avenue BRT currently under study by the San Francisco County Transportation Authority is also favoring a design with dual-door buses.

In summary, the use of dual-door buses has several advantages and disadvantages over right-door only buses. The primary advantages are:

- Roughly 100 fewer parking spaces displaced;
- Potential to place BRT stations on existing medians, preserving more of the existing median; and
- Construction cost lowered on the order of $10 million.

Primary disadvantages:

- Vehicle cost increased on the order of $4-11 million;
- Only dual-door buses could operate in the bus lanes;
- More complex to procure, operate and maintain fleet; and
- Might reduce effectiveness of transit signal priority (TSP), though this is minimized by BRT’s low dwell time variability and the use of newer “smart” TSP technology.

Design Implications

The most significant implication of dual-door buses on the design of the East Bay BRT project is allowing flexibility in the design and location of station platforms. With regular right-door only...
buses, BRT station platforms are generally located between the bus lane and the adjacent travel lane. This requires having two platforms at each BRT station, one for each direction of travel. The left figures in Figures 1 through 3 show the current split twin platform design at three locations on International Boulevard.

**Figure 1**  Right-Door Versus Dual-Door Station Design - International at High

**Figure 2**  Right-Door Versus Dual-Door Station Design - International at 66th
With dual-door buses, the BRT station platform could be located between the two opposing bus lanes, allowing a single platform to serve both directions of travel (see the right figures in Figures 1 through 3).

Having a single center platform has several advantages.

1. A single center platform costs less than two platforms, lowering the capital cost of the project. This topic is discussed further later in this memorandum.

2. Parking displacement is often required to accommodate BRT station platforms. As illustrated in Figures 1 and 3, having a single platform can in some cases result in less parking displacement than two platforms. This topic is discussed further later in this memorandum.

3. A single platform in the middle of the roadway could allow BRT platforms to be located on existing medians, for example in Fruitvale and in East Oakland. However, some tree removal would likely be needed in East Oakland to accommodate the station structures. Figure 3 shows how this could be done for the BRT station at International and 87th, where a center median is currently in existence.

We note that having dual-door buses allows use of the single center platform BRT station design where beneficial, but allows other BRT stations to retain the split twin platform design if that works better.

Another advantage of the single center platform is a wider “throat” between the center platform and sidewalk curbs. As shown in Figures 1 and 2, this eliminates the pinch point created by the split twin platform design, and provides for improved truck turning and the opportunity to pass stalled or double-parked vehicles.
The width of the platform under the single center platform design would be greater than with the split twin platform design. Split station platforms are typically 9 to 10' wide. For a single center platform, the platform would ideally be a minimum of 12' wide to accommodate the added passenger load and to include adequate width for additional station amenities (e.g., additional ticket vending machines, more seating, more security cameras, etc.), and tactile warning strips on both edges of the platform. In addition, clear spaces need to be provided on the platform at the locations of wheelchair boardings and alightings, and accessible routes maintained. With a center platform, these clear spaces and accessible routes would need to be on both sides of the platform, which results in a somewhat larger platform.

BRT station platforms would likely need to be somewhat higher to accommodate dual-door buses. Our current design for the East Bay BRT project assumes 13" high station platforms, or just high enough to allow level boarding with AC Transit's existing Van Hool buses. The dual-door buses used in Cleveland, Ohio and in Eugene, Oregon have a 15.1 to 15.8" door height above pavement. The cost to provide the additional 2.1 to 2.8" of platform height is not expected to be significant.

Vehicle Implications

A dual-door bus could generally accommodate fewer seats than a right-door only bus with a similar seating arrangement. However, the dual-door bus used by the Cleveland HealthLine BRT has 47 seats on-board, similar if not somewhat more than AC Transit's existing articulated Van Hool buses. The seating layout for the Cleveland bus is shown in Figure 5.

AC Transit is considering accommodating bicycles on-board BRT buses. This could be done on the Cleveland bus by replacing four seats near the rear door with a bicycle rack able to hold three bicycles. The replaced seats are identified as 7 and 8 in Figure 5. Bicycles would enter the bus through the rear doors.

To accommodate wheelchairs, buses would need one set of ADA-compliant doors on both sides of the bus. In Cleveland, wheelchairs enter the bus through the forward right door or the middle left door. In Eugene, they enter through the middle doors. In both Cleveland and Eugene, wheelchairs are accommodated near the front of the bus, using flip-up seats at locations 3 or 20 in Figure 5.

In order to have precision docking, buses would also require guidance equipment on both sides of the bus.
Operations Implications

AC Transit's operations and maintenance would be made more complex by the introduction of dual-door buses into its fleet. The dual-door buses could operate anywhere in the AC Transit system, both in the BRT bus lanes and elsewhere. While outside the bus lanes, only the right-side doors would be used. However, AC Transit's regular right-door only buses could not operate in those portions of the BRT bus lanes requiring left-side entry. Thus, only dual-door buses could be dispatched for the East Bay BRT service. This will require AC Transit to have a full fleet of 31 dual-door buses plus spares available on the opening day of the East Bay BRT system. AC Transit could not phase in BRT vehicles over time as would be possible with a system employing right-side door buses only.
Dispatching drivers may also be more complex because only those drivers trained on dual-door buses could operate them.

AC Transit would also need to determine whether its existing maintenance facilities could accommodate dual-door buses. If not, modifications or expansion of facilities would be needed.

There may also be implications regarding the effectiveness of transit signal priority (TSP) on bus operations. TSP is more effective with stations located on the far side of signalized intersections. This is because it is easier to predict when the bus will "need TSP assistance" if the bus travels through the intersection before stopping at the station. Thus, with a single center platform, TSP effectiveness is reduced in one of the two directions.

The diminishment in near side TSP effectiveness can be reduced by two factors:

1. Lower dwell time variability with BRT than with 1R. TSP can be effective with near side stops if dwell time variability is minimized. Because dwell time variability for the 1R is relatively high, near side TSP is ineffective. However, because BRT minimizes dwell time variability with proof-of-payment ticketing and level boarding, near side TSP can be effective, though still not as effective as with far side stations.

2. Newer TSP technology. Existing Opticom TSP is a "dumb" infrared emitter-based bus detection system letting traffic signals know the bus is within approximately X feet of the intersection. Newer TSP systems employ GPS with "smart" programming, providing more accurate and situation dependent information to traffic signals. These features would increase near side TSP effectiveness, though still not to the level of far side effectiveness.

Parking Implications

As described earlier, the use of dual-door buses allows the possibility of using single center platform BRT stations, which in turn can result in a less parking displacement to accommodate stations. More detailed design work is needed to properly understand the effect on parking. However, we estimate that parking displacement in Oakland and San Leandro caused by the East Bay BRT project could be reduced from 872 with regular right-door only buses to approximately 781 with dual-door buses, or 91 fewer spaces displaced. Table 1 shows estimates by corridor segment. Over half of the reduction in parking displacement is in East Oakland, south of 40th.
Table 1  
Right-Door Versus Dual-Door Design Parking Displacement (Oakland and San Leandro)

<table>
<thead>
<tr>
<th></th>
<th>Existing Spaces</th>
<th>Displaced (Right-Door Design)</th>
<th>Displaced (Dual-Door Design)</th>
<th>Reduction in Parking Displacement</th>
</tr>
</thead>
<tbody>
<tr>
<td>Oakland - Telegraph¹</td>
<td>687</td>
<td>374</td>
<td>363</td>
<td>11</td>
</tr>
<tr>
<td>Oakland – International (North of 40ᵗʰ)¹,²</td>
<td>848</td>
<td>192</td>
<td>176</td>
<td>16</td>
</tr>
<tr>
<td>Oakland – International (South of 40ᵗʰ)¹</td>
<td>866</td>
<td>285</td>
<td>232</td>
<td>53</td>
</tr>
<tr>
<td>San Leandro – East 14ᵗʰ St (North of Davis)³</td>
<td>146</td>
<td>21</td>
<td>10</td>
<td>11</td>
</tr>
<tr>
<td>TOTAL</td>
<td>2,547</td>
<td>872</td>
<td>781</td>
<td>91</td>
</tr>
</tbody>
</table>

Cost Implications

Dual-door buses are generally more expensive than equivalent right-door only buses. There is also greater variation in the prices for dual-door buses than for right-door only buses. The cost of a diesel-hybrid articulated dual-door bus similar to those used in Cleveland and Eugene is roughly $0.85-1.2 million. The cost of a comparable diesel-hybrid right-door only bus is $0.75-0.90 million, or roughly $100-300 thousand less per bus. The East Bay BRT requires 31 buses to operate, or 36 with spares. Thus, the total incremental vehicle cost is approximately $3.6-11 million.

As described earlier, the East Bay BRT project would require fewer station platforms if dual-door buses were used. Further engineering work is needed to develop a proper estimate for the number of platforms needed. However, we roughly estimate that 29 fewer station platforms would be required. Assuming the cost per station platform is $0.5 million, but that the wider center platforms are 20 percent more expensive than the two platform design because of the increased size of platform, canopies and number of seats required, the total savings to the project would be on the order of $10 million. Additional cost savings would result from the reduced maintenance associated with fewer platforms, ticket vending machines, and other platform amenities.

¹ Existing spaces and displaced spaces with right-door bus design based Kimley-Horn parking data, May 2010.
² Includes East 12ᵗʰ Street between 1ˢᵗ Avenue and 14ᵗʰ Avenue.
³ Existing spaces and displaced spaces with right-door bus design based on designs presented during City of San Leandro public meetings, October 2009.
Memorandum

TO: Dwayne Weeks, Ray Sukys, FTA
FROM: Jim Cunradi, AC Transit
DATE: April 7, 2010
RE: AC Transit East Bay BRT
   Disclosure of Possible Dual Door Bus Design

AC Transit has developed a proposed plan for providing adequate public disclosure for a possible dual door bus design for the East Bay Bus Rapid Transit (BRT) project. This plan was developed in response to guidance from the Federal Transit Administration (FTA) regarding adequate disclosure of design changes. AC Transit is seeking FTA’s comments on the adequacy of the proposed plan.

Background

AC Transit’s current design for the East Bay BRT project is based on the use of buses with right side doors only. This design has been developed collaboratively with the stakeholder cities of Berkeley, Oakland, and San Leandro and has been refined several times based on comments received from city staff, policymakers, and the public. The City Councils of Berkeley, Oakland and San Leandro are scheduled to take actions later this month on the Locally Preferred Alternative (LPA) for the East Bay BRT project.

During the last month, City of Oakland staff have suggested the possibility of the East Bay BRT project considering the use of dual door buses in the project’s design to address specific concerns the City of Oakland has regarding the project’s effect on parking and existing medians. City of Oakland staff are willing, however, to await the results of the Final Environmental Impact Statement (FEIS) – both in terms of impact analysis and mitigation measures – before making a final determination on the need/use of dual door buses. AC Transit believes the City of Oakland’s suggestion has merit and is seriously considering this possible design element. AC Transit has also discussed the possibility of dual door buses with City of Berkeley and San Leandro staff. They are also interested in this possibility and are willing to await the release of the FEIS before making a final determination.

An important item to note is based on preliminary dual door bus investigations, AC Transit believes that the environmental impacts of a dual door bus design would be the same as or less than the impacts of the current right door bus design.
Proposed Disclosure Plan

In order to meet FTA’s desire to complete the FEIS stage of the East Bay BRT project as expediently as possible while also addressing the need to provide adequate disclosure of the possible dual door bus design, AC Transit proposes the following:

1. The cities would adopt the current right door bus design as their LPA. AC Transit in turn would adopt a LPA that reflects the current right door bus design.

2. The FEIS would be written with the right door bus design as the LPA, but would also disclose a possible dual door bus variant. The FEIS would describe the dual door bus design, provide representative designs for a few selected representative locations, describe the likely effects on station platform locations, and disclose the likely effects on operations, cost, and environmental impacts.

3. Following public release of the FEIS, should AC Transit and the cities jointly determine that the dual door bus design is the most prudent alternative, AC Transit and the cities could jointly decide to change the LPA to the dual bus design. This decision would be based on impacts and mitigation measures disclosed in the FEIS, comments received on the FEIS as well as the financial feasibility of the dual door bus design. Should this occur, AC Transit would seek a Record of Decision (ROD) based on the dual door bus design disclosed in the FEIS.

AC Transit believes this plan would allow the East Bay BRT FEIS to be completed in an expedient fashion while providing disclosure of a possible dual door bus design to the public. Because the dual door bus design would have the same or lesser environmental impacts than the right door bus design, AC Transit would seek concurrence from the FTA that a Supplemental FEIS would not be needed should the design be changed to dual door buses following release of the FEIS.