



**December 14, 2017**

**To:** Transit Committee

**From:** Darrell Johnson, Chief Executive Officer

**Subject:** Central Harbor Boulevard Transit Corridor Study

### **Overview**

In August 2015, the Orange County Transportation Authority initiated the Central Harbor Boulevard Transit Corridor Study to analyze transit options in the Harbor Boulevard corridor. The study scope was amended in October 2016 to also evaluate transit connections between the Anaheim Resort and the Anaheim Regional Transportation Intermodal Center. In February 2017, 12 draft conceptual alternatives were presented for review and comment, and this update presents the results of the conceptual alternatives analysis.

### **Recommendations**

- A. Direct staff to offer presentations of the study results to the city councils in the study area, and return to the Board of Directors with a status report when completed.
- B. Direct staff to continue to work with technical staff from each of the corridor cities and the California Department of Transportation to identify key issues that would need to be addressed during any subsequent study efforts.

### **Background**

Harbor Boulevard is one of the Orange County Transportation Authority's (OCTA) most productive transit corridors with eight percent of the countywide daily bus boardings. While OCTA operates a high frequency of service in the study area, much more could be done to improve the quality, convenience, and visibility of the service for residents, employees, and tourists alike. The study area is characterized by some of the highest population and employment densities in the county. Moreover, the Anaheim Resort is home to the county's largest employer (Disneyland), and is an international tourist destination that attracts 27 million annual visitors. Despite the large number of

daily visitors, existing OCTA bus routes serve a relatively small number of these trips. In addition, the Anaheim Transit Network system shuttles visitors and some employees between parking structures, hotels, and major attractions in the Anaheim Resort area. OCTA currently provides high frequency Bravo! service in the corridor with high ridership. Increasing transit ridership further requires more transit capacity and better travel times.

The Central Harbor Boulevard Transit Corridor Study (Harbor Study) evaluates 12 conceptual transit alternatives that include a variety of alignment, mode, and feature options in order to identify the concepts that offer the most significant transportation benefits and also receive the widest community support. The draft alternatives were presented to the OCTA Board of Directors (Board) in February 2017. The modes evaluated include enhanced bus, bus rapid transit (BRT), streetcar, and rapid streetcar. These transit modes cover a range of implementation costs and ridership levels.

For example, bus and BRT options would provide operational flexibility and lower implementation costs, while the streetcar options would attract more riders due to improved quality and comfort. Two study objectives were to estimate the ridership for these modes within the study area, and to estimate the travel time improvements that could be achieved by various modes and features. The rapid streetcar and BRT options would operate in a dedicated transit lane for at least 50 percent of the alignment.

The project development team included representatives from OCTA, the California Department of Transportation, and technical staff from each of the corridor cities (Anaheim, Fullerton, Garden Grove, and Santa Ana). Over the past two years, the team analyzed the study corridor and identified mobility needs, established evaluation criteria, developed 12 conceptual alternatives, and conducted two rounds of outreach to solicit feedback from the public and stakeholders.

### ***Discussion***

The summary of evaluation results are presented in two parts: (1) the performance evaluation and (2) city and community input. An executive summary (Attachment A) and maps of the alignments (Attachment B) are included in the attachments.

For the performance evaluation, a set of 24 evaluation criteria (Attachment C) was used to determine how each alternative performed in terms of ridership, cost-effectiveness, travel-time improvement, and ability to reduce vehicle miles traveled (VMT). The evaluation criteria was based on well defined and accepted planning practice. The performance metrics also indicated how well the conceptual alternatives were supported by local land uses, as well as how many physical constraints or land-use impacts there might be.

The planning-level benefits and impacts of the alternatives were evaluated for a future year (2035) and compared to a 2035 baseline scenario in which no capital or service improvements were made to the corridor. Any benefits that were measured above and beyond the baseline are considered the net benefits that result from project implementation. Planning-level cost estimates were developed for each alternative. These included both the capital costs needed to implement the project and the estimated increase to annual operating and maintenance costs. The cost estimates were used to evaluate cost-effectiveness for each alternative.

Below are the total scores for each conceptual alternative, ranked from highest to lowest.

Overall Performance Scores Based on 24 Evaluation Criteria

| Alternative                                       | Length (Miles) | Performance Score |
|---------------------------------------------------|----------------|-------------------|
| H3: Harbor Rapid Streetcar <sup>1</sup>           | 8.0            | 74                |
| H2: Harbor Long Streetcar                         | 8.0            | 73                |
| H5: Harbor Bus Rapid Transit <sup>1*</sup>        | 12.0           | 73                |
| L1: Anaheim-Lemon Streetcar                       | 8.5            | 68                |
| L4: Anaheim-Lemon Bus Rapid Transit <sup>1*</sup> | 12.5           | 66                |
| L2: Anaheim-Lemon Rapid Streetcar <sup>1</sup>    | 8.5            | 65                |
| K1: Harbor-Katella Streetcar                      | 5.9            | 65                |
| H1: Harbor Short Streetcar                        | 3.4            | 64                |
| K2: Katella + Anaheim-Lemon Enhanced Bus          | 10.5           | 57                |
| L3: Anaheim-Lemon Enhanced Bus*                   | 12.5           | 56                |
| K3: Katella + Harbor Hybrid                       | 10.5           | 56                |
| H4: Harbor Enhanced Bus*                          | 12.0           | 55                |

<sup>1</sup> Operates in a dedicated transit lane for approximately 50 percent of the alignment.

\* Extends to MacArthur Boulevard, consistent with existing Bravo! Route 543 service area.

The three highest scoring projects all included Harbor Boulevard alignments, which provided direct connections between Harbor/Westminster (future terminus of the OC Streetcar), and the Fullerton Transportation Center (FTC). The next three highest scoring projects included Anaheim-Lemon alignments, which also made direct connections between Harbor/Westminster and the FTC. Ability to attract ridership was the most important factor in determining how well an alternative performed because ridership was considered in multiple criteria.

### Ridership

In terms of ridership, the top performing alternatives included rapid streetcar, streetcar, and BRT alternatives that connected Harbor/Westminster and the FTC via Harbor Boulevard or Anaheim-Lemon. Ridership for the top performing alternatives is listed below.

#### Alternatives with Highest Estimated Ridership (See Attachment D for a complete list)

| Alternative                                       | Average Weekday Boardings | Per-Mile Boardings |
|---------------------------------------------------|---------------------------|--------------------|
| H3: Harbor Rapid Streetcar <sup>1</sup>           | 15,200                    | 1,900              |
| H2: Harbor Long Streetcar                         | 14,700                    | 1,800              |
| H5: Harbor Bus Rapid Transit <sup>1*</sup>        | 14,600                    | 1,200              |
| L2: Anaheim-Lemon Rapid Streetcar <sup>1</sup>    | 12,500                    | 1,500              |
| L4: Anaheim-Lemon Bus Rapid Transit <sup>1*</sup> | 12,000                    | 1,000              |
| L1: Anaheim-Lemon Streetcar                       | 11,300                    | 1,300              |

<sup>1</sup> Operates in a dedicated transit lane for approximately 50 percent of the alignment.

\* Extends to MacArthur Boulevard, consistent with existing Bravo! Route 543 service area.

The Harbor-Katella streetcar alignment, which connected Harbor/Westminster with the Anaheim Regional Transportation Intermodal Center via Disney Way, had an estimated 5,500 average weekday boardings, approximately 900 boardings per mile of service. This was comparatively lower than the other streetcar projects that operated on Harbor Boulevard or Anaheim-Lemon and connected to the FTC. The Ridership Summary Table (Attachment D) provides the ridership estimates for all alternatives.

Comparing the per-mile boardings by mode and alignment, the Harbor Boulevard alignments had the highest estimated per-mile boardings for both the bus rapid transit and the streetcar modes. The Anaheim-Lemon alignments had the next highest per-mile boardings for these modes. The enhanced bus alternatives averaged between 430 and 470 boardings per-mile.

#### Per-Mile Boardings by Mode and Alignment

| Alignment         | Enhanced Bus | BRT   | Streetcar | Rapid Streetcar |
|-------------------|--------------|-------|-----------|-----------------|
| Harbor to FTC     | 430          | 1,200 | 1,800     | 1,900           |
| Anaheim-Lemon     | 430          | 1,000 | 1,300     | 1,500           |
| Harbor to Katella | 470          | n/a   | 900       | n/a             |

n/a – not applicable

**Travel Time Improvement:**

Travel time improvement was measured two ways: by estimating average decrease in travel time for trips taken between common destinations, and by estimating the improvement to the 2035 average operating speeds. For the best performing alternatives, the average decrease in travel time for trips to/from common destinations ranged from nine to 17 percent, compared to the 2035 baseline scenario:

- H5 Harbor BRT (16.7 percent),
- H3 Harbor Rapid Streetcar (15.1 percent),
- L4 Anaheim-Lemon BRT (12.8 percent),
- H4 Harbor Enhanced Bus (12.0 percent),
- H2 Harbor Long Streetcar (8.9 percent),
- L2 Anaheim-Lemon Rapid Streetcar (8.8 percent).

The other travel time improvement measure estimated the percentage improvement in 2035 average operating speeds (in miles per hour {mph}) compared to the 2035 no-build scenario. Below are the estimated changes in average operating speeds for the four long Harbor alternatives. Although the Harbor alignments performed slightly better than other alignments, the average operating speeds are indicative of those for each mode:

- H4 Harbor enhanced bus: improved from 14.9 to 16.4 mph (ten percent),
- H5 Harbor BRT: improved from 14.9 to 17.5 mph (17 percent),
- H2 Harbor long streetcar: improved from 10.4 to 13.2 mph (27 percent),
- H3 Harbor rapid streetcar: improved from 10.4 to 14.2 mph (36 percent).

While the change in mph may seem nominal at first glance, improvement in average operating speeds has significant implications for transit operating costs. A ten percent improvement in average operating speeds, for example, represents a ten percent decrease in the costs of operating that service.

**Cost-Effectiveness**

Cost-effectiveness was evaluated using four measures: (1) annual project cost per annual linked trip on the project, (2) annual project cost per new linked trip on the system, (3) farebox recovery ratio, and (4) financial feasibility. The Cost and Cost-Effectiveness Table (Attachment E) includes the cost information for each alternative, as well as the annual cost per annual linked trip on the project.

The BRT alternatives (which operated on Harbor and Anaheim-Lemon) achieved the highest overall cost-effectiveness ratings. They had the best combined cost-ratios for “cost per annual linked trips on project” and “cost per annual new system trips.” They also ranked among the top in farebox recovery and received high financial feasibility scores. The Harbor Rapid Streetcar, Anaheim-Lemon Enhanced Bus, and Katella + Anaheim-Lemon Enhanced Bus scored the next best for overall cost-effectiveness.

The Harbor BRT and Harbor Rapid Streetcar tied for the highest farebox recovery ratio (31 percent); followed by the Harbor Streetcar (30 percent), and the Anaheim-Lemon BRT (29 percent).

### Land Use

For the land-use evaluation, population and employment densities, transit supportive land-use plans and zoning, percentage of affordable housing, economic development potential, reduced daily VMT, and physical constraints were all analyzed. While population and employment densities were fairly similar for all alternatives, the measures with the most significant differences were the reduced daily VMT and the physical constraints. The top performing alternatives for this measure reduced daily VMT by an estimated 102,000 to 104,000, compared to the No-Build scenario. While the short streetcar alignments (H1 and K1) generated much smaller daily VMT reductions due to the shorter alignments, they registered the best scores for physical constraints and potential land-use impacts. At the other end of the spectrum, the long streetcar alternatives on Harbor and Anaheim-Lemon had the highest estimated daily VMT reductions, but also encountered the most physical constraints. While most of the alternatives received similar scores overall, the Harbor BRT and Harbor Rapid Streetcar scored about a point higher than the rest of the field in this category.

### Performance Evaluation Conclusion

Based on the performance evaluation there are five conceptual alternatives that have the potential to perform well, provide significant ridership benefits, and rate competitively against the Federal Transit Administration New Starts evaluation criteria. For the purposes of any further evaluation and analysis it is recommended that focus be narrowed to the following five alternatives:

- H3 Harbor Rapid Streetcar: from Harbor/Westminster to FTC,
- H2 Harbor Long Streetcar: from Harbor/Westminster to FTC,
- H5 Harbor BRT: from Harbor/MacArthur to FTC,
- L1 Anaheim-Lemon Streetcar: from Harbor/Westminster to FTC via Anaheim-Lemon,
- L4 Anaheim-Lemon BRT: from Harbor/MacArthur to FTC via Anaheim-Lemon.

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City Input and Key Issues

Some of the key issues identified by the cities that would require additional analysis in the next study phase or would need to be addressed prior to more study include:

- Dedicated transit lanes - a thorough analysis of the benefits and impacts of dedicated transit lanes, as well as identification of performance measures for evaluating appropriate locations, is needed before city staff can consider these.
- Master Plan of Arterials and Highways (MPAH) Guidelines - the path and process for amending the MPAH plan to allow for a change in transit corridor status will need to be outlined and made available to city staff considering any changes to existing traffic operations.
- Center-running alignments with center stations - there is little support among the jurisdictions for center-running alignments with center stations due to the likelihood that this configuration would require additional right-of-way and reconfiguration of left-turn pockets to accommodate the stations.
- Harbor Boulevard constraints - a portion of Harbor Boulevard in northern Anaheim has not been built out to the full capacity and is limited to four traffic lanes in width. This is a potential physical constraint which must be considered with various improvement strategies. Because of the close proximity of the residences, this is also an area of increased community sensitivity sites must also be taken into consideration. For these reasons, further evaluation of both the Harbor and Anaheim-Lemon alignments is recommended.
- Underlying changes to bus service south of Westminster Avenue - with the implementation of some streetcar and bus alternatives a corresponding reduction in bus service frequencies on Harbor Boulevard south of Westminster Avenue is assumed. Staff from the City of Santa Ana (City) have indicated that this would be an issue of concern for the City.
- Evaluation of the streetcar mode option - the Anaheim City Council adopted a resolution in January 2017 stating opposition to a streetcar system in the City of Anaheim. Among the reasons stated in the resolution were concerns over the expense of a streetcar system, disruptions to traffic and potential added congestion, and lack of flexibility of the system. The City of Anaheim accounts for a considerable part of the project study area, and all 12 of the study alternatives travel into or through the city.

An important next step will be identifying the specific strategies and concepts that each city council is open to evaluating. The final round of outreach will take place after the January 2018 Board update and provide another opportunity to receive input from each city.

### Community Input

The Public Outreach Summary Report (Attachment F {full report with appendices is available at [www.octa.net/harbordocuments](http://www.octa.net/harbordocuments)}) provides a summary of the public and stakeholder input that was received during the course of the study via four public open houses, two stakeholder working group meetings, online surveys, and on-board surveys. Some of the key points of the online survey were:

- The great majority of survey respondents (92 percent) supported making improvements to transit in the Harbor corridor.
- Rapid streetcar was the preferred mode option with 24 percent support, followed by enhanced bus (20 percent), BRT (17 percent), and streetcar (13 percent).
- Respondents were evenly split in their support of bus and streetcar mode options, with 37 percent supporting the enhanced bus and BRT options and 37 percent supporting the streetcar or rapid streetcar options.
- More respondents chose mode options that included a dedicated transit lane (41 percent).
- The most popular alignment choice was Harbor Boulevard (37 percent), followed by the Anaheim-Lemon alignment (20 percent), and the Katella + Anaheim-Lemon alignment (19 percent).

### Next Steps

The next steps include offering council presentations to each of the corridor cities to receive comments. The team will continue to work with the corridor cities' staff to identify key issues to be addressed in the next study phase. The Harbor Study reports will be made available on the study webpage for public review and comment. Input received from the cities, public, and stakeholders will be incorporated into the final report and help inform next steps. The feedback received will be reported back to the Board.

The top ranked alternatives have the potential to provide significant transportation benefits and compete well in state and federal funding programs. As the county transit agency, OCTA cannot move alternatives forward without support from the cities. With Board approval, OCTA staff will be presenting the study results to the local city councils and the stakeholder working group for feedback. If sufficient support develops around a few alternatives, OCTA could recommend those be advanced to the next step of the process, which would be a detailed environmental review.

However, if consensus is not developed, OCTA may need to spend additional time discussing project concerns with cities and refining alternatives to develop sufficient support. OCTA may also consider making lower cost, lower impact transit improvements in the study area which are more under OCTA's direct control.

### ***Summary***

The project team has completed the conceptual alternatives evaluation for the Central Harbor Boulevard Transit Corridor Study. This report provides a summary of the performance evaluation results of the 12 draft conceptual alternatives and also provides a summary of the city and community input received to date. A final round of outreach is proposed, to present the evaluation results to each of the cities in the study area and to receive comments.

### ***Attachments***

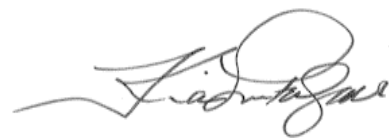
- A. Central Harbor Boulevard Transit Corridor Study, Executive Summary, December 2017
- B. Maps of the Alignments
- C. Central Harbor Boulevard Transit Corridor Study, Evaluation Criteria
- D. Ridership Summary Table
- E. Cost and Cost-Effectiveness Table
- F. Orange County Transportation Authority, Central Harbor Boulevard Transit Corridor Study, Public Outreach Summary Report

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