

Metro

*Los Angeles County Metropolitan Transportation Authority
One Gateway Plaza
3rd Floor Board Room*



Metro

Agenda - Final

Thursday, October 20, 2016

10:15 AM

**One Gateway Plaza, Los Angeles, CA 90012,
3rd Floor, Metro Board Room**

System Safety, Security and Operations Committee

Michael Antonovich, Chair

Mike Bonin, Vice Chair

Diane DuBois

Paul Krekorian

Mark Ridley-Thomas

Carrie Bowen, non-voting member

Phillip A. Washington, Chief Executive Officer

METROPOLITAN TRANSPORTATION AUTHORITY BOARD RULES (ALSO APPLIES TO BOARD COMMITTEES)

PUBLIC INPUT

A member of the public may address the Board on agenda items, before or during the Board or Committee's consideration of the item for one (1) minute per item, or at the discretion of the Chair. A request to address the Board should be submitted in person at the meeting to the Board Secretary. Individuals requesting to speak on more than three (3) agenda items will be allowed to speak up to a maximum of three (3) minutes per meeting. For individuals requiring translation service, time allowed will be doubled.

The public may also address the Board on non-agenda items within the subject matter jurisdiction of the Board during the public comment period, which will be held at the beginning and/or end of each meeting. Each person will be allowed to speak for up to three (3) minutes per meeting and may speak no more than once during the Public Comment period. Speakers will be called according to the order in which the speaker request forms are received. Elected officials, not their staff or deputies, may be called out of order and prior to the Board's consideration of the relevant item.

In accordance with State Law (Brown Act), all matters to be acted on by the MTA Board must be posted at least 72 hours prior to the Board meeting. In case of emergency, or when a subject matter arises subsequent to the posting of the agenda, upon making certain findings, the Board may act on an item that is not on the posted agenda.

CONDUCT IN THE BOARD ROOM - The following rules pertain to conduct at Metropolitan Transportation Authority meetings:

REMOVAL FROM THE BOARD ROOM The Chair shall order removed from the Board Room any person who commits the following acts with respect to any meeting of the MTA Board:

- a. Disorderly behavior toward the Board or any member of the staff thereof, tending to interrupt the due and orderly course of said meeting.
- b. A breach of the peace, boisterous conduct or violent disturbance, tending to interrupt the due and orderly course of said meeting.
- c. Disobedience of any lawful order of the Chair, which shall include an order to be seated or to refrain from addressing the Board; and
- d. Any other unlawful interference with the due and orderly course of said meeting.

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Tiếng Việt

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NOTE: ACTION MAY BE TAKEN ON ANY ITEM IDENTIFIED ON THE AGENDA

CALL TO ORDER

ROLL CALL

APPROVE Consent Calendar Items: 21, 22, 23 and 42.

Consent Calendar items are approved by one motion unless held by a Director for discussion and/or separate action.

CONSENT CALENDAR

21. APPROVE nominees for **membership on Metro's Service Councils.** [2016-0659](#)
Attachments: [Attachment A - Listing of Qualifications 10-2016](#)
[Attachment B - Nomination Letters 10-2016](#)
22. RECEIVE AND FILE informational report in response to Board Motion on **Line 501 to present proposed marketing plan, improved span of service and a temporary reduction in fare.** [2016-0742](#)
Attachments: [Attachment A - Amendment to Item 30](#)
[Attachment B - Line 501 Marketing Campaign](#)
23. RECEIVE AND FILE **monthly update on Transit Policing performance.** [2016-0790](#)
Attachments: [Attachment A - Transit Policing Report August 2016](#)
[Attachment B - Matrix of Bus Operator Assault Suspects](#)
42. RECEIVE AND FILE status report on Metro's Zero Emission Bus Plans. [2016-0778](#)
Attachments: [ATTACHMENT A BOARD MOTION APRIL 28, 2016](#)
[ATTACHMENT B - RESPONSES TO BOARD REQUEST FOR ZEB PLANS AP](#)
[ATTACHMENT C RAMBOLL ENVIRON REPORT SEPTEMBER 29 2016](#)
[ATTACHMENT D LIST OF TRANSIT OPERATORS RUNNING ZEBs](#)
[ATTACHMENT E IDENTIFIED ZEB SUPPLIERS](#)
[ATTACHMENT F NOISE LEVEL COMPARISON OF ZEB AND CONVENTION/](#)
[ATTACHMENT G METRO ROUTES MOST SUITABLE TO ZE OPS](#)
[ATTACHMENT H SUMMARY OF ZEB FUNDING OPPORTUNITIES](#)

(ALSO ON EXECUTIVE MANAGEMENT COMMITTEE)

NON-CONSENT

24. **Operations Employees of the Month** [2016-0732](#)
25. **RECEIVE oral report on System Safety, Security and Operations, update on Metro Bus Buy.** [2016-0733](#)
26. **AUTHORIZE the Chief Executive Officer to execute Modification No. 5 for Contract No. OP31202523 with Goodyear Tire & Rubber Company to extend bus tire leasing and maintenance services for up to twelve (12) months, for the period covering December 1, 2016 through November 30, 2017, in an amount not to exceed \$7,951,670, increasing the total not to exceed contract amount from \$41,138,647 to \$49,090,317.** [2016-0448](#)
Attachments: [Attachment A - Procurement Summary](#)
[Attachment B - Contract Mod Log](#)
[Attachment C - DEOD Summary](#)
27. **AUTHORIZE the Chief Executive Officer to execute Modification No. 1 to Contract No. OP31203099 to exercise the two, one-year options, with Hazardous Technologies Inc., for liquid waste removal services, in the total amount of \$1,617,800 increasing the total contract value from \$2,434,400 to \$4,052,200 and extend the contract term from November 1, 2016 to October 31, 2018.** [2016-0628](#)
Attachments: [Attachment A - Procurement Summary](#)
[Attachment B - Contract Mod Log](#)
[Attachment C - DEOD Summary](#)
28. **ADOPT the findings of a Title VI Triennial Review of FTA required service standards that found no disparate impact in the attainment of service standards relative to minority and non-minority services operated by Metro. This review was conducted for Metro bus and rail service during the fourth quarter of fiscal year 2016:** [2016-0658](#)

A. Finding that the Metro bus system conforms to the adopted Bus Passenger Loading Standards and results in no disparate impact on minorities. The Rail Passenger Loading Standards cannot accurately be determined, due to the Metro Rail ridership data

- collection methodology. It relies on a limited number of staff counting the boarding and alighting passengers while riding a limited number of rail cars. (Attachment A); and
- B. Finding that the Metro bus system and rail system conform to the adopted Headway Standards and result in no disparate impact. (Attachment B); and
- C. Finding that while Metro bus lines are not in conformance with the adopted In-Service On-Time Performance Standards (ISOTP) of 80%, there was no disparate impact. The system wide average bus ISOTP was 73.0% on weekdays, 71.6% on Saturdays, and 76.8% on Sundays. The percentage of bus lines meeting this standard were 43.5% of weekday, 42.4% on Saturday and 54.8% during Sunday. All rail lines meet the standard of 90% for light rail and 95% for heavy rail. The assessment of the current findings are contained in (Attachment C); and
- D. Finding that Metro and its fixed route operating partners are in conformance and no disparate impact with the adopted System Accessibility Standard. (Attachment D); and
- E. Finding that Metro bus and rail service passenger facilities are in conformance and no disparate impact with the adopted Passenger Amenities Standards. (Attachment E); and
- F. Finding that the Metro bus system is in conformance and no disparate impact with adopted Vehicle Assignment Standards. Conformity of the Metro rail system was reviewed in early May 2016 and was impacted by the initial delivery of new light rail vehicles and the recent start of operation of the Metro Gold Line Foothill Extension. Only 15 of 235 new vehicles had been accepted at that time with most, of necessity, assigned to the Metro Gold Line. Metro rail system conformance should be reviewed at a later time after new vehicle deliveries are substantially complete. (Attachment F)

Attachments: [Attachment A - Passenger Loading Standards](#)
[Attachment B - Headway Standards](#)
[Attachment C - On-Time Performance Standards](#)
[Attachment D - Accessibility Standards](#)
[Attachment E - Passenger Amenities Standards](#)
[Attachment F - Vehicle Assignment Standards](#)

29. AUTHORIZE the Chief Executive Officer to award a firm fixed unit rate Contract No. OP5608900 for **tree trimming services throughout Metro bus and rail facilities**, excluding Metro Orange Line covered under a separate maintenance contract, with Great Scott Tree Service Inc., the lowest, responsive and responsible bidder, for a not-to-exceed amount of \$923,040 for the three-year base period inclusive of as-needed services, and \$299,930 for each of the two, one-year options, for a combined total of \$1,522,900, effective January 1, 2017 through December 31, 2021, subject to resolution of protest(s), if any. [2016-0721](#)
- Attachments: [Attachment A - Procurement Summary](#)
 [Attachment B - DEOD Summary](#)
30. AUTHORIZE the Chief Executive Officer to award a firm fixed unit rate Contract No. OP6092200 for the **Metro Red/Purple Line Tunnel Washing services** with Parkwood Landscape Maintenance Inc., the lowest, responsive and responsible bidder, for a not-to-exceed amount of \$2,541,217 for the five year period, effective December 1, 2016, subject to resolution of protest(s), if any. [2016-0728](#)
- Attachments: [Attachment A - Procurement Summary](#)
 [Attachment B - DEOD Summary](#)
31. AUTHORIZE the Chief Executive Officer to award a firm fixed unit rate Contract No. OP6201700 for **uniform rental services** with UniFirst Corporation, for a not-to-exceed amount of \$2,528,837.41 for the three-year base period and \$2,528,837.41 for the one, three year option, for a combined total of \$5,057,674.82 effective November 1, 2016 through October 31, 2022, subject to resolution of protest(s), if any. [2016-0729](#)
- Attachments: [Attachment A - Procurement Summary](#)
 [Attachment B - DEOD Summary](#)
32. AUTHORIZE the Chief Executive Officer to award and execute a five-year, firm fixed unit rate Contract No. **OP608960027253** to Axiom xCell Inc., **for services related to the processing, adjudication and collection of transit and parking citations** in an amount not-to-exceed \$1,586,533 effective January 1, 2017 through December 31, 2021, subject to resolution of protest(s), if any. [2016-0711](#)
- Attachments: [Attachment A - Procurement Summary](#)
 [Attachment B - DEOD Summary](#)

Adjournment

Consideration of items not on the posted agenda, including: items to be presented and (if requested) referred to staff; items to be placed on the agenda for action at a future meeting of the Committee or Board; and/or items requiring immediate action because of an emergency situation or where the need to take immediate action came to the attention of the Committee subsequent to the posting of the agenda.



Board Report

File #: 2016-0659, **File Type:** Appointment

Agenda Number: 21.

**SYSTEM SAFETY, SECURITY AND OPERATIONS COMMITTEE
OCTOBER 20, 2016**

SUBJECT: MEMBERSHIP ON METRO SERVICE COUNCILS

ACTION: APPROVE NOMINEES FOR APPOINTMENT TO METRO SERVICE COUNCILS

RECOMMENDATION

APPROVE nominees for **membership on Metro’s Service Councils.**

ISSUE

Each Metro Service Council is comprised of nine Representatives that serve a term of three years; terms are staggered so that the terms of three of each Council’s nine members expire annually on June 30. Incumbent Representatives can serve additional terms if re-nominated by the nominating authority and confirmed by the Metro Board.

DISCUSSION

Metro seeks to appoint Service Council members reflective of the demographics of each respective region. The 2010 Census demographics of each of the Service Council regions are as follows:

% Sector Total	Hispanic	White	Asian	Black	Other	Total Pop
SGV	50.0%	19.9%	24.9%	3.3%	2.0%	100.0%
SFV	41.0%	42.0%	10.7%	3.4%	2.9%	100.0%
South Bay	42.5%	23.8%	12.0%	18.3%	3.4%	100.0%
Westside/Central	43.5%	30.7%	13.0%	10.0%	2.8%	100.0%
Gateway Cities	63.9%	16.7%	8.5%	8.6%	2.3%	100.0%
Service Area Total	48.5%	26.8%	14.0%	8.2%	2.6%	100.0%

The individuals listed below have been nominated to serve by the Councils’ appointing authorities. If approved by the Board, these appointments will serve a three-year term or the remainder of the seat’s three-year term as indicated. A brief listing of qualifications for the new nominees is provided along with the nomination letters from the nominating authorities:

- A. Joseph Strapac, Gateway Cities Service Council, New Appointment/Re-Appointment
Nominated by: Gateway Cities Council of Governments
Term Ending: June 30, 2017

The demographic makeup of the Gateway Cities Service Council with the appointment of this nominee will consist of five (5) White members and four (4) Hispanic members as self-identified by the members in terms of racial/ethnic identity. The gender breakdown of the Council will be six (6) men and three (3) women.

- B. Carla Canales, San Fernando Valley Service Council, New Appointment
Nominated by: Third District Supervisor Sheila Kuehl
Term Ending: June 30, 2019

The demographic makeup of the San Fernando Valley Service Council with the appointment of this nominee will consist of three (3) White members, five (5) Hispanic members, and one (1) Asian member as self-identified by the members in terms of racial/ethnic identity. The gender breakdown of the Council will be seven (7) men and two (2) women.

- C. Alba M. Peña, Westside Central Service Council, New Appointment
Nominated by: Los Angeles Mayor Eric Garcetti
Term Ending: June 30, 2019

The demographic makeup of the Westside Central Service Council with the appointment of this nominee will consist of four (4) Hispanic members, three (3) White members, and two (2) Black members as self-identified by the members in terms of racial/ethnic identity. The gender breakdown of the Council will be six (6) men and three (3) women.

DETERMINATION OF SAFETY IMPACT

Maintaining the full complement of representatives on each Service Council to represent each service area is important. As each representative is to be a regular user of public transit, and each Council is composed of people from diverse areas and backgrounds, this enables each Council to better understand the needs of transit consumers including the need for safe operation of transit service and safe location of bus stops.

FINANCIAL IMPACT

There is no financial impact imparted by approving the recommended action.

ALTERNATIVES CONSIDERED

The alternative to approving this appointment would be for these nominees to not be approved for appointment. To do so would result in reduced effectiveness of the Service Council, as it would increase the difficulty of obtaining the quorum necessary to allow the Service Council to formulate and submit their recommendations to the Board. It would also result in the Service Council having less diverse representation of their service area.

NEXT STEPS

Staff will continue to monitor the major contributors to the quality of bus service from the customer's perspective, and share that information with the Service Councils for use in their work to plan, implement, and improve bus service in their areas and the customer experience using our bus service.

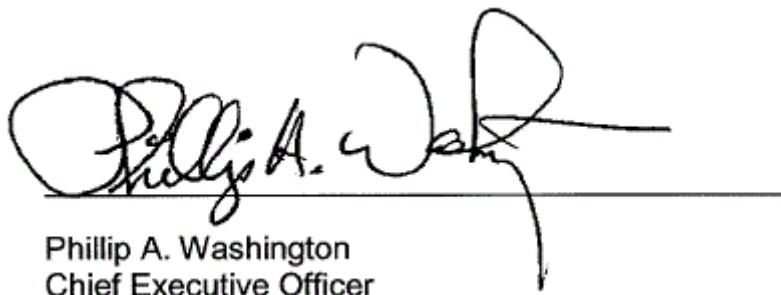
ATTACHMENTS

Attachment A - New Appointee/s Biography and Listing of Qualifications

Attachment B - Appointing Authority Nomination Letter

Prepared by: Jon Hillmer, Executive Officer of Service Development, Scheduling & Analysis,
(213) 922-6972

Reviewed by: James T. Gallagher, Chief Operations Officer, (213) 922-4424



Phillip A. Washington
Chief Executive Officer

NEW APPOINTEES BIOGRAPHIES AND QUALIFICATIONS

Joseph A. Strapac, Nominee for Gateway Cities Service Council



Joseph A. Strapac is a self-employed publisher of reference books on the history, engineering, and operation of rail. Mr. Strapac resides in the city of Bellflower, and is a long-time resident of southeast Los Angeles County, having graduated from Compton High School and California State University, Long Beach. Mr. Strapac is a former high school and adult school teacher, and a long-time transit user with extensive knowledge of transportation operations and history. He has been an active member of the Southern Pacific historical and Technical Society for many years, and has held various positions within the organization including

President, Board Member, Archivist, and Advisor.

Carla E. Canales, Nominee for San Fernando Valley Service Council

Carla E. Canales has been employed with the County of Los Angeles since 2009, and is currently working in the Department of Public Works, Administrative Services Bureau as a Management Fellow. Ms. Canales has previously worked in the Treasurer and Tax Collector Bureau, Public Works Fleet Management, and the Department of Mental Health, giving her a broad range of experience with local government agencies functions. Ms. Canales was previously employed with Los Angeles World Airports where she supported ridesharing programs and related events such as Bike to Work Day. Ms. Canales holds a Bachelor of Business Administration from Loyola Marymount University, and is a recent graduate of California State Northridge with a Master's in Public Administration. Ms. Canales is a resident of Sun Valley and a long-time transit user.

Alba M. Peña, Nominee for Westside Central Service Council



Alba M. Peña is an urban planning professional with a focus in community health, health education, community engagement, and program development. Ms. Peña is currently employed as a Lead Community Health Associate with Cedars-Sinai Medical Center's Healthy Habits program. Ms. Peña has previously worked for the National Health Foundation as a Program Manager and a Senior Program Coordinator, as well as with the Los Angeles County Metropolitan Transportation Authority as an Entry Level Trainee. Ms. Peña also completed a graduate internship with the City of Los Angeles Department of Neighborhood Empowerment. She is a

member of the L.A. Walks Steering Committee and a California Walks Board Member. Ms. Peña holds a Bachelor of Arts in Sociology from University of California, Santa Barbara, and a Master's in Urban & Regional Planning from University of California, Los Angeles.

APPOINTING AUTHORITY NOMINATION LETTERS

SOUTHEAST LOS ANGELES COUNTY

Artesia

Avalon

Bell

Bellflower

Bell Gardens

Cerritos

Commerce

Compton

Cudahy

Downey

Hawaiian Gardens

Huntington Park

Industry

La Habra Heights

La Mirada

Lakewood

Long Beach

Lynwood

Maywood

Montebello

Norwalk

Paramount

Pico Rivera

Santa Fe Springs

Signal Hill

South Gate

Vernon

Whittier

County of Los Angeles

Port of Long Beach



GATEWAY CITIES
COUNCIL OF GOVERNMENTS

September 8, 2016

Mr. Phillip A. Washington, CEO
Los Angeles County Metropolitan Transportation Authority
One Gateway Plaza
Los Angeles, CA 90012

Dear Mr. Washington:

Nominees for the Metro Gateway Cities Service Council

Acting in its capacity as the convening coalition of the Metro Gateway Cities Service Council, the Board of Directors of the Gateway Cities Council of Governments has nominated one Service Council member to fill the current vacant seat, which expires June 2017.

At its regularly scheduled meeting of September 7, 2016, the Gateway Cities Council of Governments Board of Directors nominated Mr. Joseph Strapac, a member of the community, to fill the seat expiring June 30, 2017, replacing Thomas Martin. A copy of the nominee's application is enclosed.

We would appreciate your assistance in agendizing the nominations for confirmation by the MTA Board of Directors at the next regularly scheduled meeting.

Sincerely,



Richard Powers
Executive Director

Enclosure

16401 Paramount Boulevard ■ Paramount, California 90723 ■ phone (562) 663-6850 fax (562) 634-8216
www.gatewaycog.org



BOARD OF SUPERVISORS COUNTY OF LOS ANGELES

821 KENNETH HAHN HALL OF ADMINISTRATION / LOS ANGELES, CALIFORNIA 90012
Tel: 213-974-3333 Fax: 213-625-7380 Sheila@bos.lacounty.gov

SHEILA KUEHL
SUPERVISOR, THIRD DISTRICT

September 7, 2016

Mr. Gary Spivack
Deputy Executive Officer
Metro Regional Service Councils
One Gateway Plaza MS 99-7-2
Los Angeles, CA 90012

Dear Mr. Spivack:

This letter serves as the recommendation to appoint Carla Canales to serve as the Third District representative on the San Fernando Valley Service Council for the term of July 1, 2016 - June 30, 2019.

I am confident that Ms. Canales' knowledge and experience of the San Fernando Valley's transportation will serve the Council well.

A copy of Ms. Canales' resume is attached for your reference. Please let me know if you need any additional information. Thank you for your attention to this matter.

Sincerely,

A handwritten signature in blue ink that reads "Sheila Kuehl".

SHEILA KUEHL
Supervisor, Third District

NE:jj



ERIC GARCETTI
MAYOR

September 20, 2016

Mr. Gary Spivack
Deputy Executive Officer
Metro Regionals Service Councils
One Gateway Plaza MS 99-7-2
Los Angeles, CA 90012

Dear Mr. Spivack:

I hereby submit the nomination of Alba Peña to serve as a representative on the Westside/Central Service Council. I certify that in my opinion Ms. Peña is qualified for the work that will devolve upon her, and that I make this appointment solely in the interest of the City.

Please let me know if you need any additional information. Thank you for your consideration.

Sincerely,

A handwritten signature in black ink, appearing to read 'E. Garcetti', with a horizontal line extending to the right.

ERIC GARCETTI
Mayor

EG:cl



Board Report

File #: 2016-0742, **File Type:** Motion / Motion Response

Agenda Number: 22.

REVISED
SYSTEM SAFETY, SECURITY AND OPERATIONS COMMITTEE
OCTOBER 20, 2016

SUBJECT: RESPONSE TO BOARD MOTION ON LINE 501 TO PRESENT PROPOSED MARKETING PLAN, IMPROVED SPAN OF SERVICE, AND A TEMPORARY REDUCTION IN FARE

ACTION: RECEIVE AND FILE

RECOMMENDATION

RECEIVE AND FILE informational report in response to Board Motion on **Line 501 to present proposed marketing plan, improved span of service and a temporary reduction in fare.**

ISSUE

At the August 18, 2016, System Safety, Security and Operations Committee Meeting, Board Members Antonovich and Najarian presented a motion (Attachment A) directing the CEO to direct staff to implement the following:

- 1) Place wayfinding signage at stops along Line 501, including North Hollywood station, Burbank, Glendale, Del Mar Station and Memorial Park Station to ensure that riders can easily locate Line 501; and
- 2) Ensure that Line 501 is included in existing informational signage at each stop that lists connections and destinations.

In addition, the CEO is to return in October with an informational report from staff on the following:

- A: Conduct a feasibility/cost study for reducing fares to match MTA's regular fare and transfer structure and/or promotional programming that offers free or discounted fares for a specified period of time (i.e. 60 days);
- B: Identification of weekend sporting, concert, holiday, cultural and other major events in the City of Los Angeles and cities along the SR-134 and I-210 corridors, coupled with a cost-effective marketing plan that promotes Line 501 service as a preferred mode of transportation to those events;

C: Inventory new eye-catching marketing materials such as seat drops and signage on the Orange and Gold Lines that promote destinations by way of Line 501 connections, such as Hollywood Burbank Airport;

D: Conduct a cost estimate and the feasibility of including Line 501 on system map kiosks; and

E: Conduct a cost estimate and the feasibility of increasing span of service by adding trips earlier in the morning and later into the evening up to midnight.

DISCUSSION

As directed, placing wayfinding signage at individual stops outside of Metro owned property is simple. However, doing the same in the cities of Burbank, Glendale and Pasadena requires considerable coordination. Besides placing additional signs on Metro's existing bus stop pole, separate wayfinding signage would require Metro to obtain permits to install signage on city property that will require considerably more time and resources. As a low cost effective alternative, Stops and Zones will install bus stop cubes (four sided) on existing Metro poles at each stop, these are available in inventory. Each cube will be customized by Marketing and Communications to provide wayfinding and connections information for each particular area.

The following discusses the directed informational report and costs associated with implementing a promotional fare amount and period, expanded Marketing and Communications plan, and potential expanded span of service.

Promotional Fare

The Board Motion directed staff to investigate implementing a reduced fare program for Line 501. Currently, Line 501 charges patrons the same express fare as charged on all of the other six express lines (422, 460, 487/489, 550, 577 and 910/950). All express lines have a regular and college cash fare of \$2.50, students at \$1.75 and \$1.35 for seniors and disabled (\$0.95 during off-peak periods). The 30-day regular express pass costs \$122, senior & disabled are priced at \$20, college students at \$43 and other students at \$24. It is proposed that the promotional fare be \$1.75 for a period of six months.

It is estimated that at the current express fare rates, Line 501 is generating about \$366,000 in annual passenger revenue at the present ridership numbers. Converting this line to a promotional Metro local fare structure of \$1.75 would produce an estimated annual passenger revenue total of about \$256,000, also at the current ridership levels. This would cause a reduction in annual passenger revenue of about \$110,000. Thus, using the Simpson-Curtin transit elasticity model of a three percent fare change results in a one percent ridership change, it would be expected that the proposed fare reduction would generate a 14 percent increase in ridership. This would be equivalent to an annual increase of 47,000 passenger boardings generating about \$36,000 per year. If the reduced fares on Line 501 did produce this level of increased ridership, the net annual decrease in passenger revenue would be \$73,000.

Marketing Line 501

An extensive marketing and communications plan was developed along the guidelines of the motion, combining items B, C and D into one program as described in Attachment B. Implementation of the entire plan is estimated to cost \$275,360.

The plan includes extensive efforts that require printed matter, outdoor advertising including digital billboards and other digital assets, radio spots, new audio announcements on trains and Line 501 (providing wayfinding/connections information), an expanded wayfinding effort dedicated to North Hollywood and Pasadena rail stations, expanded use of TAP products, and game day public relations outreach efforts that includes UCLA and other Rose Bowl events.

Expanded Span of Service

Operating expanded weekday service from 5AM to Midnight will add an additional 11 Vehicle Hours at a cost of \$305,550 annualized. There are no resources available at this time to implement an expanded service. Patronage after 7:00pm is very lightly patronized with average loads of 7 per trip.

FINANCIAL IMPACT

Adoption of any of the described programs in this report would require additional resources of \$580,910.

~~Funding of \$580,910 for this action is included in the FY17 budget in Cost Center 3591 – North Region, Account 50801 – Purchased Transportation, in Project 306001 – Operations Transportation~~

~~The cost center manager and project manager will ensure that funds for this scope of work are budgeted in future fiscal years.~~

Impact to Budget

None of the described actions including the promotional fare proposal, marketing/communications plan, and widening of the weekday span of service are included in the FY17 budget.

~~The current year funding for this action will come from the Enterprise operating fund. The source of funds will be Federal, State and Local funding sources, including sales tax and fares that are eligible for Bus and Rail Operating Projects. These funding sources will maximize the use of funds for these activities.~~

ALTERNATIVES CONSIDERED

Prior to expending resources to expand the span of service, as an option, staff could report back in April 2017 with an update report on ridership, as the board just approved improving the weekday service from every 15 to 12 minutes. If the improvement did not attract anticipated ridership, the Board could consider expending funds in the FY18 budget to implement the proposed temporary fare

reduction, marketing/communications plan, and modify the span of service (all to be implemented in June 2017), at a combined unfunded cost of \$580,910.

NEXT STEPS

Receive and file staff report.

ATTACHMENTS

Attachment A - Amendment to Item 30

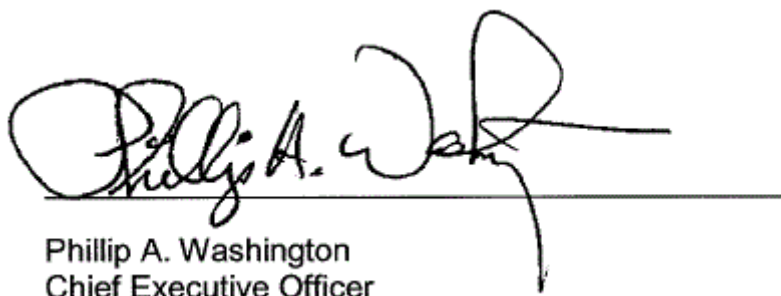
Attachment B - Line 501 Marketing Campaign

Prepared by: Scott Page, Senior Director, Service Performance and Analysis,
(213) 922-1228

Jon Hillmer, Senior Executive Officer, Service Development, Schedule Analysis, (213)
922-6972

Glen Becerra, Deputy Director, Communications
(213) 922-5661

Reviewed by: James T. Gallagher, Chief Operations Officer, (213) 922-4424



Phillip A. Washington
Chief Executive Officer

ATTACHMENT A

MOTION BY DIRECTORS ANTONOVICH AND NAJARIAN

System Safety, Security and Operations Committee

August 18, 2016

Amendment to Item #30: Performance Updates on Line 501 Pilot Express Bus Service

MTA's 501 Pilot Express Bus (Line 501) began service March 1, 2016, providing a quick connection between the Orange and Gold Lines. While Line 501 has yet to meet its anticipated performance measures, ridership appears to be slowly but steadily increasing. The Los Angeles Department of Transportation runs a similar line that serves an additional 300 daily peak riders. If combined, weekday ridership between the two lines has reached 1371. MTA staff is recommending that the Line 501 Pilot be extended an additional 180 days and that service modifications be approved to improve scheduling efficiencies and increase service.

We believe, in addition to the staff recommendations above, that new wayfinding signage, an expanded marketing plan, and a reduction in fares may result in Line 501 exceeding its anticipated performance measures.

WE THEREFORE MOVE THAT, the CEO direct staff to:

1. Place wayfinding signage at stops along Line 501, including North Hollywood station, Burbank, Glendale, Del Mar station and Memorial Park station to ensure that riders can easily locate Line 501; and
2. Ensure that Line 501 is included on existing informational signage at each stop that lists connections and destinations;

WE FURTHER MOVE THAT, the CEO report back to the board at the October 2016 board meeting with:

An expanded plan to increase Line 501 ridership that includes, but is not limited to:

1. A feasibility study for reducing fares to match MTA's regular fare and transfer structure and/or promotional programming that offers free or discounted fares;
2. Identification of weekend sporting, concert, holiday, cultural and other major events in the City of Los Angeles and the cities along the SR-134 and I-210 corridors, coupled with a cost-effective marketing plan that promotes Line 501 service as a preferred mode of transportation to those events;
3. New eye-catching marketing materials such as seat drops and signage on the Orange and Gold Lines that promote destinations by way of Line 501 connections, such as Hollywood Burbank Airport; and
4. A cost estimate and the feasibility of including Line 501 on system map kiosks.

ATTACHMENT B

Line 501 NoHo to Pasadena

Dec 2016 Marketing + Outreach Plan

Objective:

- To remind new and current riders of the benefits of Line 501, express non-stop service from North Hollywood

Target Audience:

- New Metro riders, existing Metro Riders, Metro Red & Gold Line Commuters, Commuters of Pasadena Transit, and Commuters of Line 549 looking for alternate service.

New Messages

- Take advantage of our promotional fare of \$1.75 for the next 6 months
- Greater connectivity from North Hollywood to Pasadena
- More options to make your commute easier

Strategies

- Reach non-riders through print, web and outdoor advertising
- Reach current riders via onboard materials
- Partner with local businesses and to promote destination based events in Los Angeles
- Partner with Colleges/Universities to promote daily commute

Tactics (December launch with new promotional fare)

Printed Materials (60-day period) <i>(Section C)</i>	QTY	Cost
Take One Brochure <i>(system drop)</i>	2 drops	\$3500
Car Card <i>(entire fleet)</i>	3250	\$3000
Rail Poster <i>(Red, Orange & Gold)</i>	2500	\$3000
Newspaper Ads 50+ major publications		\$40K

Outdoor Advertising <i>(Section C)</i>		
Bus Shelters	20	\$23k
Jr. Posters	30	\$15K
Bus Benches	30	\$11K
Updated Bus Wraps	10	\$29K
King Ads on selected lines <i>(NoHo & Pas Bus Div's)</i>	200 (\$60 ea)	\$12K
Digital Assets <i>(Section B,C)</i>		
Web Banners Paid Media	12 weeks	\$35K
Social Media Promotion	2 months	\$15K
Digital Billboards	6	\$13k
15-sec spot Pandora/Spotify	8 weeks	\$8K
Radio <i>(Section B, C)</i>		
15-sec spot major stations	2 weeks	\$30K
Audio Announcements on Board Bus/Rail <i>(Section B, C)</i>		
Red Line, Orange Line, Gold Line, Line 501	4	\$600
Wayfinding <i>(Section D)</i>		
System Map	170	\$17K
System Map (Cartography)	-	\$1000
NoHo Connections Map	6	\$600
NoHo Connection Map (Cartography)	-	\$1975
Central Pasadena Connections Map	8	\$800
Central Pasadena Connections Map (Cartography)	-	\$1975
Installation of Maps (covered by advertising contract)	-	-
NoHo Bus Shelter Ads at Bus Bays	2	\$260
NoHo Bus Shelter Ads at Bus Bays (Production)	-	\$100
Stanchion Directional signage	2	\$50

Avalon Del Mar Station Ad Space	TBD	TDB
Station Screen notice (TPIS Ad)	93	0
Other B-TAP promotion (Section B)		
Business outreach (100 locations) over 6 months	5 people	Labor hours
3-month promotional Employer Pass Program (Discount 50%)	-	-
U-Pass Promo (CSUN, APU, Citrus, Pierce, Mission, PCC)	-	-
PR Initiatives (Section B)		
Issue Go Metro to UCLA Games at the Rose Bowl	1	0
Conduct press event to promote 501 bus Line to Pasadena for UCLA Games at Rose Bowl	1	\$5k
Produce YouTube video on benefits of Line 501 (add paid promotion placement)	1	\$1k
Draft news Source posts on new destinations available along Line 501	3	0
Tournament of Roses Promotion on NoHo to Pasadena Express	1	\$5k
Total		\$275,360



Board Report

File #: 2016-0790, **File Type:** Informational Report

Agenda Number: 23.

SYSTEM SAFETY, SECURITY AND OPERATIONS COMMITTEE OCTOBER 20, 2016

SUBJECT: MONTHLY UPDATE ON TRANSIT POLICING PERFORMANCE

ACTION: RECEIVE AND FILE

RECOMMENDATION

RECEIVE AND FILE **monthly update on Transit Policing performance.**

ISSUE

On September 4, 2014, the board requested that staff provide a monthly update on transit policing performance to Systems Safety and Operations Committee. Specifically, the board requested monthly updates on criminal activity, fare enforcement, response time, deployment and perception of safety.

DISCUSSION

In August 2016, staff continues to be proactive in working with Operations, Los Angeles County Sheriff's Department (LASD), and Communications in addressing perception of safety, criminal activity, fare enforcement, response time, and deployment.

In the new law enforcement services contract, staff is including key performance indicators as tools to track performance.

Below are the key highlights for August 2016:

Actions to Improve the Ridership Experience

- Staff is utilizing Problem Oriented Policing strategies to develop innovative solutions at the Westlake/MacArthur Park Station.
- Staff is developing a strategic plan to address homelessness on the Metro Transit System.
- High Visibility
 - Transit Security Officers (TSO) and Los Angeles County Sheriffs (LASD) have been

engaging and interacting with patrons and operators to increase presence and increase the perception of safety on the Metro system. LASD has a 20 deputy train riding team (10 cover the Red and Gold Lines and 10 cover Blue, Expo and Green Lines. The goal of these operations is to combat quality of life issues on the Metro system. TSO's conduct high visibility both on bus and rail.

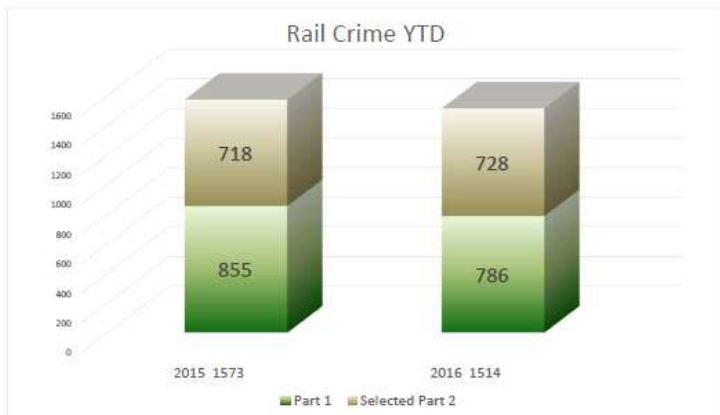
- TSO High Visibility Activity:

	Mode	Fare Checks	Boardings/Exits
August	Rail	41,190	41,190 Stations
	Bus	6,552	6,552 Boardings

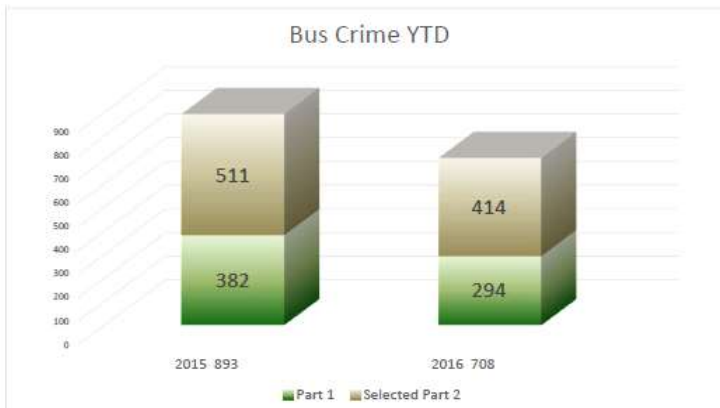
- LASD High Visibility Activity: The total number of LASD train rides for the month of August 2016 is 1,865. The total number of fares checked in the month of August 2016 is 93,094.

Criminal Activity:

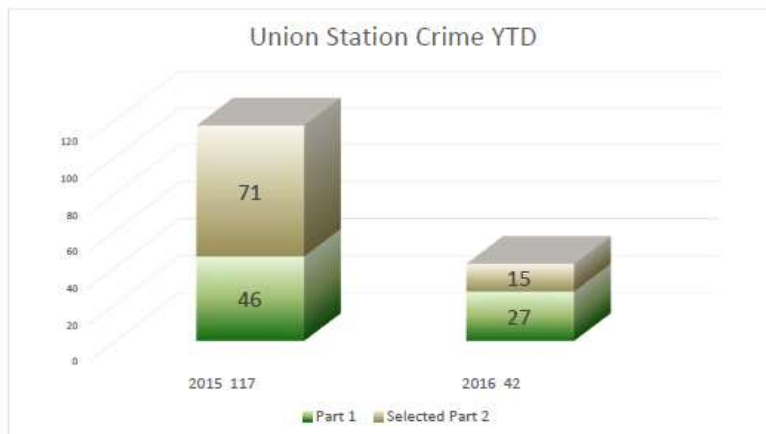
AUGUST 2016



Rail Part 1 Crime
DOWN -8.1%
from last year
Rail Part 2 Crime
UP 1.4%
from last year
Total Rail Crime
DOWN -3.8%
from last year



Bus Part 1 Crime
Down -23.0%
from last year
Bus Part 2 Crime
DOWN -19.0%
from last year
Total Bus Crime
DOWN -20.7%
from last year



Union Station Part 1 Crime
DOWN -41.3%
from last year

Union Station Part 2 Crime
DOWN -78.9%
from last year

Total Union Station Crime
DOWN -64.1%
from last year

Bus Operator Assaults:

- From January to August 2016, there were 80 operator assaults. Of the 80 total operator assaults, 35% of the total assaults have had a suspect taken into custody. The majority of bus operator assaults are caused by fare related followed by missed stop.
- Comparing January-August 2015 to January-August 2016, Operator Assaults have decreased 32%.
- Of the 80 total operator assaults from January to August 2016, there were 69 non-aggravated assaults, 8 aggravated assaults, and 3 sex crimes. The method of assault was as follows: 38 used hands/feet, 25 used spit, 5 threw cold liquid, 4 threw an object, 3 used a weapon, there were 3 sex crimes and there was 2 robberies.
- Attachment B contains the matrix for the suspects who have assaulted Bus Operators that LASD has been tracking.
- From January to August 2016, there were 206,369,188 bus boardings and 80 total operator assaults, equating to 1 bus operator assault per 2.5 million boardings.

Operator Safety:

- The Metro Communications team completed phase one in July 2016 for a campaign targeted at reducing Bus Operator assaults.
- The ongoing Transit Ambassador Program focuses on classes that address conflict resolution for Operators and Supervisors.
- Metro Operations is continuing to move forward with the installation of barriers and monitors in the remaining serviceable fleet.

- For the rest of Metro's fleet (about 1300 buses), staff will be starting a program to retrofit operator barriers onto buses starting in June 2016. This program is expected to run for approximately 24 months. Staff is also developing a new program to have video monitors retrofit onto the rest of Metro's bus fleet.
- As of September 16, 2016 the Metro New Flyer Buses that in service are as follows:
 - Number of New Flyer buses in service (LA Metro & Contract Services) = 848 of 900
 - Number of buses "in-service" with protective barriers = 693
 - Number of buses "in-service" with live video monitors = 839
 - All other New Flyer Buses are on track to be retrofitted with barriers by the end of 2016

Significant Activities

- **8/17/2016**- Transit Bureau North deputies responding from the Chatsworth sub-station, found two stabbing victims aboard a Metro bus at the intersection of Sepulveda Boulevard and Chase Street. At approximately 2:02 PM, the victims were still coherent enough to give the deputies a detailed description of the suspect. The deputies, believing that the suspect may have boarded another bus, fanned out and checked several buses in the area. They found the suspect, detained him, and transported him back to the location of the victims. They positively identified the detained suspect and he was arrested for assault with a deadly weapon. During the arrest, the suspect attempted to fight with deputies, but he was subdued and remained in custody with no injuries noted. The victims were transported to a local hospital with non-life threatening injuries.

Transit Policing Division detectives responded to the scene and are handing the investigation. Based on the severity of the attack, the suspect may be subject to additional charges of attempted murder, and resisting a peace officer.

- **8/23/2016** - LASD Executive Officer (Undersheriff) Neal Tyler, Assistant Sheriff Richard Barrantes, joined Transit Division Chief Ronene Thomas, along with Transit Bureau Captains Bateman and Schow, at the 1st Annual Partnership in Safety Community Appreciation Day. The event was held at the Rosa Parks Transit Complex in Willowbrook from 4:00 PM to 7:00 PM. Transit Policing Division units from the Threat Interdiction Unit, Explosives Detection K9 Unit, and Sheriff's Recruitment Bureau, had displays for the public and Metro patrons. Several specialty LASD vehicles and motorcycles were also on display. Metro recruitment and community affairs were also on hand to greet patrons. The event was well attended and covered by the Long Beach Post and the Los Angeles County Channel.
- **8/26/2016** - A Transit Bureau North, early morning unit responded to 7th Street and Hill Street in regard to vandalism to a Metro bus call, at approximately 1:24 AM. The Bus Operator informed responding units that a male had shattered the front windshield of the bus with a metal pipe. Responding deputies learned the same suspect had also shattered the front windshields of two other buses at 7th Street and Olive Street, and Olive Street and Grand Avenue. Deputies canvassed the area and located the suspect who was identified by the Bus Operators as the person who shattered their windshields. The suspect was placed under

arrest for felony vandalism. The investigation is continuing as this suspect may be responsible for other vandalisms.

Fare Enforcement:

- In August 2016, law enforcement performed 809,732 fare checks on the rails and Orange Line. Based on the monthly targets, in August 2016 law enforcement had a 9% saturation rate.
- Based on the chart, green checks occur when a patron has valid fare and has tapped at a turnstile or stand-alone validator. Yellow checks occur when a patron has valid fare, but failed to TAP at a transfer point. Red checks occur when a patron either has a daily/weekly/monthly pass and has not tapped at all during their trip, has stored value and failed to TAP, or has no stored value.
- At the discretion of the fare inspector, patrons are encouraged to make payment at the ticket vending machine or TAP their card on the validator in lieu of receiving a citation.

AUGUST	2016								*MONTHLY TARGET
	FARES CHECKED	GREEN CHECKS	YELLOW CHECKS	RED CHECKS	TICKETS	TARGET* ATTAINED	RIDERSHIP	TAP ENTRIES	
Red/Purple	243,540	216,490	10,093	16,957	1,594	6%	4,040,258	3,175,256	220,000
Blue	154,194	97,917	39,151	17,126	750	73%	2,211,363	1,326,598	212,000
Green	129,951	112,407	8,818	8,726	88	96%	982,710	982,710	136,000
Gold	139,967	125,058	5,880	9,029	151	121%	1,442,672	1,010,490	116,000
Expo	63,262	50,782	6,939	5,541	6	70%	1,261,597	769,391	90,000
Orange	67,333	60,140	3,294	3,899	72	73%	636,813	450,833	92,000
Bus	11,485	9,481	1,018	986	134		-	-	
Total	809,732	672,275	75,193	62,264	2,795		10,575,413	7,715,278	
SATURATION RATE	9%								

Traffic Enforcement Activity in the Bus Rapid Transit Lanes:

- In August 2016, there were 107 “Failure to Obey Signs” citations issued on Wilshire Blvd.

Response Time:

- In August 2016, the average response time for “Calls for Service” (Emergency, Priority and Routine) for all rail lines and buses was 18.6 minutes.
- LASD currently complies with Metro’s Performance Metrics requirement of average of 30 minutes for calls for service. The response time for emergency calls was 5.3 minutes for August 2016.

ATTACHMENTS

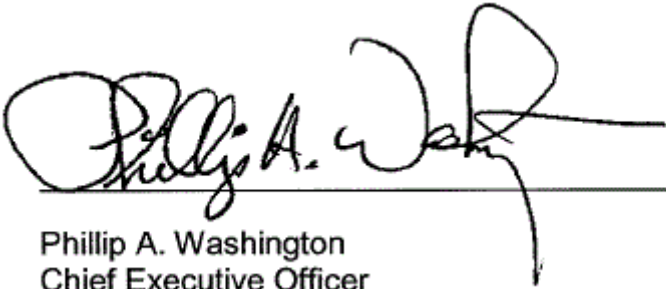
Attachment A - Transit Policing Division Report August 2016

Attachment B - Matrix of Bus Operator Assault Suspects

Prepared by: Alex Wiggins, Chief, System Security and Law Enforcement, (213) 922-4433

Reviewed by:

Stephanie Wiggins, Deputy Chief Executive Officer, (213) 922-1023



Phillip A. Washington
Chief Executive Officer

*LOS ANGELES COUNTY SHERIFF'S DEPARTMENT
TRANSIT POLICING DIVISION
RONENE M. THOMAS, CHIEF*



MTA MONTHLY REPORT August 2016

Prepared by the Crime Analysis Unit



*LOS ANGELES COUNTY SHERIFF'S DEPARTMENT
TRANSIT POLICING DIVISION
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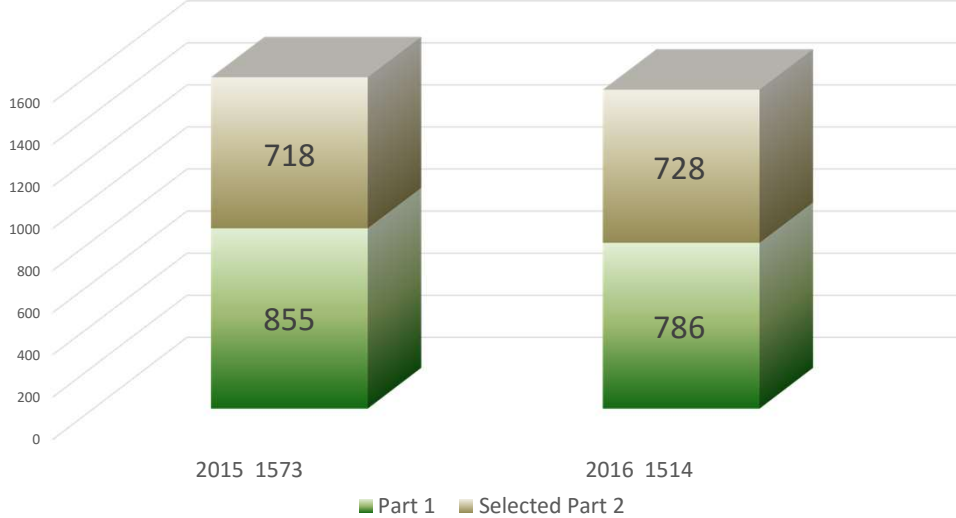
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TRANSIT POLICING DIVISION - 2016

Rail Crime YTD

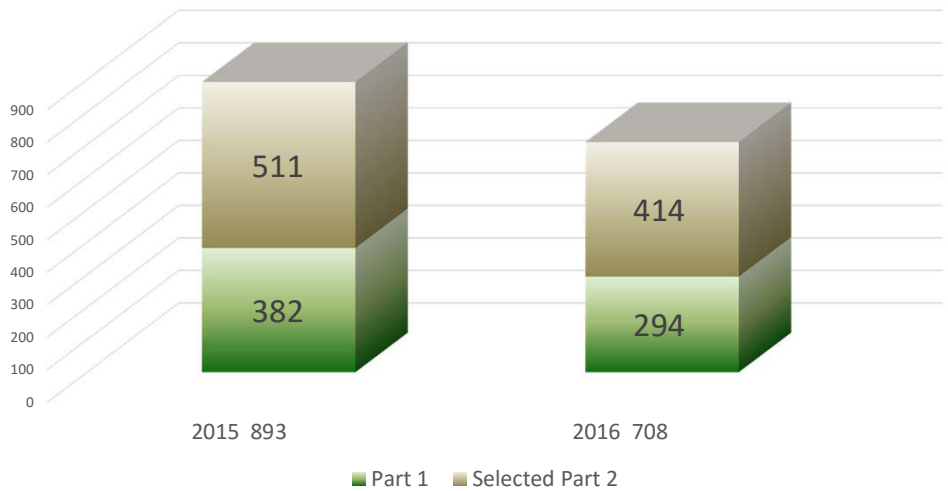


Rail Part 1 Crime
DOWN -8.1%
from last year

Rail Part 2 Crime
UP 1.4%
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Total Rail Crime
DOWN -3.8%
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Bus Crime YTD

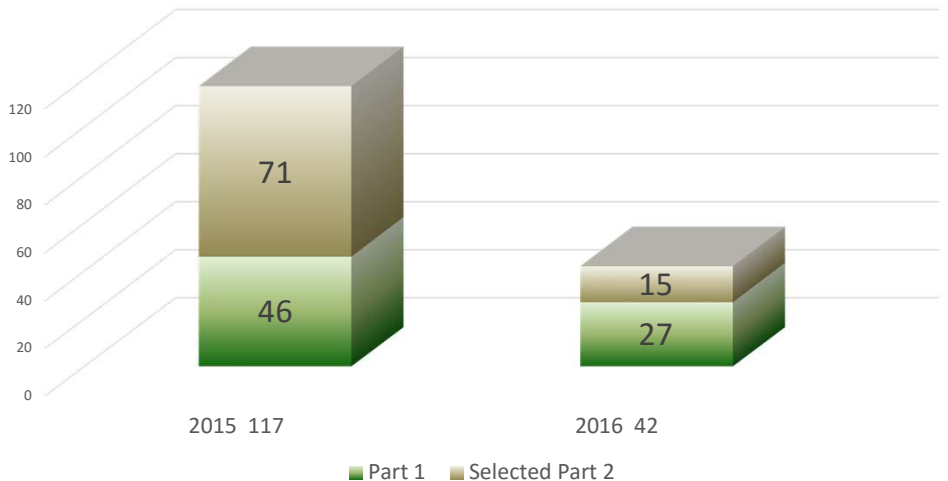


Bus Part 1 Crime
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from last year

Bus Part 2 Crime
DOWN -19.0%
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Total Bus Crime
DOWN -20.7%
from last year

Union Station Crime YTD



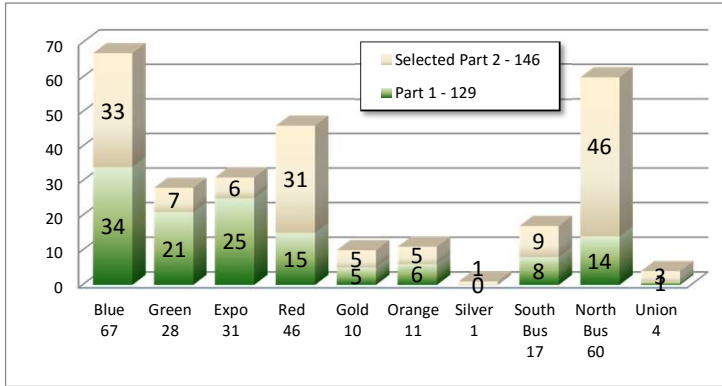
Union Station Part 1 Crime
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Union Station Part 2 Crime
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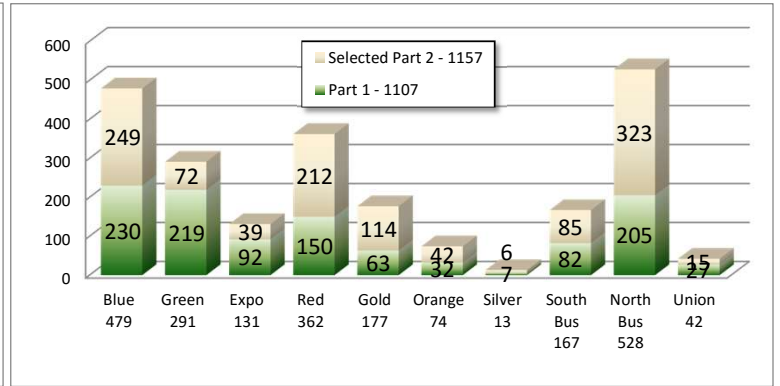
Total Union Station Crime
DOWN -64.1%
from last year

TRANSIT POLICING DIVISION - 2016

Aug Crimes - 275



YTD Crimes - 2264

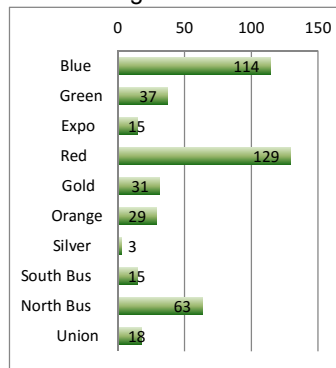


Part 1 Crimes per 1,000,000 Riders

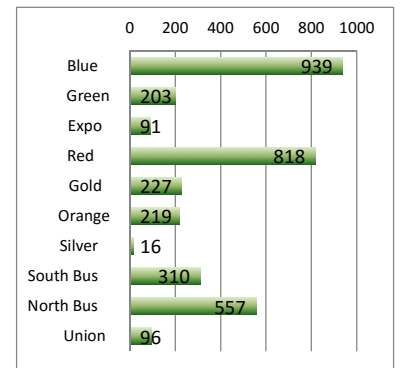
	2016 Jan - Aug	2015 Jan - Aug	2014 Jan - Aug	2013 Jan - Aug
Blue	13.7 ↓	14.9	13.3	14.5
Green	29.2 ↑	24.2	25.0	24.5
Expo	11.3 ↓	15.1	11.8	19.6
Red	4.9 ↓	5.3	4.5	4.8
Gold	5.8 ↓	11.1	5.5	6.9
Orange	6.2 ↓	8.2	7.8	6.6
Silver	2.3 ↓	2.4	3.6	0.8
Bus	1.4 ↓	1.8	1.7	1.4

Arrow indicates an increase or decrease from last year.

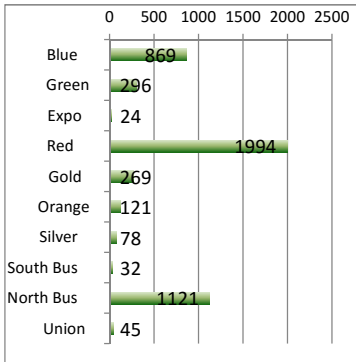
Aug Arrests - 454



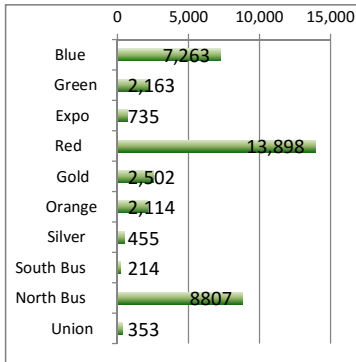
YTD Arrests - 3476



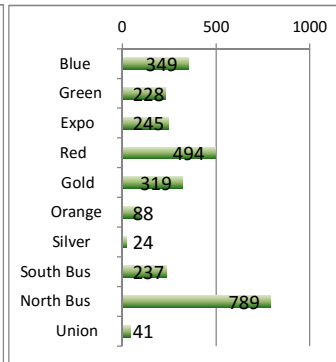
Aug Citations - 4849



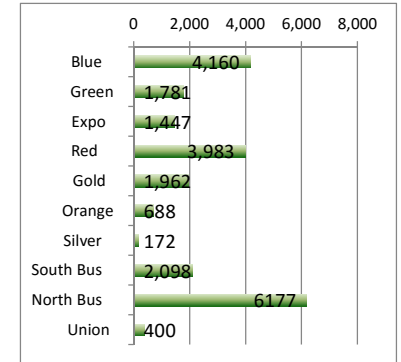
YTD Citations - 38504



Aug Calls For Service - 2814



YTD Calls For Service - 22868



SATURATION RATE

August	BLUE	GREEN	EXPO	RED	GOLD	ORG	TOTAL
Ridership	2,211,363	982,710	1,261,597	4,040,258	1,442,672	636,813	10,575,413
Contacts	155,114	130,074	63,285	245,672	140,202	67,441	801,788
%Passengers Inspected	7.01%	13.24%	5.02%	6.08%	9.72%	10.59%	7.58%
Boardings	0	0	0	0	0	0	0
Rides	701	46	155	963	0	19	1,884
Fare Warnings	0	0	0	0	0	0	0

YTD	BLUE	GREEN	EXPO	RED	GOLD	ORG	TOTAL
YTD Ridership	16,849,347	7,491,309	8,167,514	30,465,881	10,886,262	5,176,787	79,037,100
YTD Contacts*	1,153,146	1,049,782	452,762	2,004,163	1,110,001	559,524	6,329,378
%Passengers Inspected	6.84%	14.01%	5.54%	6.58%	10.20%	10.81%	8.01%
Boardings	0	0	0	0	0	57	57
Rides	701	46	155	963	0	19	1,884
Fare Warnings	0	0	0	0	0	5	5

* Contacts are calculated by adding MPV checks and citations.

System-Wide Highlights

Part 1 Crimes have decreased by 14% from Jan - Aug 2016 compared to Jan - Aug 2015.

All rail lines had a decrease in part 1 crimes per 1,000,000 riders except the Green Line and Red Line

Overall, buses had a decrease in part 1 crimes per 1,000,000 riders from the same period last year.

*Part 1 Crimes by Month - Rail

Blue Line	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	YTD
Homicide	0	0	0	1	0	0	0	0	0	0	0	0	1
Rape	0	0	0	0	0	0	0	0	0	0	0	0	0
Robbery	13	6	5	4	9	13	9	11	0	0	0	0	70
Agg Assault	2	5	7	0	9	4	7	6	0	0	0	0	40
Agg Assault on Op	0	0	0	0	0	0	0	0	0	0	0	0	0
Burglary	0	0	0	0	0	0	0	0	0	0	0	0	0
Grand Theft	7	3	9	3	4	6	4	4	0	0	0	0	40
Petty Theft	3	4	8	6	3	8	5	8	0	0	0	0	45
GTA	1	0	4	3	1	2	3	1	0	0	0	0	15
BTFV	3	3	1	0	2	4	2	4	0	0	0	0	19
Arson	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	29	21	34	17	28	37	30	34	0	0	0	0	230

Green Line	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	YTD
Homicide	0	0	0	0	0	0	0	0	0	0	0	0	0
Rape	1	0	0	0	0	0	0	0	0	0	0	0	1
Robbery	8	3	8	6	11	11	9	11	0	0	0	0	67
Agg Assault	6	1	2	2	3	0	2	6	0	0	0	0	22
Agg Assault on Op	0	0	0	0	0	0	0	0	0	0	0	0	0
Burglary	0	0	0	0	0	0	0	0	0	0	0	0	0
Grand Theft	9	1	2	7	3	5	3	2	0	0	0	0	32
Petty Theft	1	7	5	4	7	5	7	1	0	0	0	0	37
GTA	4	5	3	0	2	8	10	1	0	0	0	0	33
BTFV	2	2	2	5	1	7	7	0	0	0	0	0	26
Arson	1	0	0	0	0	0	0	0	0	0	0	0	1
Total	32	19	22	24	27	36	38	21	0	0	0	0	219

Expo Line	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	YTD
Homicide	0	0	0	0	0	0	0	0	0	0	0	0	0
Rape	0	0	0	0	0	0	0	0	0	0	0	0	0
Robbery	0	6	3	2	6	3	4	3	0	0	0	0	27
Agg Assault	0	2	1	2	1	1	4	2	0	0	0	0	13
Agg Assault on Op	0	0	0	0	0	0	0	0	0	0	0	0	0
Burglary	0	0	0	0	0	0	0	0	0	0	0	0	0
Grand Theft	4	6	0	2	3	0	2	3	0	0	0	0	20
Petty Theft	2	0	0	0	2	5	4	16	0	0	0	0	29
GTA	0	0	1	0	0	0	0	0	0	0	0	0	1
BTFV	0	0	1	0	0	0	0	1	0	0	0	0	2
Arson	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	6	14	6	6	12	9	14	25	0	0	0	0	92

Red Line	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	YTD
Homicide	0	0	0	0	0	0	0	0	0	0	0	0	0
Rape	1	0	0	0	0	0	0	0	0	0	0	0	1
Robbery	6	4	2	5	3	3	5	7	0	0	0	0	35
Agg Assault	4	8	2	3	4	7	9	2	0	0	0	0	39
Agg Assault on Op	0	0	0	0	0	0	0	0	0	0	0	0	0
Burglary	0	0	0	0	0	0	0	0	0	0	0	0	0
Grand Theft	2	3	3	5	4	2	5	4	0	0	0	0	28
Petty Theft	6	5	3	10	2	10	4	1	0	0	0	0	41
GTA	1	0	1	0	0	2	0	1	0	0	0	0	5
BTFV	0	0	0	0	0	0	1	0	0	0	0	0	1
Arson	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	20	20	11	23	13	24	24	15	0	0	0	0	150

Gold Line	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	YTD
Homicide	0	0	0	0	0	0	0	0	0	0	0	0	0
Rape	0	0	0	0	0	0	0	0	0	0	0	0	0
Robbery	1	1	0	1	0	0	0	1	0	0	0	0	4
Agg Assault	2	0	0	0	0	1	3	0	0	0	0	0	6
Agg Assault on Op	0	0	0	0	0	0	0	0	0	0	0	0	0
Burglary	0	0	0	0	0	1	0	0	0	0	0	0	1
Grand Theft	1	0	0	1	1	1	0	0	0	0	0	0	4
Petty Theft	1	0	4	3	2	4	2	2	0	0	0	0	18
GTA	0	0	1	1	2	0	0	0	0	0	0	0	4
BTFV	5	0	9	4	3	2	1	1	0	0	0	0	25
Arson	0	0	0	0	0	0	0	1	0	0	0	0	1
Total	10	1	14	10	8	9	6	5	0	0	0	0	63

* Part 1 Crimes are calculated in accordance with the FBI Uniform Crime Report standards.
 Homicides, Rapes, and Aggravated Assaults are counted by the number of victims.

Part 1 Crimes by Month - Bus

Orange Line	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	YTD
Homicide	0	0	0	0	0	0	0	0	0	0	0	0	0
Rape	0	0	0	0	0	0	0	0	0	0	0	0	0
Robbery	1	0	0	0	1	1	0	0	0	0	0	0	3
Agg Assault	0	0	1	1	3	3	1	3	0	0	0	0	12
Agg Assault on Op	0	0	0	0	0	0	0	0	0	0	0	0	0
Burglary	0	0	0	0	0	0	0	0	0	0	0	0	0
Grand Theft	1	0	0	1	0	0	0	0	0	0	0	0	2
Petty Theft	1	2	1	0	1	4	0	1	0	0	0	0	10
GTA	0	0	1	1	0	1	0	1	0	0	0	0	4
BTFV	0	0	0	0	0	0	0	1	0	0	0	0	1
Arson	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	3	2	3	3	5	9	1	6	0	0	0	0	32

Silver Line	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	YTD
Homicide	0	0	0	0	0	0	0	0	0	0	0	0	0
Rape	0	0	0	0	0	0	0	0	0	0	0	0	0
Robbery	2	1	0	1	0	0	0	0	0	0	0	0	4
Agg Assault	1	0	0	1	0	0	0	0	0	0	0	0	2
Agg Assault on Op	0	0	0	0	0	0	0	0	0	0	0	0	0
Burglary	0	0	0	0	0	0	0	0	0	0	0	0	0
Grand Theft	0	0	0	1	0	0	0	0	0	0	0	0	1
Petty Theft	0	0	0	0	0	0	0	0	0	0	0	0	0
GTA	0	0	0	0	0	0	0	0	0	0	0	0	0
BTFV	0	0	0	0	0	0	0	0	0	0	0	0	0
Arson	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	3	1	0	3	0	0	0	0	0	0	0	0	7

South Bus	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	YTD
Homicide	0	0	0	0	0	0	0	0	0	0	0	0	0
Rape	0	0	0	0	0	0	0	0	0	0	0	0	0
Robbery	4	4	1	2	1	3	4	2	0	0	0	0	21
Agg Assault	2	3	3	0	1	1	1	3	0	0	0	0	14
Agg Assault on Op	0	0	0	0	1	0	0	1	0	0	0	0	2
Burglary	0	0	0	0	0	0	0	0	0	0	0	0	0
Grand Theft	1	2	6	2	1	2	2	0	0	0	0	0	16
Petty Theft	5	0	4	2	6	0	1	2	0	0	0	0	20
GTA	2	0	0	0	0	0	0	0	0	0	0	0	2
BTFV	1	1	1	1	1	0	1	0	0	0	0	0	6
Arson	0	0	0	0	0	1	0	0	0	0	0	0	1
Total	15	10	15	7	11	7	9	8	0	0	0	0	82

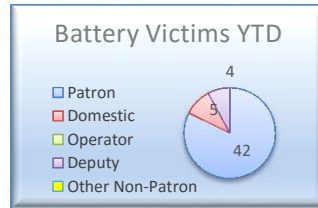
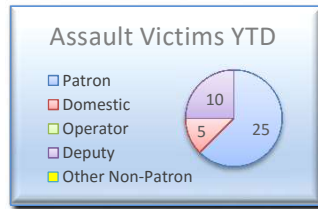
North Bus	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	YTD
Homicide	0	0	0	0	0	0	0	0	0	0	0	0	0
Rape	0	0	0	0	0	2	0	0	0	0	0	0	2
Robbery	6	5	3	1	5	1	7	3	0	0	0	0	31
Agg Assault	6	7	5	8	5	9	3	5	0	0	0	0	48
Agg Assault on Op	0	1	1	0	0	1	0	1	0	0	0	0	4
Burglary	0	0	2	0	0	0	0	0	0	0	0	0	2
Grand Theft	14	9	6	9	5	7	8	1	0	0	0	0	59
Petty Theft	5	11	10	5	4	6	7	3	0	0	0	0	51
GTA	0	1	0	0	0	1	0	1	0	0	0	0	3
BTFV	0	1	3	0	0	0	0	0	0	0	0	0	4
Arson	0	0	1	0	0	0	0	0	0	0	0	0	1
Total	31	35	31	23	19	27	25	14	0	0	0	0	205

Union Station	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	YTD
Homicide	0	0	0	0	0	0	0	0	0	0	0	0	0
Rape	0	1	0	0	0	0	0	0	0	0	0	0	1
Robbery	0	0	0	0	0	0	1	0	0	0	0	0	1
Agg Assault	1	0	0	0	2	0	1	0	0	0	0	0	4
Agg Assault on Op	0	0	0	0	0	0	0	0	0	0	0	0	0
Burglary	2	1	1	0	0	0	0	0	0	0	0	0	4
Grand Theft	0	0	0	0	0	1	2	0	0	0	0	0	3
Petty Theft	3	1	2	2	0	2	1	1	0	0	0	0	12
GTA	0	0	0	0	0	0	0	1	0	0	0	0	1
BTFV	0	0	0	0	0	0	0	0	0	0	0	0	0
Arson	0	0	0	0	1	0	0	0	0	0	0	0	1
Total	6	3	3	2	3	3	5	2	0	0	0	0	27

Total	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	YTD
Homicide	0	0	0	1	0	0	0	0	0	0	0	0	1
Rape	2	1	0	0	0	2	0	0	0	0	0	0	5
Robbery	41	30	22	22	36	35	39	38	0	0	0	0	263
Agg Assault	24	26	21	17	28	26	31	27	0	0	0	0	200
Agg Assault on Op	0	1	1	0	1	1	0	2	0	0	0	0	6
Burglary	2	1	3	0	0	1	0	0	0	0	0	0	7
Grand Theft	39	24	26	31	21	24	26	14	0	0	0	0	205
Petty Theft	27	30	37	32	27	44	31	35	0	0	0	0	263
GTA	8	6	11	5	5	14	13	6	0	0	0	0	68
BTFV	11	7	17	10	7	13	12	7	0	0	0	0	84
Arson	1	0	1	0	1	1	0	1	0	0	0	0	5
Total	155	126	139	118	126	161	152	130	0	0	0	0	1107

BLUE LINE

REPORTED CRIME		
PART 1 CRIMES	Aug	YTD
Homicide	0	1
Rape	0	0
Robbery	11	70
Agg Assault	6	40
Agg Assault on Op	0	0
Burglary	0	0
Grand Theft	4	40
Petty Theft	8	45
Motor Vehicle Theft	1	15
Burg/Theft From Vehicle	4	19
Arson	0	0
SUB-TOTAL	34	230
Selected Part 2 Crimes		
Battery	4	51
Battery Rail Operator	0	0
Sex Offenses	0	11
Weapons	6	26
Narcotics	14	68
Trespassing	7	56
Vandalism	2	37
SUB-TOTAL	33	249
TOTAL	67	479



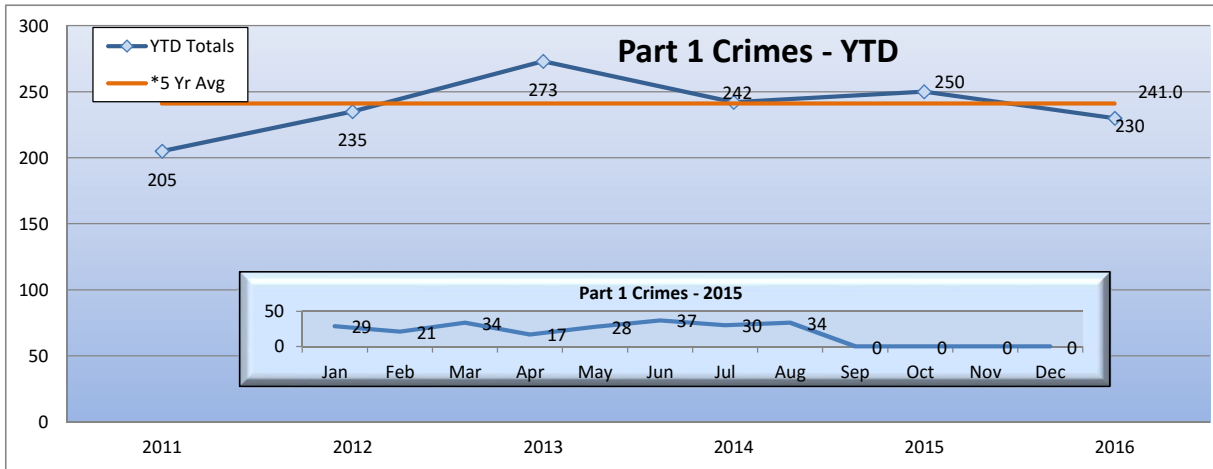
Part 1 Crimes per Station		
Station	Aug	YTD
7th/Metro	2	14
Pico	0	5
Grand	1	4
San Pedro	1	4
Washington	1	2
Vernon	0	6
Slauson	2	11
Florence	2	14
Firestone	2	16
103rd St	1	9
Willowbrook	4	25
Compton	1	13
Artesia	1	18
Del Amo	3	26
Wardlow	3	11
Willow	1	13
PCH	6	19
Anaheim	1	7
5th St	0	2
1st St	1	1
Transit Mall	1	8
Pacific	0	2
Rail Yard	0	0
Total	34	230

ARRESTS		
Type	Aug	YTD
Felony	28	239
Misdemeanor	86	700
TOTAL	114	939

CITATIONS		
Type	Aug	YTD
Fare Evasion Citations	553	5,019
Other Citations	127	934
Vehicle Code Citations	189	1,310
TOTAL	869	7,263

CALLS FOR SERVICE				
TYPE	Aug		YTD	
	Total	Avg	Total	Avg
Emergency	68	5.4	365	6.2
Priority	33	102.4	2,079	14.2
Routine	248	18.9	1,716	21.4
Total	349	24.2	4,160	16.5

FARE ENFORCEMENT		
	Aug	YTD
Ridership	2,211,363	16,849,347
Contacts	155,114	1,153,146
% of Patrons Inspected	7.01	6.84
Boardings	0	0
Ride	701	701
Fare Warning	0	0



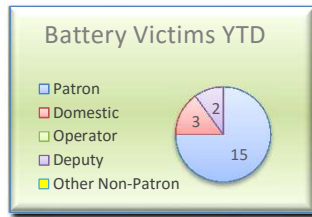
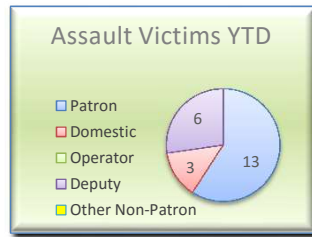
*5 yr average is based on the average of part 1 crimes from 2011 - 2015.

Blue Line Highlights
 The Blue Line had 13 less part 1 crimes, which is a 8% decrease from the same period last year.
 Part 1 crimes per 1,000,000 riders were down from the same period last year.

GREEN LINE

REPORTED CRIME

PART 1 CRIMES	Aug	YTD
Homicide	0	0
Rape	0	1
Robbery	11	67
Agg Assault	6	22
Agg Assault on Op	0	0
Burglary	0	0
Grand Theft	2	32
Petty Theft	1	37
Motor Vehicle Theft	1	33
Burg/Theft From Vehicle	0	26
Arson	0	1
SUB-TOTAL	21	219
Selected Part 2 Crimes		
Battery	0	20
Battery Rail Operator	0	0
Sex Offenses	2	3
Weapons	1	4
Narcotics	1	19
Trespassing	0	2
Vandalism	3	24
SUB-TOTAL	7	72
TOTAL	28	291



Part 1 Crimes per Station

Station	Aug	YTD
Redondo Beach	0	3
Douglas	1	3
El Segundo	0	7
Mariposa	1	4
Aviation	1	12
Hawthorne	2	14
Crenshaw	1	15
Vermont	2	23
Harbor	5	39
Avalon	2	17
Willowbrook	4	21
Long Beach	2	36
Lakewood	0	11
Norwalk	0	14
Total	21	219

ARRESTS

Type	Aug	YTD
Felony	12	62
Misdemeanor	25	141
TOTAL	37	203

CITATIONS

Type	Aug	YTD
Fare Evasion Citations	53	870
Other Citations	37	192
Vehicle Code Citations	206	1,101
TOTAL	296	2,163

CALLS FOR SERVICE

TYPE	Aug		YTD	
	Total	Avg	Total	Avg
Emergency	16	4.1	126	5.9
Priority	83	11.7	711	11.8
Routine	129	16.9	944	19.5
Total	228	14.1	1781	15.5

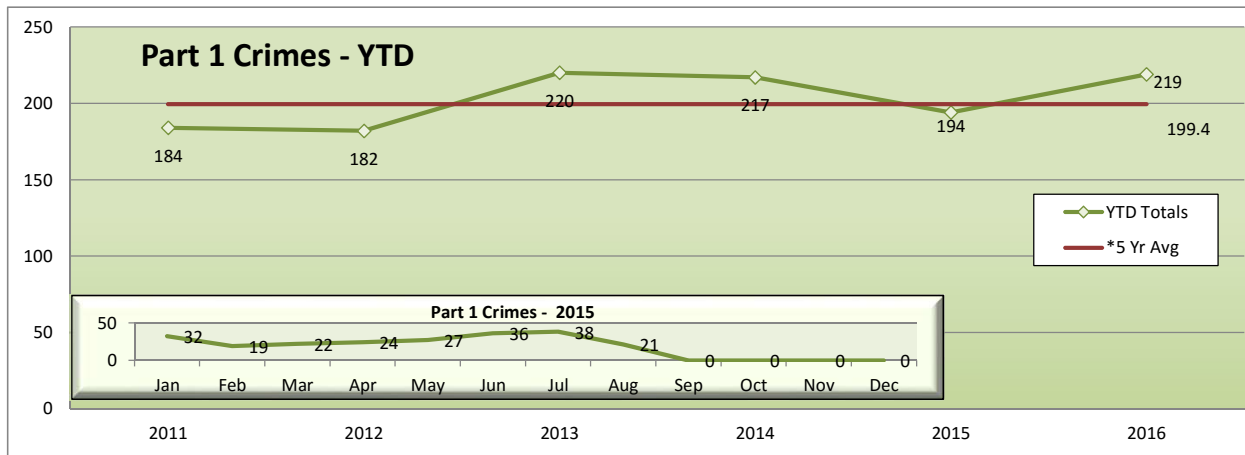
FARE ENFORCEMENT

	Aug	YTD
Ridership	982,710	7,491,309
Contacts	130,074	1,049,782
% of Patrons Inspected	13.24	14.01
Boardings	0	0
Ride	46	46
Fare Warning	0	0

Green Line Highlights

The Green Line had 25 more part 1 crimes, which is a 13% increase from the same period last year.

Part 1 crimes per 1,000,000 riders were up from the same period last year.

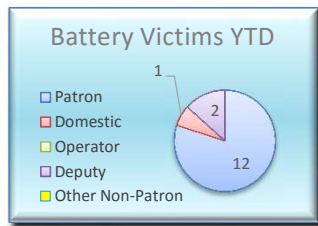
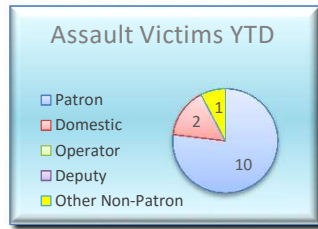


*5 yr average is based on the average of part 1 crimes from 2011 - 2015.

EXPO LINE

REPORTED CRIME

PART 1 CRIMES	Aug	YTD
Homicide	0	0
Rape	0	0
Robbery	3	27
Agg Assault	2	13
Agg Assault on Op	0	0
Burglary	0	0
Grand Theft	3	20
Petty Theft	16	29
Motor Vehicle Theft	0	1
Burg/Theft From Vehicle	1	2
Arson	0	0
SUB-TOTAL	25	92
Selected Part 2 Crimes		
Battery	2	15
Battery Rail Operator	0	0
Sex Offenses	3	5
Weapons	0	0
Narcotics	0	7
Trespassing	0	3
Vandalism	1	9
SUB-TOTAL	6	39
TOTAL	31	131



Part 1 Crimes per Station

Station	Aug	YTD
7th/Metro	0	1
Pico	2	4
23rd St	1	7
Jefferson/USC	0	4
Expo/USC	0	0
Expo/Vermont	0	4
Expo/Western	1	6
Expo/Crenshaw	1	5
Farmdale	0	12
La Brea	1	5
La Cienega	4	6
Culver City	6	21
Palms	1	2
Expo/Westwood	1	1
Expo/Sepulveda	2	4
Expo/Bundy	1	2
26th St /Bergamot	1	2
17th St/SMC	2	2
D/T Santa Monica	1	4
Total	25	92

ARRESTS

Type	Aug	YTD
Felony	4	19
Misdemeanor	11	72
TOTAL	15	91

CITATIONS

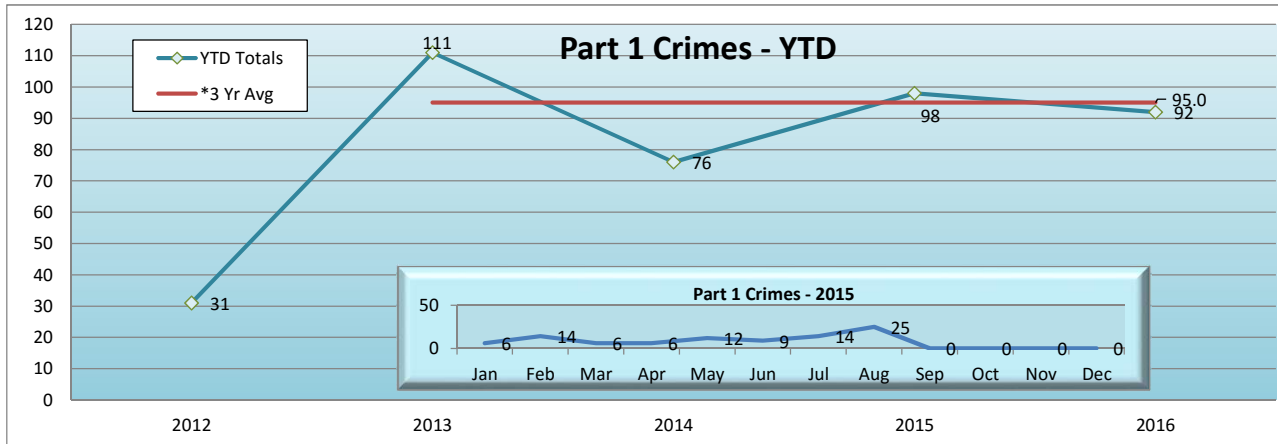
Type	Aug	YTD
Fare Evasion Citations	5	270
Other Citations	1	49
Vehicle Code Citations	18	416
TOTAL	24	735

CALLS FOR SERVICE

TYPE	Aug		YTD	
	Total	Avg	Total	Avg
Emergency	17	4.1	86	5.2
Priority	109	11.9	756	16.7
Routine	119	22.7	605	21.8
Total	245	16.6	1447	16.7

FARE ENFORCEMENT

	Aug	YTD
Ridership	1,261,597	8,167,514
Contacts	63,285	452,762
% of Patrons Inspected	5.02	5.54
Boardings	0	0
Ride	155	155
Fare Warning	0	0



Expo Line Highlights

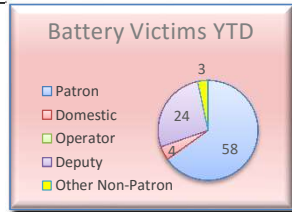
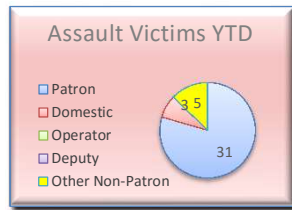
The Expo Line had 6 less part 1 crime, which is a 6% decrease from the same period last year.

Part 1 crimes per 1,000,000 riders were down from the same period last year.

*Expo line opened in April 2012, so a 3 yr average from 2013 - 2015 is calculated.

RED LINE

REPORTED CRIME		
PART 1 CRIMES	Aug	YTD
Homicide	0	0
Rape	0	1
Robbery	7	35
Agg Assault	2	39
Agg Assault on Op	0	0
Burglary	0	0
Grand Theft	4	28
Petty Theft	1	41
Motor Vehicle Theft	1	5
Burg/Theft From Vehicle	0	1
Arson	0	0
SUB-TOTAL	15	150
Selected Part 2 Crimes		
Battery	13	89
Battery Rail Operator	0	0
Sex Offenses	4	17
Weapons	2	7
Narcotics	3	50
Trespassing	7	30
Vandalism	2	19
SUB-TOTAL	31	212
TOTAL	46	362



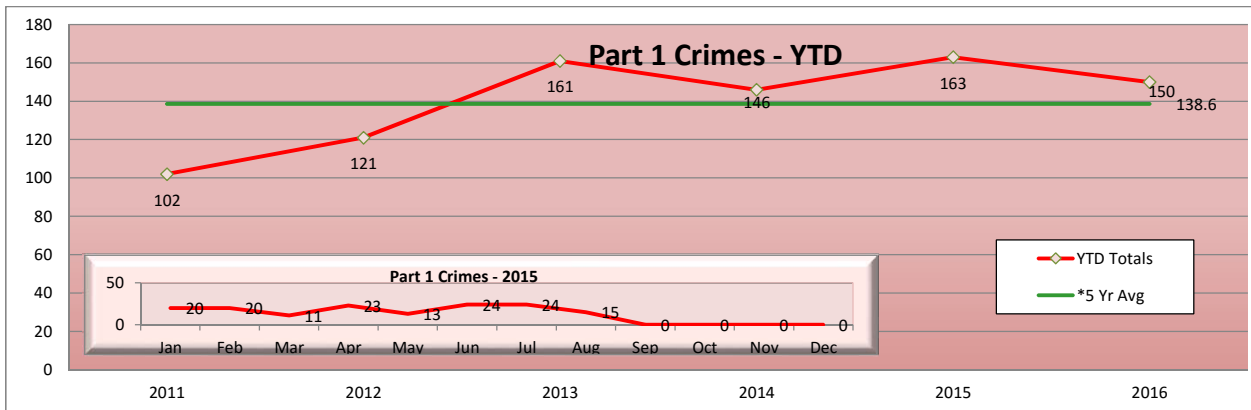
Part 1 Crimes per Station		
Station	Aug	YTD
Union Station	0	14
Civic Center	0	5
Pershing Square	1	9
7th/Metro	0	5
Westlake	2	19
Wilshire/Vermont	3	13
Wilshire/Normandie	0	0
Vermont/Beverly	2	5
Wilshire/Western	1	9
Vermont/Santa Monica	1	8
Vermont/Sunset	0	4
Hollywood/Western	1	6
Hollywood/Vine	1	8
Hollywood/Highland	1	10
Universal	1	8
North Hollywood	1	26
Red Line Rail Yard	0	1
Total	15	150

ARRESTS		
Type	Aug	YTD
Felony	22	168
Misdemeanor	107	650
TOTAL	129	818

CITATIONS		
Type	Aug	YTD
Fare Evasion Citations	1,687	11,346
Other Citations	118	1,033
Vehicle Code Citations	189	1,519
TOTAL	1,994	13,898

CALLS FOR SERVICE				
TYPE	Aug		YTD	
	Total	Avg	Total	Avg
Emergency	31	6.5	232	6.1
Priority	247	17.5	2126	15.3
Routine	216	26.5	1625	24.5
Total	494	20.7	3983	18.5

FARE ENFORCEMENT		
	Aug	YTD
Ridership	4,040,258	30,465,881
Contacts	245,672	2,004,163
% of Patrons Inspected	6.08	6.58
Boardings	0	0
Ride	963	963
Fare Warning	0	0



RED Line Highlights

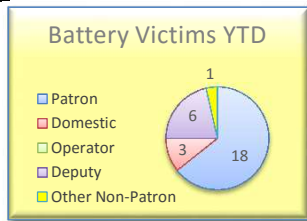
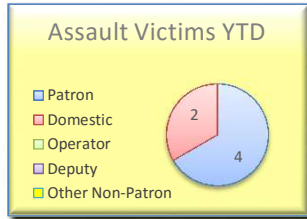
The Red Line had 13 less part 1 crimes which is a 8% decrease from the same period last year.

Part 1 crimes per 1,000,000 riders were down compared to the same period last year.

*5 yr average is based on the average of part 1 crimes from 2011 - 2015.

GOLD LINE

REPORTED CRIME		
PART 1 CRIMES	Aug	YTD
Homicide	0	0
Rape	0	0
Robbery	1	4
Agg Assault	0	6
Agg Assault on Op	0	0
Burglary	0	1
Grand Theft	0	4
Petty Theft	2	18
Motor Vehicle Theft	0	4
Burg/Theft From Vehicle	1	25
Arson	1	1
SUB-TOTAL	5	63
Selected Part 2 Crimes		
Battery	2	28
Battery Rail Operator	0	0
Sex Offenses	1	7
Weapons	0	1
Narcotics	0	8
Trespassing	0	38
Vandalism	2	32
SUB-TOTAL	5	114
TOTAL	10	177



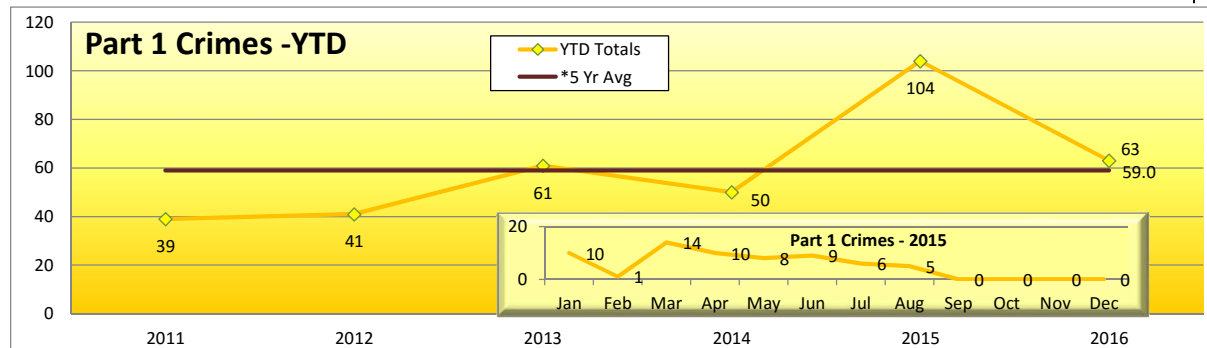
Part 1 Crimes per Station		
Station	Aug	YTD
APU/Citrus College	0	2
Azusa Downtown	0	1
Irwindale	0	1
Duarte	0	1
Monrovia	0	3
Arcadia	2	4
Sierra Madre	0	3
Allen	0	4
Lake	0	1
Memorial Park	0	1
Del Mar	0	0
Fillmore	0	0
South Pasadena	0	1
Highland Park	0	1
SW Museum	0	0
Heritage Square	0	2
Lincoln Heights	0	15
Chinatown	1	3
Union Station	0	0
Little Tokyo	0	0
Pico	0	0
Mariachi	0	0
Soto	0	4
Indiana	0	5
Maravilla	0	0
East La	0	0
Atlantic	2	11
Total	5	63

ARRESTS		
Type	Aug	YTD
Felony	3	27
Misdemeanor	28	200
TOTAL	31	227

CITATIONS		
Type	Aug	YTD
Fare Evasion Citations	158	1,429
Other Citations	14	155
Vehicle Code Citations	97	918
TOTAL	269	2,502

CALLS FOR SERVICE				
TYPE	Aug		YTD	
	Total	Avg	Total	Avg
Emergency	16	6.7	111	6.8
Priority	172	16.6	1045	15.2
Routine	131	22.2	806	23.6
Total	319	18.4	1962	18.2

FARE ENFORCEMENT		
	Aug	YTD
Ridership	1,442,672	10,886,262
Contacts	140,202	1,110,001
% of Patrons Inspected	9.72	10.20
Boardings	0	0
Ride	0	0
Fare Warning	0	0



*5 yr average is based on the average of part 1 crimes from 2011 - 2015.

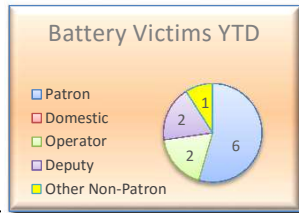
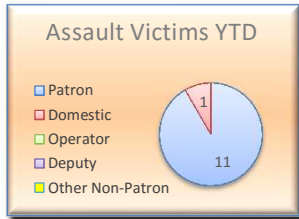
Gold Line Highlights

The Gold Line had 41 less part 1 crimes, which is a 39% decrease of from the same period last year.

Part 1 crimes per 1,000,000 riders were down from the same period last year.

ORANGE LINE

REPORTED CRIME		
PART 1 CRIMES	Aug	YTD
Homicide	0	0
Rape	0	0
Robbery	0	3
Agg Assault	3	12
Agg Assault on Op	0	0
Burglary	0	0
Grand Theft	0	2
Petty Theft	1	10
Motor Vehicle Theft	1	4
Burg/Theft From Vehicle	1	1
Arson	0	0
SUB-TOTAL	6	32
Selected Part 2 Crimes		
Battery	0	9
Battery Bus Operator	1	2
Sex Offenses	0	5
Weapons	0	1
Narcotics	4	17
Trespassing	0	0
Vandalism	0	8
SUB-TOTAL	5	42
TOTAL	11	74



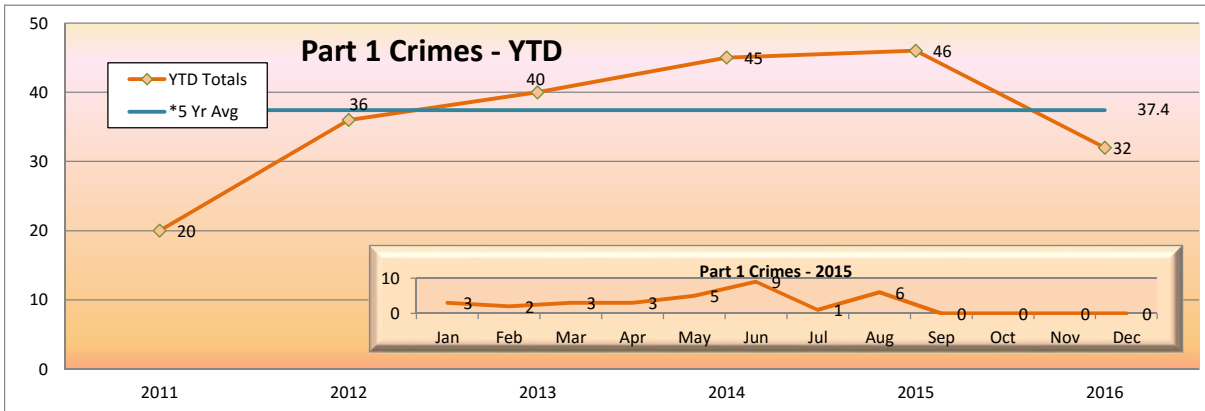
Part 1 Crimes per Station		
Station	Aug	YTD
North Hollywood	1	5
Laurel Canyon	1	2
Valley College	0	0
Woodman	1	3
Van Nuys	0	3
Sepulveda	0	2
Woodley	0	0
Balboa	0	1
Reseda	0	1
Tampa	0	1
Pierce College	1	4
De Soto	0	0
Canoga	0	3
Warner Center	1	1
Sherman Way	0	3
Roscoe	1	1
Nordhoff	0	0
Chatsworth	0	2
Total	6	32

ARRESTS		
Type	Aug	YTD
Felony	3	27
Misdemeanor	26	192
TOTAL	29	219

CITATIONS		
Type	Aug	YTD
Fare Evasion Citations	65	1,444
Other Citations	8	78
Vehicle Code Citations	48	592
TOTAL	121	2,114

CALLS FOR SERVICE				
TYPE	Aug		YTD	
	Total	Avg	Total	Avg
Emergency	6	10.5	45	9.2
Priority	45	15.1	415	14.3
Routine	37	32.3	228	32.2
Total	88	22.0	688	19.9

FARE ENFORCEMENT		
	Aug	YTD
Ridership	636,813	5,176,787
Contacts	67,441	559,524
% of Patrons Inspected	10.59	10.81
Boardings	0	57
Ride	19	19
Fare Warning	0	5



Orange Line Highlights

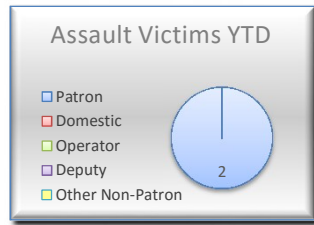
The Orange Line had 14 less part 1 crimes, which is a 30% decrease from the same period last year.

Part 1 crimes per 1,000,000 riders were up from the same period last year.

SILVER LINE

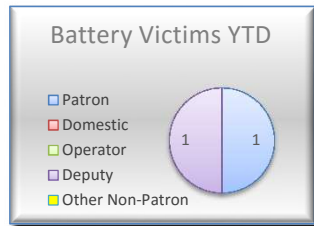
REPORTED CRIME

PART 1 CRIMES	Aug	YTD
Homicide	0	0
Rape	0	0
Robbery	0	4
Agg Assault	0	2
Agg Assault on Op	0	0
Burglary	0	0
Grand Theft	0	1
Petty Theft	0	0
Motor Vehicle Theft	0	0
Burg/Theft From Vehicle	0	0
Arson	0	0
SUB-TOTAL	0	7
Selected Part 2 Crimes		
Battery	0	2
Battery Bus Operator	0	0
Sex Offenses	1	3
Weapons	0	1
Narcotics	0	0
Trespassing	0	0
Vandalism	0	0
SUB-TOTAL	1	6
TOTAL	1	13



Part 1 Crimes per Station

Station	Aug	YTD
El Monte	0	0
Cal State LA	0	0
LAC/USC	0	1
Alameda	0	0
Downtown	0	1
37th St/USC	0	0
Slauson	0	2
Manchester	0	0
Harbor Fwy	0	3
Rosecrans	0	0
Harbor/Gateway	0	0
Total	0	7



ARRESTS

Type	Aug	YTD
Felony	0	3
Misdemeanor	3	13
TOTAL	3	16

CITATIONS

Type	Aug	YTD
Fare Evasion Citations	18	22
Other Citations	37	209
Vehicle Code Citations	23	224
TOTAL	78	455

CALLS FOR SERVICE

TYPE	Aug		YTD	
	Total	Avg	Total	Avg
Emergency	2	0.0	9	4.7
Priority	10	13.5	84	12.4
Routine	12	27.8	79	24.0
Total	24	19.9	172	17.3

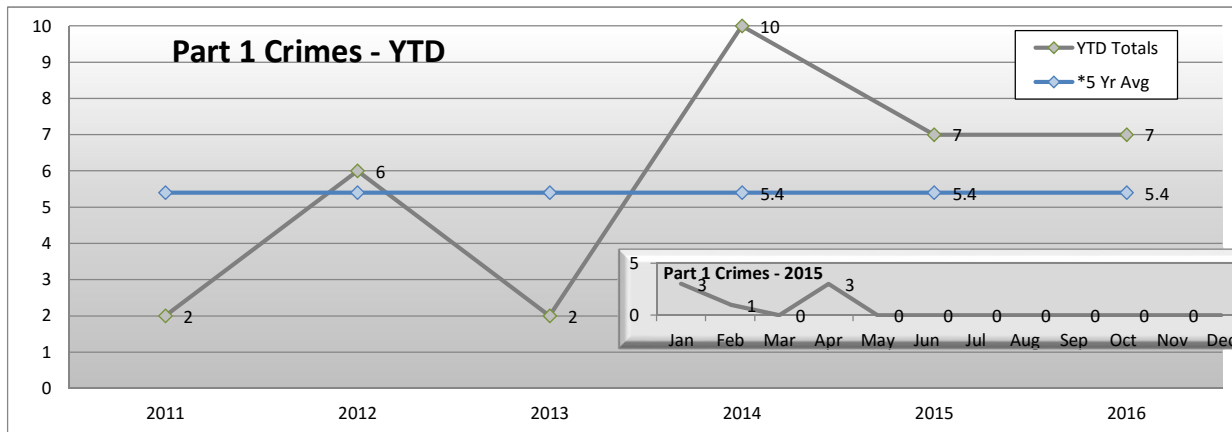
FARE ENFORCEMENT

	Aug	YTD
Ridership	378,440	3,074,105
Contacts	11,367	50,197
% of Patrons Inspected	3.00	1.63
Boardings	0	468
Ride	0	0
Fare Warning	0	29

Silver Line Highlights

The Silver Line had the same amount of part 1 crimes compared to the same period last year.

Part 1 crimes per 1,000,000 riders were down from the same period last year.



*5 yr average is based on the average of part 1 crimes from 2011 - 2015.

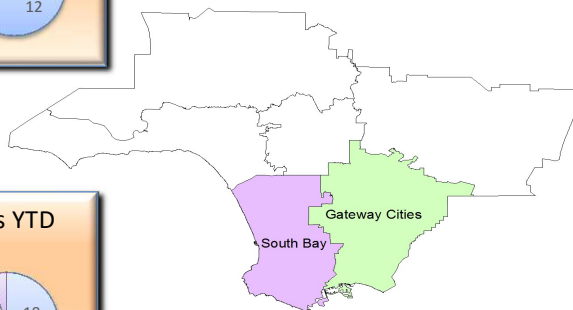
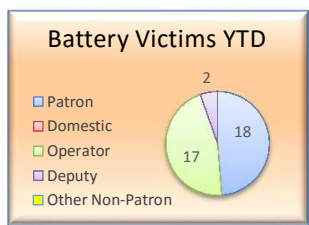
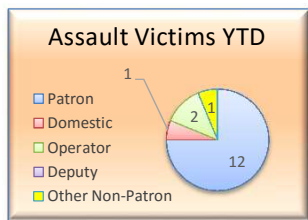
South Bus Patrol

REPORTED CRIME

PART 1 CRIMES	Aug	YTD
Homicide	0	0
Rape	0	0
Robbery	2	21
Agg Assault	3	14
Agg Assault on Op	1	2
Burglary	0	0
Grand Theft	0	16
Petty Theft	2	20
Motor Vehicle Theft	0	2
Burg/Theft From Vehicle	0	6
Arson	0	1
SUB-TOTAL	8	82
Selected Part 2 Crimes		
Battery	6	20
Battery Bus Operator	0	17
Sex Offenses	1	6
Weapons	1	8
Narcotics	0	8
Trespassing	0	1
Vandalism	1	25
SUB-TOTAL	9	85
TOTAL	17	167

Part 1 Crimes per Sector

Sector	Aug	YTD
Gateway Cities	4	18
South Bay	4	64
Total	8	82



ARRESTS

Type	Aug	YTD
Felony	7	68
Misdemeanor	8	242
TOTAL	15	310

CITATIONS

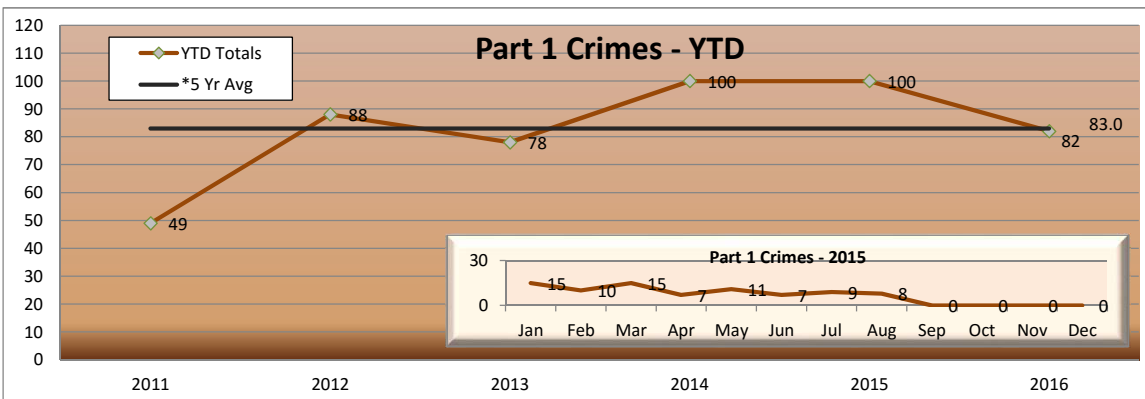
Type	Aug	YTD
Fare Evasion Citations	16	112
Other Citations	2	26
Vehicle Code Citations	14	76
TOTAL	32	214

CALLS FOR SERVICE

TYPE	Aug		YTD	
	Total	Avg	Total	Avg
Emergency	14	7.8	124	8.4
Priority	131	15.8	1,277	16.3
Routine	92	27.2	697	32.7
Total	237	19.7	2,098	21.2

FARE ENFORCEMENT*

*South Bus Fare Enforcement data is combined with North Bus.



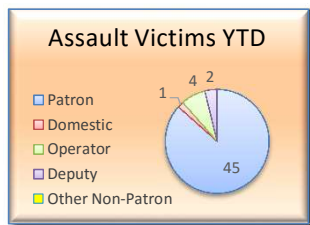
*5 yr average is based on the average of part 1 crimes from 2011 - 2015.

South Bus Highlights

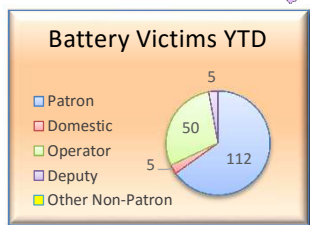
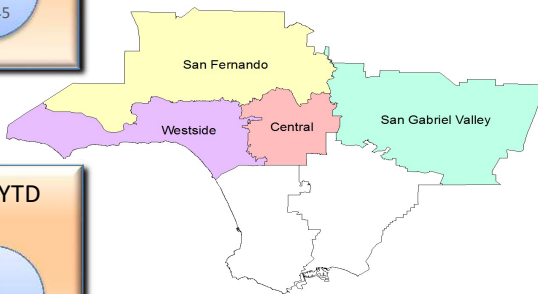
The South bus Lines had 18 less part 1 crime, which is a 18% decrease from the same period last year.

North Bus Patrol

REPORTED CRIME		
PART 1 CRIMES	Aug	YTD
Homicide	0	0
Rape	0	2
Robbery	3	31
Agg Assault	5	48
Agg Assault on Op	1	4
Burglary	0	2
Grand Theft	1	59
Petty Theft	3	51
Motor Vehicle Theft	1	3
Burg/Theft From Vehicle	0	4
Arson	0	1
SUB-TOTAL	14	205
Selected Part 2 Crimes		
Battery	17	122
Battery Bus Operator	4	50
Sex Offenses	3	35
Weapons	2	10
Narcotics	0	20
Trespassing	1	2
Vandalism	19	84
SUB-TOTAL	46	323
TOTAL	60	528



Part 1 Crimes per Sector		
Sector	Aug	YTD
San Gabriel	1	13
Westside	1	12
San Fernando	4	20
Central	8	160
Total	14	205

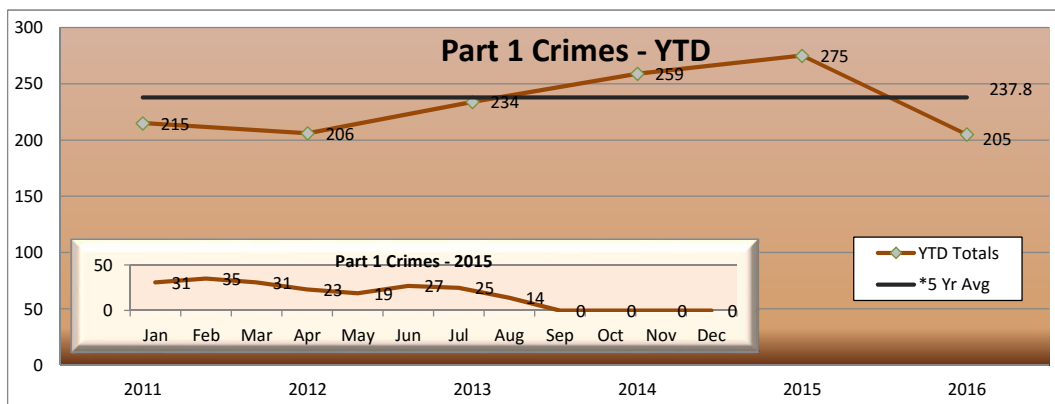


ARRESTS		
Type	Aug	YTD
Felony	11	100
Misdemeanor	52	457
TOTAL	63	557

CITATIONS		
Type	Aug	YTD
Fare Evasion Citations	9	262
Other Citations	9	127
Vehicle Code Citations	1,103	8,418
TOTAL	1,121	8,807

CALLS FOR SERVICE				
TYPE	Aug		YTD	
	Total	Avg	Total	Avg
Emergency	54	8.2	346	8.4
Priority	411	16.6	3,547	16.6
Routine	324	35.9	2,284	28.7
Total	789	24.0	6,177	20.6

FARE ENFORCEMENT		
	Aug	YTD
Ridership*	24,958,589	197,947,189
Contacts	1,031	12,327
% of Patrons Inspected	0.00	0.01
Boardings	2,753	28,682
Rides	1,447	11,066
Fare Warning	491	3,379

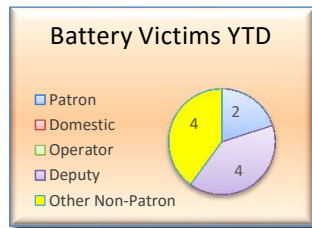
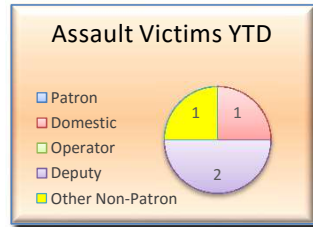


North Bus Highlights
The North Bus Lines had 70 less part 1 crimes, which is a 25% decrease from the same period last year.

*5 yr average is based on the average of part 1 crimes from 2011 - 2015.

Union Station

REPORTED CRIME		
PART 1 CRIMES	Aug	YTD
Homicide	0	0
Rape	0	1
Robbery	0	1
Agg Assault	0	4
Agg Assault on Op	0	0
Burglary	0	4
Grand Theft	0	3
Petty Theft	1	12
Motor Vehicle Theft	0	1
Burg/Theft From Vehicle	0	0
Arson	0	1
SUB-TOTAL	1	27
Selected Part 2 Crimes		
Battery	3	10
Battery Bus Operator	0	0
Sex Offenses	0	1
Weapons	0	0
Narcotics	0	0
Trespassing	0	0
Vandalism	0	4
SUB-TOTAL	3	15
TOTAL	4	42



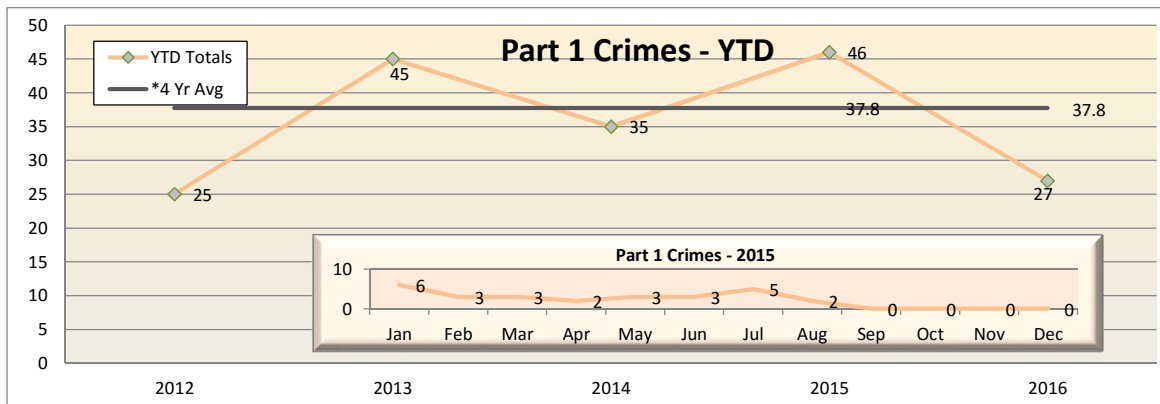
Part 1 Crimes at Union Station		
Side	Aug	YTD
Westside	1	24
Eastside	0	3
Total	1	27



ARRESTS		
Type	Aug	YTD
Felony	5	23
Misdemeanor	13	73
TOTAL	18	96

CITATIONS		
Type	Aug	YTD
Fare Evasion Citations	5	56
Other Citations	40	202
Vehicle Code Citations	0	105
TOTAL	45	363

CALLS FOR SERVICE				
TYPE	Aug		YTD	
	Total	Avg	Total	Avg
Emergency	0	0.0	10	2.6
Priority	19	6.2	215	16.4
Routine	22	8.1	175	14.6
Total	41	7.2	400	15.3



*4 yr average is based on the average of part 1 crimes from 2012 - 2015.

Union Station Highlights

Union Station had 19 less part 1 crimes, which is a 41% decrease from the same period last year.



LOS ANGELES COUNTY SHERIFF'S DEPARTMENT
 TRANSIT POLICING DIVISION
 RONENE M. THOMAS, CHIEF

**ALLOCATION OF LAW ENFORCEMENT SERVICES
 RESERVE COMPANY SERVICES
 August 2016**

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	YTD
TSB San Fernando Valley	12	40	61	21	24	22	16	53					249
Westside/Central Motors	161	120	155	181	189	155	109	171					1241
SGV Volunteer Company	16	21	24	16	16	24	16	16					149
Blue/Green Line Sector	16	16	16	12	32	32	16	8					148
TOTAL	205	197	256	230	261	233	157	248	0	0	0	0	1787

*Each month, Reserve totals will display totals from the previous month because totals are not submitted until the end of each month.

The LASD reserve units are attached to regular LASD units of assignments. The reserves are there to perform the same function as any deputy. In that way, the reserves augment the force at no increase in cost. Contract agencies benefit significantly by the presence of reserves since they are directly paying for the LASD contract and do not have to pay for the additional reserve force.

*N/C = Not Complete

www.lasdreserve.org

Bus Operator Assault Matrix

Reason	Line	Div	Type	Date	Day	Time	Narrative	Flyer	Barrier	Arrest	Charges Requested	Charges Filed	Sentence (Probation/Time/Jail or Prison)
Passenger Pass Up	L244	15	Battery	1/6/2016	Wed	21:00	Sus MB/50/510/180/Blk/Bro spit in the bus op face for passing him up, no barrier	Y					
Fare	L2	10	Battery	1/8/2016	Fri	19:37	Battery sus arrested for bumping bus op outside of bus after she asked for fare, barrier, only half shut			Yes	243.3 PC	243.3 PC	
Fare	L111	18	Battery	1/11/2016	Mon	15:15	Sus MH/35/601/250 spit on the bus op after he was asked for fare	Y					
Demand Stop	L207	18	Battery	1/16/2016	Sat	12:52	Battery sus arrested for spitting on bus op after he wouldn't stop the bus where the sus wanted			Yes	243.3 PC	243.3 PC	
Missed stop	L164	8	Battery	1/17/2016	Sun	17:19	Battery sus arrested for puchning bus op in the face for missing her stop, no barrier			Yes	243.3 PC	243.3 PC	
Fare	L240	8	Battery	1/21/2016	Thu	17:50	Sus MB/18-20 threw cold liquid on bus op after sus stated his TAP card wasn't working, vic said Whatever, no barrier	Y					
Disorderly	L245	8	Battery	2/2/2016	Tue	16:30	Sus FW/25-30 spit on bus op when he asked her to leave for yelling, no barrier						
Other/Bus Pass	L45	1	Battery	2/3/2016	Wed	9:25	Sus MB/25-30/511/thin spit on bus op after he asked to see his day pass	Y					
Policy/door	L243	8	Battery	2/5/2016	Fri	11:30	Battery sus arrested for throwing coin slot cover at bus op for not holding bus for her brother and requesting fare			Yes	243.3 PC	243.3 PC	Case given to Probation for review
No Reason	L-Unk	3	Battery	2/10/2016	Wed	23:20	Sus MH/25/507/508/175 punched bus op in the face unprovoked, no barrier	Y					
Missed stop	L51	2	Battery	2/13/2016	Sat	12:15	Battery sus arrested for hitting bus op in the head with a purse for missing a stop, barrier installed, only bottom portion being used			Yes	242/243.3 PC	242/243.3 PC	Convicted - 12 Months Summary Probation
Other/Calling Police	L115	18	Battery	2/13/2016	Sat	16:10	Battery sus arrested for assaulting vic1 and then spitting on bus op for calling the police			Yes	243.3 PC	243.3 PC	Misdemeanor filed; Case # 6DN05865
Passenger Pass Up	L780	3	Assault	2/17/2016	Wed	14:00	Sus MB/50s/602-603/240 threw beer can at bus op, hit him in the chest, and vic injured elbow in fall outside of bus for passing sus up at stop (no barrier, incident outside of bus)						
Fare	L62	1	Battery	2/19/2016	Fri	9:59	Sus MB/20-25/511/170 reached over barrier and poured water on bus op after he asked for fare, barrier in use						
No Reason	L165	9	Battery	2/20/2016	Sat	11:45	Sus MW/509/170/Bro/Blu grabbed bus op shoulders with both hands and held on, vic pushed him away	Y					
Mentally Ill	L234	15	Battery	2/21/2016	Sun	19:46	Battery sus arrested for attacking bus op and 2 other patrons, mentally ill, happened outside bus (no barrier)			Yes	243.3 PC	243.3 PC	Case Closed/Unable to file Reason: 5150
	L264	9	Sex Crime	2/21/2016	Sun	20:10	L264 City of Hope Hospital 2/21 2010hrs - Sus MB/20-25/511/250/Blk/Bro rubbed his crotch against vic's thigh and grabbed her breast, no barrier						

*Highlighted in yellow: have court dates pending or have been referred to the LA County Attorney's Office with no disposition yet.

ATTACHMENT B

Missed stop	L705	7	Battery	2/26/2016	Fri	16:32	Sus MB/20/507/140 spit on bus op for passing sus stop b/c it was a rapid bus, no barrier	Y						
No Reason	L110	5	Battery	2/27/2016	Sat	13:34	Sus MB/50/600/165/Blk/Bro attempted to assault bus op for no reason, but was unable to get to vic because barrier was up, vic hurt his knee & back avoiding sus							
Policy/Blocking	L2	7	Battery	2/29/2016	Mon	22:20	Sus MW/35/207/150 spit on bus op for telling sus to move bags out of the aisle	Y						
Policy/end of line	L210	18	Battery	3/6/2016	Sun	23:08	Sus MB/20s/508/160/Blk/Bro punched the bus op in the face for vic asking him to leave at the end of the line, no barrier (bus op standing in front of bus)	Y						
Policy/out of service	L704	10	Battery	3/7/2016	Mon	10:00	Battery sus arrested for pushing & punching bus op for asking sus to exit bus at the end of service, no barrier (bus op standing in front of bus)		Yes	242 PC	242 PC		Misdemeanor referred to diff court; Case # 6AR21962	
Policy/drugs	L40	18	Battery	3/9/2016	Wed	15:55	L40 MLK Blvd/Normandie 3/9 1555hrs - Battery sus arrested for throwing cold liquid on the bus op after telling sus he could not board w/ marijuana,							
Policy/Boarding	L487	9	Battery	3/10/2016	Thu	14:20	Battery sus arrested for punching and kicking bus op outside bus when vic told her to board at passenger pickup, no barrier (outside bus)		Yes	243.3 PC	243.3 PC		Misdemeanor filed; Case # 6EM01973, Bk # 4603176	
Other/Closed door on sus	L204	5	Battery	3/11/2016	Fri	23:01	Sus FB/25-35 kicked and slapped the bus op for closing the rear door on her							
Policy/Boarding	L745	10	Battery	3/12/2016	Sat	5:40	Battery sus arrested for spitting on bus op after he told sus he would have to board at the bus stop, (spit through window)		Yes	243.3 PC	243.3 PC		Convicted - 60 days jail & 3 years Summary Probation	
Missed stop	L728	3	Battery	3/17/2016	Thu	10:50	Sus MB/60s/600/160-170/Bald spit on the bus op for rapid bus missing his designated stop, no barrier - but monitor							
Other/Indecent Behavior	L90	15	Assault	3/19/2016	Sat	12:10	Assault sus arrested for swinging plank at bus op outside bus when vic asked sus to exit dur to indecent behavior, no barrier (outside)		Yes	245(a)(4) PC	245(a)(4) PC		Convicted - 3 Years Formal Probation	
Demand Stop	L45	1	Battery	3/19/2016	Sat	15:58	Battery sus arrested for punching bus op in the face and demanded to be let out of the bus		Yes	243.3 PC	243.3 PC		Case Rejected/Reason: Interest of Justice	
Other/Closing door on sus	L270	95	Battery	3/24/2016	Thu	18:00	Sus MW/35-40/600/180 punched the bus op in the face for not stopping to pick him up and closing the doors on his wife							
Fare	L207	5	Battery	3/25/2016	Fri	18:40	Sus MB/510/180/40yrs spit on bus op over not having fare	Y						
Missed stop	L207	5	Battery	3/26/2016	Sat	17:55	Sus FB/18-25/504/slim/Brn/Brn threw dirt on bus op after missing stop							
Missed stop	L45	1	Battery	3/27/2016	Sun	10:41	Sus FB/506/160/30-40 punched bus op 3 times for missing stop	Y						
Demand Stop	L234	15	Battery	3/29/2016	Tue	16:16	MB sus arrested for punching bus op after he demanded a stop		Yes	243.3 PC	243.3 PC		Felony filed; Case # LA083122; Arraignment Hearing 9/20/16	
Fare	Dash		Battery	4/14/2016	Thu	15:00	Sus FW/27/508/200 struck bus op in face after she asked for fare; sus not arrested due to developmental disability		Yes	243.3PC	243.3PC		Sus not arrested due to developmental disability	

*Highlighted in yellow: have court dates pending or have been referred to the LA County Attorney's Office with no disposition yet.

ATTACHMENT B

Fare	L200	2	Battery	4/18/2016	Mon	20:20	Sus FH/500/50s punched bus op in shoulder over fare - no barrier							
Other	L51	2	Battery	4/22/2016	Fri	17:00	Sus MH/509/145/40-50yrs punched bus op b/c of his driving							
Policy/Hazardous Materials	L762	9	Battery	4/25/2016	Mon	16:12	Sus MH/507-508/215-220 threw liquid onto bus op b/c he wouldn't let him board with hazardous materials, no barrier	Y						
Fare	L745	10	Battery	4/29/2016	Fri	13:13	Sus MB/21-22/506/130/Blk/Bro spit on the bus op when she wouldn't let him ride for free, no barrier	Y						
Missed stop	L120	18	Battery	4/29/2016	Fri	17:55	Sus FB/18-20/500/120/Blk/Bro spit on bus op b/c she wanted to exit the bus, barrier not used properly	Y						
Missed stop	L53	1	Battery	4/30/2016	Sat	15:45	Sus MH/35-40/507/200 poked the bus op in the arm asking to be let out							
Policy/end of line	L-Orange	8	Battery	5/5/2016	Thu	14:45	Sus MH/26/602/173 took a swing at bus op after he told sus to exit the bus when it was having mechanical problems, vic non-desirous; no barrier, incident outside bus							
No Reason	L110	5	Assault	5/5/2016	Thu	5:38	Sus MH/508/215/Blk/Bro attempted to stab bus op w/ screwdriver, no barrier	Y						
Policy/out of service	L2	1	Battery	5/10/2016	Tue	8:05	Sus MW/510/200/Blk spit on bus op when he asked sus to leave b/c bus was out of service, barrier not used properly, half closed	Y						
Missed stop	L45	3	Battery	5/10/2016	Tue	17:15	Sus MB/38/511/185/Blk/Bro struck the bus op in the neck when he didn't stop the bus where the vic wanted to exit	Y						
Disorderly	L210	18	Battery	5/12/2016	Thu	9:30	Battery sus arrested for throwing cup at bus op for telling sus to exit when he was harrasing patrons		Yes	243.3PC	243.3 PC		Misdemenaor filed - City Attorney	
Disorderly	L612	2	Assault	5/12/2016	Thu	17:47	Assault sus arrested for punching bus op in the face after she was asked to exit for being too loud		Yes	245(a)(1) PC & 243.3 PC	245(a)(1) PC & 243.3 PC		Felony filed; Case # BA446659	
Policy/standing	L28	3	Battery	5/13/2016	Fri	17:01	Sus MH/506/200/Blk/Bro spit on bus op when she asked him to take a seat	Y						
No Reason	L704	10	Battery	5/15/2016	Sun	17:25	Sus FB/45/506/165/Bro/Bro wiped her fingers on bus op for no reason, then exited, no barrier	Y						
Missed stop	L40	18	Battery	5/23/2016	Mon	18:30	Sus FB/18-25/508-511/100-120 spit on bus op for missing sus stop, no barrier	Y						
Passing up sus	L740	5	Battery	5/23/2016	Mon	18:51	Sus FB/45-50/510/162/Red/Bro spit and punched bus op for almost passing her up, no barrier	Y						
Mentally Ill	L28	3	Battery	5/29/2016	Sun	15:55	Battery sus arrested for choking and punching bus op because he wanted to go back to jail, no barrier		Yes	243.3 PC	243.3 PC		Misdemeanor filed; Case # 6MZ00636; Further proceedings 9/16/16	
Mentally Ill	L204	5	Battery	6/5/2016	Sun	13:35	MB sus spit on bus op, possibly mental illness, Sus ID'd, vic non-desirous, no barrier							
Fare	L260	9	Battery	6/6/2016	Mon	14:15	MA sus arrested for hitting bus op over fare		Yes	243.3 PC	243.3 PC		Misdemeanor filed; Case # 6ES02852; pre-trial hearing 9/27/16	

*Highlighted in yellow: have court dates pending or have been referred to the LA County Attorney's Office with no disposition yet.

ATTACHMENT B

Disorderly	L40	5	Battery	6/6/2016	Mon	15:00	Sus FB/504/115/20 threatened bus op and spit on her							
Disorderly	L762	9	Battery	6/7/2016	Tue	21:00	Sus MH/510/180/braids punched bus op in face when she told sus to sit down, no barrier							
Fare	L733	10	Battery	6/14/2016	Tue	16:35	MB sus arrested for kicking bus op over fare	Yes	243.3 PC	243.3 PC		Case declined; Referred to CA for Misdemeanor consideration		
Other	L210	18	Assault	6/14/2016	Tue	15:20	Sus MB/511/250/45 attempted to hit bus op with baton, road rage							
No Reason	L4	10	Battery	6/17/2016	Fri	5:00	Sus MH/510/240/35yrs punched bus op for no reason, no barrier							
Fare	L758	8	Battery	6/18/2016	Sat	12:05	Sus FW/Blonde/45 spat on bus op over fare	Y						
No Reason	L51	2	Battery	6/18/2016	Sat	17:17	Sus MB/510/180/30-35yrs slapped bus op in the back of head for no reason	Y						
Driving slow	L20	7	Battery	6/19/2016	Sun	7:18	Battery sus arrested for punching bus op in the arm for taking too long to let wheelchair patron off bus, no barrier	Yes	243.3 PC	243.3 PC		Case Rejected/City Attorney Reason: Interest of Justice		
	L460	1	Sex Crime	6/20/2016	Mon	5:43	Sus MB/40/500-501/180 exposed himself to bus driver as she pulled into bus layover							
Passing up sus	L20	10	Battery	6/21/2016	Tue	15:45	Sus MH/25-30/506/180/Blk/Bro spit on the bus op for passing him at previous stop, barrier not used properly, only bottom half used	Y						
Missed stop	L2	7	Battery	7/3/2016	Sun	15:55	Battery sus arrested for spitting on bus op when she missed his stop due to construction	Yes	242 PC & 243.35(a) PC	242 PC & 243.35(a) PC		Misdemeanor filed w/ City Attorney		
Disorderly	L-Orange	8	Assault	7/7/2016	Thu	23:00	Assault sus arrested for spray painting bus op in the face & punching him for telling him to turn down music	Yes	244 PC	244 PC		Case Pending; Case # 36363164		
Disorderly	L260	9	Battery	7/12/2016	Tue	16:20	Battery sus arrested for running wheelchair into bus op's leg and punching him multiple times; no barrier (incident in aisle of bus)	Yes	243.3 PC	243.3 PC		Case Submitted for filing on 8/9/16; Arraignment Hearing 9/12/16 Case # 6ES03486		
Blocking bus	L16	1	Battery	7/14/2016	Thu	15:28	Sus MB/24-26/509/160/Blk/Blk spit on bus op & punched him in the face after driver told him to watch out, no barrier (outside of bus)							
Blocking bus	L14	7	Battery	7/15/2016	Fri	15:00	Sus MH/20-25/507/120 spit on bus op outside of his window for passing sus who was on bike, no barrier (outside of bus)							
No Reason	L210	18	Battery	7/21/2016	Thu	11:24	MB sus arrested for hitting bus op for no reason	Yes	243.3 PC	243.3 PC		Waiting for report to be processed		
Policy/out of service	L167	98	Battery	7/22/2016	Fri	13:58	Battery sus arrested for punching bus op when he told sus bus was out of service, no barrier (outside of bus)	Yes	243.3 PC	243.3 PC		Referred to CA for misdemeanor consideration; Case # 36132870		
Passing up sus	L108	5	Battery	7/25/2016	Mon	13:07	Sus FB/502/125/20-24yrs spit and punched bus op multiple times, barrier not used							
Passing up sus	L-Orange	8	Battery	8/2/2016	Tue	1:05	Sus MB/508/150 punched bus op for passing him up when not at bus stop							
Fare	L4	7	Battery	8/4/2016	Thu	15:15	Sus MB/25/510/160 spit on bus op when she asked for fare, barrier not used properly (top portion not shut)							
Policy/Drinking	L757	5	Battery	8/5/2016	Fri	14:35	Sus FB/35-40/506/160 sprayed bus op w/ pepper spray when he told them not to drink Alcohol,							
No Reason	L720	13	Battery	8/6/2016	Sat	10:05	Battery sus arrested for punching bus op in the mouth for no reason,							
Disorderly	L40	13	Assault	8/18/2016	Thu	22:46	Sus MB/20/510/175 punched the bus op in the face after arguing w/ other passengers	Y						
Fare	L2	13	Assault	8/23/2016	Tue	18:20	Sus MB/30/600/160 choked bus op for quoting the fare							
	L28	NF	Sex Crime	8/25/2016	Thu	2:00	Indecent Exp sus arrested for masturbating in front of bus op	Yes						
Fare	L720	13	Battery	8/27/2016	Sat	10:20	Sus MH/40/502-504/140-160 spit on bus op after advising sus his tap card was empty, no barrier							

*Highlighted in yellow: have court dates pending or have been referred to the LA County Attorney's Office with no disposition yet.

**Board Report**

File #: 2016-0778, **File Type:** Informational Report

Agenda Number: 42.

**SYSTEM SAFETY, SECURITY AND OPERATIONS COMMITTEE
EXECUTIVE MANAGEMENT COMMITTEE
OCTOBER 20, 2016**

SUBJECT: ZERO EMISSION BUS PLANS

ACTION: RECEIVE AND FILE

RECOMMENDATION

RECEIVE AND FILE status report on Metro's Zero Emission Bus Plans.

ISSUE

At the April 2016 Metro Board of Directors Meeting, Metro's CEO was asked to provide a status report on Metro's initial plans for Zero Emission Buses and to provide a comprehensive plan to further reduce greenhouse gas emissions by gradually transitioning to a zero emission bus fleet.

DISCUSSION

Metro's current plan for Zero Emission Buses (ZEB's) and reducing Greenhouse Gas Emissions (GHG) include new engine and fuel deployment and ZEB (electric bus) operational testing. Our approach consists of the following projects and activities:

1. Purchase five (5) New Flyer all-electric articulated buses with depot and en-route chargers for deployment on Metro's Orange Line with expected delivery in late 2017.
2. Purchase five (5) BYD all-electric articulated buses with depot chargers, also for use on Metro's Orange Line, with expected delivery in late 2017.
3. Purchase additional zero emission buses under RFP OP28167 for delivery between FY18 and FY22.
4. Expand use of Low NOx "Near Zero" CNG engines and Renewable Natural Gas (RCNG) for all new bus purchases and for mid-life engine repowers starting in FY18.

Given the rapid growth in ZEB technology and the strong possibility that today's technology may be dated in a couple of years, the first two ZEB projects will be used to gain first-hand experience with two prominent ZEB approaches, i.e. en-route charging and depot charging; and with operational

testing of the newest ZEB long range battery technology.

For additional ZEB's that may be purchased between FY18 and FY22, Metro will need to consider that costs and operational capabilities of ZEB technologies are maturing rapidly. ZEB's that are available today (in 2016) are more expensive to buy and to operate. ZEB's currently impose operational compromises such as limited operating range and battery charging requirements that need to be tested in a larger scale than previously. While Metro does plan to gradually build up Metro's ZEB fleet over the next 3-5 years, this assumes successful operational testing and experience; and that ZEB technologies continue to evolve. Assuming that occurs, Metro would expect to accelerate the rate that ZEB's are brought into Metro's bus fleet in the future.

The more immediate term strategy for air quality improvement is to consider purchasing "Near Zero" Cummins-Westport Low NOx ISL-G engines and renewable natural gas (RCNG) fuel for both new and repowered CNG buses. According to the fleet emission modeling done by Metro's technical consultant, this approach will have significant regional air quality benefits, including reducing NOx emissions for Metro's bus fleet by an additional 90%, and greenhouse gas emissions by an additional 80% below current fleet emission levels. This is the most cost effective approach that provides immediate emission and regional air quality benefits.

Low NOx engines were certified by CARB and EPA in 2015. The Low NOx engines may be run using existing operations infrastructure, and are commercially available today. It is anticipated that the majority of Metro's CNG powered bus fleet will be retrofit with Low NOx engines by 2026.

The attached report from Ramboll/Environ outlines different technology options for Metro to comply with pending CARB ZEB rules. The report provides a high-level cost assessments and emission impacts for several technology options, including battery electric buses, fuel cell buses, and Low NOx "Near Zero" CNG engines. Since the draft report was first released in February 2016, it has been updated and revised based on input from CARB staff and ZEB industry suppliers. As shown in Table 1, the expanded use of Low NOx CNG engines and renewable natural gas appear to be the most impactful strategies. This approach will have the greatest potential for emission reductions for our region at the lowest cost.

As compared to Electric Buses with Depot & En-route charging, Low NOx & RCNG offers:

- Approximately the same reduction in NOx (2.72 vs. 2.83 million tons)
- Approximately 39% greater reductions in GHG (11.4 vs. 8.2 million tons)
- At approximately half the increased costs from the baseline (\$173M vs. \$376.1M)

TABLE 1
ESTIMATED COSTS FOR EMISSION REDUCTION OPTIONS 2015 - 2055

Comparison to Baseline CNG	LNOx & RCNG	Electric Buses		Fuel Cell Buses	
		Depot Charging	Depot & En-Route Charging	H2 from Methane	H2 from Electrolysis
Increased Cost (NPV \$ Million)	\$173.0	\$767.8	\$376.1	\$1,379.3	\$1,680.2
GHG Reductions (million tons)	11.4	8.2	8.2	3.3	6.7
In-Basin NOx Reduction (million tons)	2.72	2.83	2.84	0.07	2.50
Cost Effectiveness					
\$/Ton Reduction of GHG	\$15.19	\$93.71	\$45.69	\$419.43	\$249.84
\$/Ton Reduction of NOx	\$63,530	\$271,638	\$132,667	\$20,247,155	\$670,849

Source: Ramboll/Environ, October 2016

FINANCIAL IMPACT

Staff and consultants will continue to refine our comprehensive cost analysis that encompasses the total life-cycle cost for ZEB implementation. Details of the cost elements include, but are not limited to the necessary infrastructure changes, operation and maintenance costs (including staff training), engine repower mileage impacts, and short term capital cost impacts. Metro expects to pursue a number of competitive federal, state and local grant funding opportunities. Specific funding sources may include FTA “Lo-No” grants, Measure R and a “Buy Back” credit from BYD for the trade-in of Metro’s original BYD 40’ buses.

The recommended bus procurement program, including zero emission buses is expected to be made under RFP OP28167, Forty and Sixty Foot Low Floor CNG or Zero Emission Buses. Funding for these projects will be identified when this contract is awarded. Currently the RFP is an active procurement and in a blackout period. Specific quantities and types of ZE buses to be purchased under RFP OP28167 are to be determined based on Metro’s operational needs, and these ZE buses may be a combination of 40’ and 60’ buses. Each of these ZEB projects will be subject to Metro Board approval and funding availability.

NEXT STEPS

Staff will return to the Board with award recommendations for purchasing new CNG and zero emission buses in early 2017. This will include recommendations for quantities and types of zero

emission buses that are best suited for Metro's operational needs, reflect best performance in field tests, and that fit within Metro's available funding.

ATTACHMENTS

Attachment A - Board Motion April 28, 2016

Attachment B - Staff Responses to Board Requests for ZEB Plans

Attachment C - Updated Ramboll/Environ Report September 29, 2016

Attachment D - List of Transit Properties Running ZEB's

Attachment E - Identified ZEB Suppliers

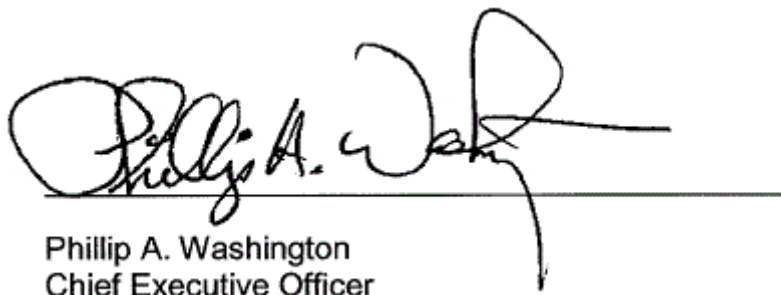
Attachment F - Noise Level Comparison of Conventional Buses and ZEB's

Attachment G - Metro Routes Most Suitable for ZEB Operation

Attachment H - Summary of ZEB Funding Opportunities

Prepared by: John Drayton, Director, Equipment/Vehicle Acquisition (213) 617-6285

Reviewed by: James T. Gallagher, Chief Operations Officer, (213) 922-4424



Phillip A. Washington
Chief Executive Officer

Metro

Los Angeles County
Metropolitan Transportation
Authority
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3rd Floor Board Room
Los Angeles, CA



Board Report

File #:2016-0388, File Type:Informational Report

Agenda Number:

**REGULAR BOARD MEETING
APRIL 28, 2016**

Motion by:

DIRECTORS GARCETTI, SOLIS, FASANA AND DUPONT-WALKER

Related to Item 29

ZERO-EMISSION BUS TECHNOLOGY

As one of the largest transit agencies in the U.S., Metro needs to continue leading the nation in the application of best environmental and sustainable practices. After purchasing its first natural gas bus in 1995, Metro became the largest clean compressed natural gas (CNG) bus fleet in the nation with its last diesel bus retiring in 2011.

With the fast-paced evolution of new and clean technology, the transit industry is adopting and deploying new bus technologies that offer significant economic and environmental benefits. According to the American Public Transportation Association ("APTA"), 46.9 percent of U.S. public transportation buses are using alternative fuels or hybrid technology. Various transit agencies have embraced these advancements such as, but not limited to, the following: Philadelphia ("SEPTA"), Indianapolis ("IndyGo"), Seattle's King County Metro Transit, and Foothill Transit, which has the largest electric bus fleet in the country.

Although mile-range and mass production remains a challenge, continually improving technology and the steady decrease in cost is a clear indication that zero-emission bus vehicles are in high demand.

A strong commitment toward transitioning to a zero-emission bus fleet will position Metro to capitalize on Federal grant programs along with the State of California's cap-and trade programs.

WE THEREFORE MOVE that the Board direct the CEO to:

- A. Develop an initial outline for a comprehensive plan to further reduce greenhouse gas emissions by gradually transitioning to a zero-emission bus fleet;
- B. Report which public transit agencies have deployed zero emission vehicle buses in the U.S.
- C. Identify manufacturers that provide zero emission bus technology for large U.S. transit agencies.

D. Report that provides the following information for zero emission buses:

1. Greenhouse gases and air pollutant levels;
2. Noise levels (i.e. decibels) comparison between conventional Clean Natural Gas ("CNG") and zero emission buses;
3. Production challenges and opportunities to partner with other agencies in large procurements to achieve economies scale discounts;
comparison of long-term maintenance costs.
4. Chronological timeline of the advancements and forecasts in zero emission bus technologies;

E. Provide a report on all mile-range and run times for all current MTA bus routes.

F. Identify possible Federal, State and local funding sources that are eligible for the purchase of zero-emission bus vehicles.

G. For this new bus procurement of advanced transit buses, include the following:

1. Zero emission bus technology cost options for the base order and all other bus purchase options.
2. Increasing and maximizing seating capacity.

H. Report back on the above at the October 2016 MTA Board meeting and provide a semi-annual report thereafter on zero emission bus technology.

RESPONSES TO BOARD REQUEST FOR ZEB PLANS 4/28/16

During the April 28, 2016 Board meeting, staff was directed to report back and provide detailed updates on several items at the October 2016 Board of Directors meeting. Attached are technical responses to these questions, and supporting data is also attached to this report.

- A. **Greenhouse Gas Emission Reduction Options:** Metro's technical consultant, Ramboll/Environ, has provided a detailed assessment of options for reducing greenhouse gas emissions and for transitioning to ZEB's. Key recommendations from this analysis include focusing on using longer range ZE buses and immediately adopting the use of Low NOx "Near Zero" CNG engines and using RCNG for fueling. For certain corridors, such as Metro's Orange Line, there will be opportunities to use specialty ZEB's with en-route opportunity charging. Based on this technology assessment and state of ZE technologies in 2016, Ramboll/Environ does not recommend pursuing fuel cell buses at this time.
- B. **USA ZEB Transit Deployments:** As of April 2016, staff identified 57 transit agencies that are operating a total of 280 zero emission buses in the US.
- C. **Current ZEB Manufacturers:** Staff has identified five (5) major domestic US manufacturers that have produced heavy duty 40' or 60' zero emission buses for large transit agencies in the US: BYD; Proterra; Gillig; New Flyer; and Nova Bus (a subsidiary of Volvo). Of these manufacturers, BYD and Proterra solely produce electric buses; Gillig, New Flyer and Nova offer both electric buses as well as conventionally powered transit buses. In addition to these five manufacturers, there are several other smaller manufacturers that produce light and medium duty transit vehicles in a variety of configurations.
- D. **Additional Updates on Zero Emission Buses:**
1. Greenhouse gases and air pollutant levels. All the programs identified for Zero and Near Zero Emission propulsion systems have impacts on criteria pollutants and GHG emissions. The most cost effective option for emission reductions today is Near Zero CNG engines. Refer to Ramboll/Environ report.
 2. Noise levels (i.e. decibels): Attached is a comparison between conventional CNG and zero emission buses. Based on Altoona noise testing data, the average interior and exterior noise levels for Zero Emission buses are 4-8 dB lower than CNG buses.
 3. Partnering and Scalability: Production challenges and opportunities to partner with other agencies in large procurements to achieve economies of scale discounts; comparison of long-term maintenance costs.

Metro has identified over 50 transit operators who have initiated ZEB programs. No single US transit operator, even the largest operators like LA Metro, have the resources and means to single-handedly support ZEB commercialization. We have also surveyed the five

major US bus manufacturers who have produced heavy duty 40' and 60' buses and will pursue any opportunities to leverage Metro's ZEB investments. We will also continue to reach out to regional municipal transit operators and provide opportunities to partner with Metro on our upcoming bus procurements.

4. Chronological timeline of the advancements and forecasts in zero emission bus technologies; refer to Ramboll/Environ report.

- E. **Metro Routes Suitable for ZEB's** – Metro reviewed all lines and run assignments by operating division, and also looked at potential layover facilities to rank the best corridors for ZEB operation. Out of Metro's 1,900 weekly run assignments, 71% are under 150 miles, and 99% are under 250 miles; many of these lines may be suitable to battery electric buses. However, many of these runs also have extended run times; almost every operating division has run assignments where buses don't return to the home division for 20 hours or more.

The top rated corridor for ZEB's is the Metro Orange Line (MOL) BRT which currently operates 43 articulated buses. The MOL corridor has several advantages for operating ZEB's, including a dedicated right-of-way with no traffic and Metro-owned terminals at each end that can be used for en-route opportunity charging. Metro is also looking at other BRT services like the Silver Line that have similar operational characteristics and advantages for deploying ZEB's.

Attached is a line-by-line assessment of all Metro bus routes and operating divisions to help determine suitability for ZEB operation.

- F. **ZEB Funding Sources** – Attached is a listing of potential Federal, State and local funding sources that are eligible for the purchase of zero-emission bus vehicles.
- G. **ZEB Bus Procurements** – Recommendations from Metro's Board for costing ZE options and considering seating capacity have been included in the new bus solicitation that is currently underway. The full RFP can be found on-line on Metro's Vendor Portal ([here](#)). Staff will report back periodically on the status of these items when they return to the Board with recommendations for contract award(s) based on this solicitation.

UPDATED DRAFT

Intended for

**Advanced Transit Vehicle Consortium
Los Angeles, California**

Prepared by

**Ramboll Environ US Corporation
Los Angeles, California**

**M.J. Bradley & Associates, LLC
Concord, Massachusetts**

Date

September 29, 2016

ZERO EMISSION BUS OPTIONS: ANALYSIS OF 2015-2055 FLEET COSTS AND EMISSIONS

**NEW TRANSIT VEHICLE TECHNOLOGIES AND
ADVANCED TECHNOLOGY IMPLEMENTATION
(OP33203093)**



Date **09/29/2016**

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Ref 06-35843D

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EXECUTIVE SUMMARY

The Los Angeles County Metropolitan Transportation Authority (LACMTA) currently operates an active fleet of 2,194 urban transit buses in fixed-route service throughout the Los Angeles metropolitan area. All of LACMTA's buses are compressed natural gas (CNG) buses which operate on standard natural gas procured from the local natural gas utility. LACMTA fuels these buses at eleven CNG fuel stations located on LACMTA property at various locations throughout the city.

LACMTA continually renews their bus fleet by purchasing new buses and retiring their oldest buses. Their general policy is to keep buses in service for 14 years; as such approximately 7% of the fleet is replaced each year with new buses.

This report summarizes the results of modeling to estimate capital and operating costs, as well as exhaust emissions, for the LACMTA bus fleet over the period 2015 – 2055 under five different future bus technology/fuel purchase scenarios:

- 1) **BASELINE:** Continue to purchase standard CNG buses to replace retiring buses, and continue to purchase conventional natural gas.
- 2) **RENEWABLE NATURAL GAS:** Beginning in 2016 start to phase in the purchase of renewable natural gas (RNG), with 100% of natural gas use by the bus fleet renewable gas after 2017. Continue to purchase standard CNG buses to replace retiring buses.
- 3) **RENEWABLE NATURAL GAS PLUS LOW NO_x BUSES:** In addition to phasing in the use of renewable natural gas, in 2019 begin to purchase new CNG buses with "Low NO_x" engines (LNO_x), certified to have NO_x, CH₄, and PM emissions 92%, 72% and 50% lower, respectively, than emissions from "standard" natural gas engines that meet California Air Resources Board new engine standards. In addition, beginning in 2018 begin to repower old buses with new Low NO_x engines during their mid-life overhaul. Under this scenario the entire fleet will turn over to Low NO_x natural gas engines by 2028.
- 4) **ELECTRIC BUSES:** Starting in 2025 replace all retiring buses with battery-electric buses. Under this scenario the entire bus fleet will turn over to electric buses by 2039. There are two options for battery charging under this scenario: 1) charging at the bus depot only, and 2) charging at the bus depot and in-route throughout the day.
- 5) **FUEL CELL BUSES:** Starting in 2025 replace all retiring buses with hydrogen fuel cell buses. Under this scenario the entire bus fleet will turn over to fuel cell buses by 2039. There are two options for producing the necessary hydrogen fuel under this scenario: 1) produce hydrogen on-site at LACMTA depots using steam reformation of natural gas (SMR), and 2) produce hydrogen on-site at LACMTA depots using electrolysis of water.

Scenarios four and five represent current options available to transit agencies under the California Air Resources Board's (CARB) proposed Zero Emission Bus (ZEB) rule. Scenario three is an alternative approach to reducing both GHG and NO_x emissions that could be considered as an alternative method to meet the intent of CARB's ZEB rule.

This September 2016 updated draft report is a revision to a Draft report released by LACMTA/ATVC in February 2016 ("draft analysis"). It incorporates updated assumptions based on newly available information. The major differences between this revised analysis and the draft analysis include:

- Fuel costs for electricity used to power battery buses, and hydrogen used to power fuel cell buses, presented in this revised analysis, are net of credits that LACMTA could generate under California's Low Carbon Fuel Standard (LCFS). LCFS credits for electricity and hydrogen were

not included in the draft analysis. Commercial providers of Renewable Natural Gas can also generate credits under LCFS, and these credits were implicitly included in LACMTA's projected cost of RNG in the draft analysis, as well as in this revised analysis.

- Projected purchase and overhaul costs for battery-electric and fuel cell buses were revised downward based on feedback from bus manufacturers. The revised prices reflect recent, significant reductions in near-term battery prices (2017 – 2020) as well as recent projections of continued, significant battery cost reductions through 2030.
- Revised assumptions for projected average energy use (kWh/mi) for electric buses in LACMTA service. The revised assumptions are based on the average energy use from a fleet of five 40-ft electric buses recently put into service by LACMTA, which has accumulated approximately 30,000 in-service miles to date. In this revised analysis, electric buses are projected to use approximately 20% more energy per mile than was assumed in the draft analysis.
- Revised assumptions for projected average range per charge for electric buses, based on the revised assumptions for average energy use, as well as revised assumptions about the battery capacity of commercially available electric buses after 2025. Based on feedback from bus manufacturers, and recent developments, this analysis assumes that future electric buses will have approximately 20% larger battery packs than was assumed in the draft analysis, thus increasing their expected range per charge. The effect of the larger projected battery packs on range is, however, offset by projected greater energy use per mile.
- Revised assumptions about the practical replacement ratio of in-service CNG buses with battery-electric buses. The revised assumptions are based on an analysis of all of LACMTA's week-day scheduled bus assignments (time and mileage in-service), compared to the revised assumptions for practical battery bus range per charge. This analysis is summarized in Section 2.1 and 2.2. This analysis determined that lower replacement ratios would be required in the 2025 – 2035 time frame than was assumed in the draft analysis (i.e. fewer electric buses would be required to replace CNG buses).

Note that on 9/12/16 one electric bus manufacturer (Proterra) released preliminary information about an extended range version of their 40-ft transit bus, which can carry up to 660 kWh of batteries, potentially extending practical electric bus range beyond that estimated in this analysis. Significant questions remain unanswered about this bus, including its purchase cost, its in-use energy use in LACMTA service, its passenger capacity, and the manufacturer's production capability and timing. As such, this updated draft report does not incorporate the potential effect of this bus on future electric bus costs.

LACMTA currently has an active solicitation for purchase of 40-ft and 60-ft buses, including electric buses, with bids due in January 2017. It is expected that this solicitation will yield better information about the near-term purchase costs and technical capabilities of electric buses from several manufacturers, including the Proterra extended range bus.

When this information is available, this analysis will be updated again, with revised assumptions that reflect the new information. It is expected that this next update will be available in late January 2017.

SUMMARY OF RESULTS

Table 1 summarizes the net present value of total estimated fleet costs from 2015 – 2055 under each scenario in 2015 dollars. As shown, the use of RNG by itself is not projected to increase total fleet costs. The use of RNG and the transition to LNOx buses is projected to increase total fleets costs by \$173 million over the next 40 years, an increase of \$0.001 per revenue seat-mile, which is 1.1% greater than projected baseline costs.

The transition to electric buses is projected to increase total fleets costs by \$376 - \$768 million over the next 40 years, an increase of \$0.003 - \$0.006 per revenue seat-mile, which is 2.3% - 4.7% greater than projected baseline costs. Exclusive depot charging is projected to be more expensive than depot and in-route charging.

The transition to fuel cell buses is projected to increase total fleets costs by \$1.4 - \$1.7 billion over the next 40 years, an increase of \$0.012 - \$0.014 per revenue seat-mile, which is 8.5% - 10.3% greater than projected baseline costs. Production of hydrogen fuel for fuel cell buses using electrolysis is projected to be more expensive than hydrogen production using SMR.

Table 1. LACMTA Zero Emission Bus NPV Estimated Total Fleet Costs 2015 - 2055 (2015 \$ million)

Cost Element		BASILINE	RENEW NG	LOW NOx CNG BUS & REPOWER		ELECTRIC BUS		FUEL CELL BUS	
		Std CNG Bus Conv NG	Std CNG Bus RNG	LNOx Bus Conv NG	LNOx Bus RNG	Depot Charging	Depot & In- Route Charging	H ₂ by SMR	H ₂ by Electrolysis
Capital	Bus Purchase	\$2,299.1	\$2,299.1	\$2,332.0	\$2,332.0	\$3,031.6	\$2,931.4	\$3,133.2	\$3,133.2
	Bus Repower			\$100.3	\$100.3				
	Bus mid-life OH	\$164.2	\$164.2	\$173.2	\$173.2	\$307.3	\$280.8	\$609.1	\$609.1
	Depot Mods					\$61.1	\$36.0	\$49.8	\$49.8
	Fuel Infra	\$0.0	\$0.0	\$0.0	\$0.0	\$49.3	\$63.6	\$165.2	\$165.2
	<i>sub-total</i>	<i>\$2,463.3</i>	<i>\$2,463.3</i>	<i>\$2,605.5</i>	<i>\$2,605.5</i>	<i>\$3,449.3</i>	<i>\$3,311.7</i>	<i>\$3,957.4</i>	<i>\$3,957.4</i>
Operating	BO Labor	\$10,441.4	\$10,441.4	\$10,441.4	\$10,441.4	\$10,663.5	\$10,441.4	\$10,441.4	\$10,441.4
	Fuel	\$1,244.4	\$1,244.4	\$1,248.3	\$1,248.3	\$862.5	\$844.9	\$1,071.4	\$1,372.3
	Maintenance	\$2,128.6	\$2,128.6	\$2,155.6	\$2,155.6	\$2,070.3	\$2,055.9	\$2,186.9	\$2,186.9
	<i>sub-total</i>	<i>\$13,814.4</i>	<i>\$13,814.4</i>	<i>\$13,845.3</i>	<i>\$13,845.3</i>	<i>\$13,596.3</i>	<i>\$13,342.2</i>	<i>\$13,699.7</i>	<i>\$14,000.5</i>
TOTAL		\$16,277.7	\$16,277.7	\$16,450.8	\$16,450.8	\$17,045.6	\$16,653.9	\$17,657.1	\$17,957.9
INCREASE		NA	\$0.00	\$173.03	\$173.03	\$767.85	\$376.14	\$1,379.33	\$1,680.15
AVG \$/mile		\$4.18	\$4.18	\$4.22	\$4.22	\$4.27	\$4.28	\$4.53	\$4.61
AVG \$/revenue seat-mile	Value	\$0.138	\$0.138	\$0.139	\$0.139	\$0.144	\$0.141	\$0.150	\$0.152
	% diff to baseline	NA	100.0%	101.1%	101.1%	104.7%	102.3%	108.5%	110.3%

Table 2 summarizes total estimated fleet emissions from 2015 – 2055 under each scenario. This data is also shown in Figure 1.

As shown, compared to the baseline the use of RNG is estimated to increase NOx emitted within the South Coast Air Basin¹ over the next 40 years by 1% and reduce PM emitted within the basin by 128%. The use of RNG will also reduce NOx and PM emitted outside of the South Coast Air Basin over

¹ The South Coast Air basin encompasses Orange County and parts of Los Angeles, San Bernardino, and Riverside counties in southern California, including the entire city of Los Angeles.

the next 40 years by 82% and 600% respectively. PM emissions decrease by more than 100% because both in-basin and out-of-basin upstream PM emissions from production of RNG are negative due to credits, more than offsetting all tailpipe PM emissions from CNG buses.

The use of RNG will reduce CH₄ emissions by 2%, reduce CO₂ emissions by 81% and reduce total CO₂-equivalent GHG emissions by 70%.

Table 2. LACMTA Zero Emission Bus Estimated Total Fleet Emissions (tons) 2015 - 2055

Pollutant	BASELINE	RENEW NG	LOW NOx CNG BUS & REPOWER		ELECTRIC BUS		FUEL CELL BUS	
	Std CNG Bus	Std CNG Bus	LNOx Bus	LNOx Bus	Depot Charging	Depot & In-Route Charging	H ₂ by SMR	H ₂ by Electrolysis
	Conv NG	Renew NG	Conv NG	Renew NG				
NOx (in-basin)	6,296	6,385	3,483	3,573	3,444	3,431	6,228	3,792
PM (in-basin)	81.1	-22.8	79.0	-25.4	40.0	39.7	723.5	49.1
CH₄	89,590	87,421	76,590	74,414	41,124	40,965	59,292	45,651
CO₂	13,637,506	2,618,086	13,681,149	2,624,750	6,537,416	6,486,030	11,106,350	8,011,017
GHG (CO₂-e)	15,877,260	4,803,609	15,595,906	4,485,096	7,565,519	7,510,164	12,588,639	9,152,286
NOx (Out-of-basin)	10,157	1,785	10,190	1,789	4,954	4,910	6,410	6,228
PM (out-of-basin)	110.4	-551.7	110.7	-553.5	70.1	68.3	73.0	117.5

Compared to the baseline the use of RNG and the transition to LNOx buses is projected to reduce NOx and PM emitted within the South Coast Air Basin over the next 40 years by 43% and 131%, respectively, and to reduce NOx and PM emitted outside of the South Coast Air Basin over the next 40 years by 82% and 602%, respectively. PM emissions decrease by more than 100% because upstream PM emissions from production of RNG are negative due to credits, more than offsetting all tailpipe PM emissions from LNOx CNG buses. The use of RNG and LNOx CNG buses will reduce CH₄ emissions by 17%, will reduce CO₂ emissions by 81% and will reduce total CO₂-equivalent GHG emissions by 72%.

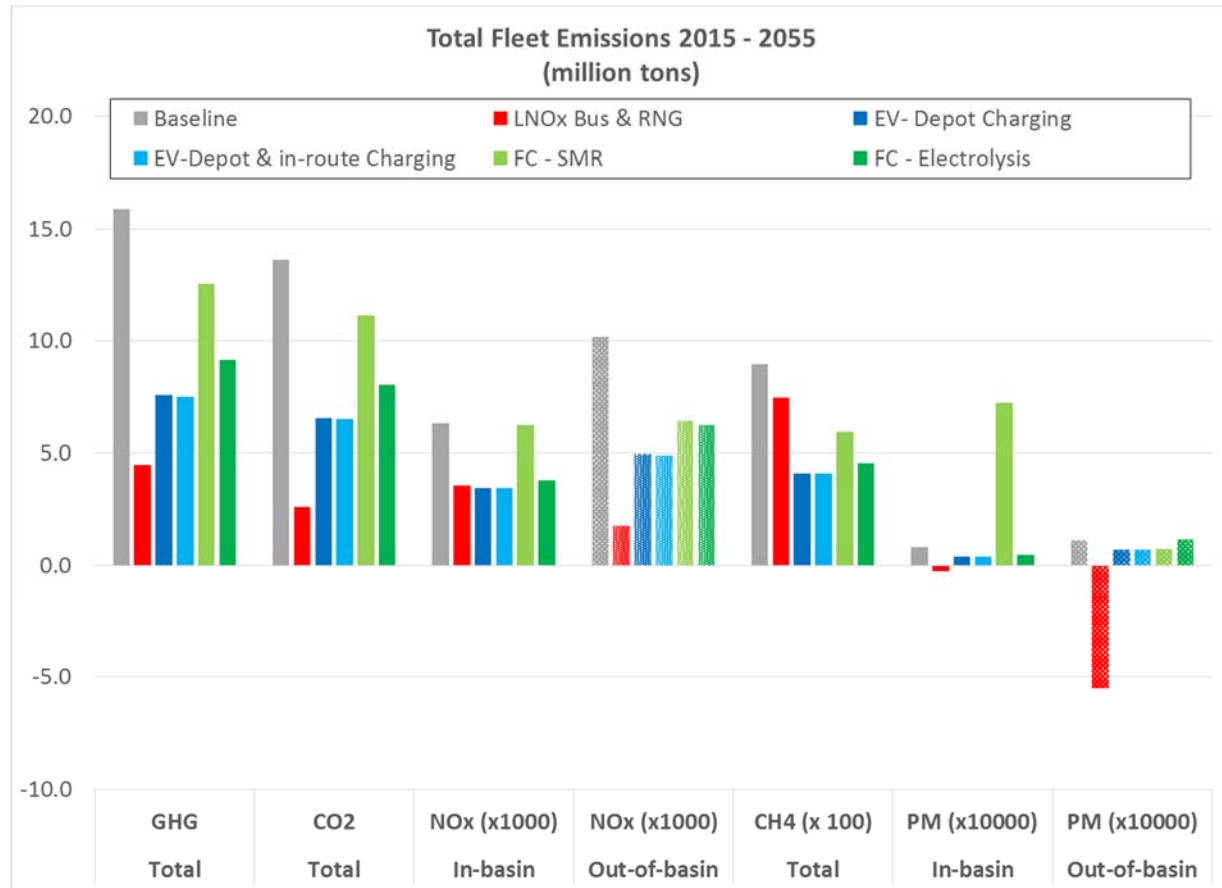
Compared to the baseline the transition to electric buses is projected to reduce NOx emitted within the South Coast Air Basin over the next 40 years by 45% -46%, and to reduce NOx emitted outside of the South Coast Air Basin over the next 40 years by 51% - 52%. It will also reduce PM emitted within the South Coast Air Basin over the next 40 years by 51%, and reduce PM emitted outside of the South Coast Air Basin over the next 40 years by 51% -52%. The transition to electric buses will reduce CH₄ emissions by 54%, reduce CO₂ emissions by 52%, and reduce total CO₂-equivalent GHG emissions by 52% - 53%. The use of depot and in-route charging will reduce emissions slightly more than the use of depot charging only, due to fewer in-service bus miles.

Compared to the baseline, the transition to fuel cell buses is projected to reduce NOx emitted within the South Coast Air Basin over the next 40 years by 1% - 40%, and to reduce NOx emitted outside of the South Coast Air Basin over the next 40 years by 37% - 39%. The transition to fuel cell buses will also reduce CH₄ emissions by 34% - 39%, reduce CO₂ emissions by 19% - 41%, and reduce total CO₂-equivalent GHG emissions by 21% - 42%.

Production of hydrogen using electrolysis will reduce NOx and GHG emissions significantly more than production of hydrogen using SMR. In addition, compared to the baseline, production of hydrogen using electrolysis will reduce PM emitted within the South Coast Air basin by 39%, but will increase PM emitted outside of the South Coast Air Basin by 6%. Production of hydrogen using SMR will increase

PM emitted within the South Coast Air Basin by 792% while reducing PM emitted outside of the South Coast Air Basin by 34%.

Figure 1. LACMTA Zero Emission Bus Estimated Total Fleet Emissions 2015 – 2055



The modeling summarized here indicates that Scenario 3, the use of RNG and transition to LNOx buses, will be more effective at reducing in-basin PM, total CO₂, total GHGs, and total NOx from the LACMTA fleet over the next 40 years than transition to either electric or fuel cell buses, but will be slightly less effective at reducing in-basin NOx.

This approach will also be less expensive than transition to either electric or fuel cell buses. Table 3 presents a summary of the cost-effectiveness of emission reductions under each scenario.

If all incremental costs (above baseline) are attributed to GHG reduction, the use of RNG and transition to LNOx buses will cost \$15/ton of GHG reduced over the next 40 years. The transition to electric buses will cost \$46 - \$94/ton of GHG reduced, and the transition to fuel cell buses will cost \$250 - \$419/ton of GHG reduced.

If all incremental costs (above baseline) are attributed to NOx reduction, the use of RNG and transition to LNOx buses will cost \$64 thousand/ton of in-basin NOx reduced over the next 40 years. The transition to electric buses will cost \$133 - \$272 thousand/ton of in-basin NOx reduced, and the transition to fuel cell buses will cost \$0.67 - \$20 million/ton of in-basin NOx reduced.

Table 3. Zero Emission Bus Options Cost Effectiveness of Emission Reductions (\$/ton)

		LNOx Bus & RNG	Electric Bus		Fuel Cell Bus	
			Depot Charging	Depot & In-route Charging	SMR	Electrolysis
Compared to Baseline	Increased Cost (NPV \$ million)	\$173.0	\$767.8	\$376.1	\$1,379.3	\$1,680.2
	GHG Reduction (million ton)	11.4	8.2	8.2	3.3	6.7
	In-basin NOx Reduction (ton x000)	2.72	2.83	2.84	0.07	2.50
Cost effectiveness of Emission Reductions	\$/ton GHG	\$15.19	\$93.71	\$45.69	\$419.43	\$249.84
	\$/ton IB NOx	\$63,530	\$271,638	\$132,667	\$20,247,155	\$670,849

1. FLEET COST & EMISSIONS MODEL DESCRIPTION

Both the fleet cost model and the fleet emissions model are based on a fleet assignment of 2,500 40-ft buses, which provides equivalent total passenger capacity (seat-miles) to LACMTA's current mixed fleet of 1,212 40-ft, 626 45-ft, and 356 60-ft buses. This fleet assignment is held constant throughout the analysis period; the models assume no growth (or reduction) in LACMTA service during the 40-year analysis period.

The starting fleet in calendar year 2015 is assumed to be composed of 625 buses with engines built prior to model year 2007, and 1,875 buses with model year 2007 – 2014 engines, consistent with LACMTA's current fleet². The model assumes that 178 older buses will be retired each year and replaced by new buses, to maintain 7% annual fleet turnover. For all scenarios other than electric buses charged exclusively at the depot, the model assumes that old buses will be replaced one-for one with new buses, so that total fleet size and total annual fleet miles will stay constant from year-to-year.

Due to daily range restrictions the model assumes that one retiring bus will need to be replaced with more than one electric bus, if the electric buses are charged only at the depot; the replacement ratio is based on assumed daily range between charging events relative to the minimum required daily range for current buses based on actual week-day bus assignments (see section 2.2). For this scenario this results in a slight increase in fleet size over time, as well as an increase in annual fleet miles, because dead-head mileage is also assumed to increase due to the need to make more daily bus-swaps in service.

For electric buses charged both at the depot and in-route using route-based chargers, the model assumes that the in-route charging will increase daily bus range above the minimum requirement, so that retiring buses can be replaced one-for one with new electric buses, and fleet size and annual fleet mileage will stay constant over time.

As the fleet composition changes over time, the model calculates for each scenario total mileage and fuel use each year by all buses of each type (CNG, Low NOx CNG, Electric, Fuel Cell) in each of the following model year bins: Pre-MY2007, MY2007 - MY2014, MY2015 - MY2024, MY2025 – MY2034, MY2035 – MY2044, MY2045 – MY2054. The model then applies cost and emission factors to calculate total costs and emissions associated with the buses of each type in each model year bin that year, and sums the costs and emissions across the bins to get the calendar year annual fleet totals.

The cost and emission factors used by the model are specific to each bus type and each model year bin. In that way, the model accounts for changes in technical capability and purchase and operating costs, as well as changes in emissions performance, for the different technologies as they mature over time. For example, range between charging events is assumed to be greater for MY2035 – MY2044 electric buses than for MY2025 – MY2034 buses, resulting in a smaller replacement ratio. Similarly, purchase and maintenance costs for electric and fuel cell buses (in 2015\$) are assumed to be lower for MY2035 – MY2044 buses than they are for MY2025 – MY2034 buses.

² The current fleet has a larger number of older buses, but for the past few years LACMTA has been repowering older buses with new engines during mid-life overhauls. Engines built in model year 2007 and later have significantly lower nitrogen oxide (NOx) emissions than earlier model year engines.

1.1 Fleet Cost Model

The fleet cost model includes capital and operating costs associated with each bus and fuel purchasing scenario. The included capital cost elements are: bus purchase, bus repower (Low NOx CNG scenario only), bus mid-life overhaul, depot upgrades and expansion, and new fueling infrastructure.

Fueling infrastructure costs include purchase of battery chargers (electric bus scenarios), and purchase of hydrogen production and fueling stations (fuel cell bus scenarios). The model does not directly include any future costs associated with renewal or replacement of existing LACMTA CNG fueling stations. These stations are currently operated under contract by a third party, and the contract requires that the operator maintain these stations in full working order at all times. In effect, the future cost of upgrade and overhaul for these stations is included in the contract price of natural gas (dollars per therm³) and is therefore captured indirectly in the model for all scenarios as part of natural gas fuel costs.

Depot expansion is only required for the electric bus scenarios. For the depot-only charging scenario, in which fleet size increases, expansion of existing depots or construction of new depots is required to accommodate the larger fleet. Expansion of depot parking areas is also required for both electric bus scenarios to accommodate the installation of depot-based chargers in bus parking areas.

Other depot upgrades include investments related to high voltage safety and diagnostic equipment (electric bus and fuel cell scenarios) and investments in hydrogen sensors and improved ventilations systems (fuel cell scenario). Neither the baseline nor Low NOx CNG bus scenarios require any depot upgrades.

The included operating cost elements are: bus operator labor (including direct fringe benefits), bus maintenance (labor and material), and fuel purchase (including commodity costs and operating costs for fueling infrastructure). For all bus technologies, the fuel costs used in the model are net of projected financial credits that could be generated under California's Low Carbon Fuel Standard (LCFS). For natural gas (baseline) and renewable natural gas these LCFS credits would accrue to the fuel provider under LCFS rules; they are implicitly included in the model based on projected LACMTA costs to purchase natural gas or RNG. For electricity used to power battery-electric buses, and for hydrogen produced on-site at LACMTA depots to power fuel cell buses, LCFS credits would accrue directly to LACMTA. The model explicitly calculates these credits and deducts them from projected electricity purchase and hydrogen production costs.

The fleet cost model does not include original purchase costs associated with any existing LACMTA fueling, maintenance, or bus storage facilities; operating costs associated with maintenance and bus storage facilities; overhead costs for maintenance and transportation supervision or management; or overhead costs associated with operations planning, marketing, and revenue collection activities. All of these costs are assumed to be substantially similar regardless of which future bus technology and fuel purchase scenario is followed.

1.2 Fleet Emissions Model

The fleet emissions model estimates, for each future bus technology/fuel purchase scenario, total annual emissions of carbon dioxide (CO₂), nitrogen oxides (NO_x), particulate matter (PM), and methane (CH₄). Using the global warming potential of methane over a 100-year period (GWP₁₀₀) the model also uses estimated CO₂ and CH₄ emissions to estimate total annual greenhouse gas (GHG) emissions in terms of CO₂-equivalent emissions (CO₂-e). For both NO_x and PM emissions the model

³ A therm is an amount of natural gas with 100,000 British thermal units (BTU) heat content

estimates separately the amount emitted under each scenario within the South Coast Air Basin, as well as the amount emitted outside of this air basin. The South Coast Air Basin encompasses Orange County and parts of Los Angeles, San Bernardino, and Riverside counties in southern California.

The fleet emissions model estimates total emissions associated with each bus technology/fuel purchase scenario on a “wells-to-wheels” life cycle basis. In addition to direct tail-pipe emissions from the engine of each in-service bus, the model estimates “upstream” emissions associated with the production and delivery of the fuel used by the buses each year.

For CNG buses upstream emissions include those associated with natural gas production, processing, pipeline transport, and compression. For electric buses upstream emissions include stack emissions from electricity generation, as well as emissions associated with production, processing, and transport of the hydrocarbon fuel(s) (i.e. coal and natural gas) used for electricity generation. For fuel cell buses upstream emissions include emissions generated directly during production, storage, transport, and compression of hydrogen; these emissions come mostly from generating the electricity used for both water electrolysis and SMR. For the SMR production path upstream emissions also include emissions associated with production, processing, and transport of the natural gas used to produce the hydrogen.

All tailpipe NO_x and PM emissions are assumed to be emitted within the South Coast Air Basin, as are upstream emissions from facilities and processes conducted within the basin (i.e. emissions from power plants located within the basin and from fuel production and transport activities that occur within the basin). Other upstream emissions (i.e. from natural gas extraction and processing, and from power plants located outside of the basin) are assumed to be out-of-basin emissions.

Emission factors used for upstream emissions vary by calendar year, to account for expected changes in the energy mix over time. For example, it is assumed that over the next 40 years average emission rates for electricity generation in California will fall significantly, reflecting greater use of zero-emission and renewable generating sources, in response to both government policy and market forces.

2. MAJOR ASSUMPTIONS AND DATA SOURCES

2.1 Electric Bus Range

To estimate the range per charge for current and future electric buses used in LACMTA service, the authors conducted a literature review, interviewed technical and sales staff from three transit bus manufacturers that currently offer 35-ft to 42-ft electric transit buses commercially⁴, and evaluated the results of an on-going in-service test of battery buses at LACMTA.

For an electric bus, range per charge (miles) is a function of two primary variables: 1) the energy capacity of the installed battery pack (kWh), and 2) actual energy use in service (kWh/mi). For any given bus the size of the battery pack is fixed, but energy use can vary based on a number of variables, including driver behavior, bus loading, and route characteristics (i.e. average speed and topography).

In addition, batteries lose capacity over time, as they are charged and dis-charged on a daily basis. This loss of capacity must be factored in to establish a practical range that can be relied on over the expected service life of a bus. Capacity loss is not solely a function of charge/discharge cycles; however, it can also be affected by the “depth” of discharge. Most battery manufacturers do not recommend depleting the battery fully (to zero percent state of charge) on a daily basis, as this can increase the rate at which batteries lose capacity. Over the past 20 years the general rule of thumb has been to use 80% depth of discharge as a planning factor when calculating practical electric vehicle range, to maximize in-service battery life.

Each of these variables is discussed further below, along with the author’s projections of practical electric bus range based on these variables.

2.1.1 Electric Bus Battery Capacity

Virtually all commercially available 40-ft electric transit buses sold today (MY2016) have installed batteries with 300 – 330 kWh of energy storage capacity. In practical terms the size of the battery pack is constrained primarily by available packaging volume on the vehicle, but may also be constrained by axle weight limits. As such, increasing the energy storage capacity of electric buses will require further improvements in battery technology, to increase energy density (kWh/kg; kWh/ft³).

All bus manufacturers interviewed indicated that their battery suppliers are promising significant improvements in energy density over the next 5 – 15 years, though estimates vary as to when these improvement will be available, and how large they will be. One bus manufacturer indicated that battery packs larger than 400 kWh would be available within two years; others were more cautious, indicating that battery packs with 33% greater capacity than current packs “might” be available by 2025, with further increases in later years.

For this analysis the authors used conservative estimates for the energy storage capacity of battery packs on future electric buses, as follows: Model Year 2025 – 2034, 420 kWh; model year 2035 – 2044, 450 kWh; model year 2045+ 482 kWh.

⁴ BYD, Proterra, and New Flyer.

2.1.2 Electric Bus Energy Use

LACMTA operated a pilot fleet of 5 40-ft battery buses in regular Metro service between June 2015 and April 2016. These buses are used on a route with average speed of approximately 9 MPH. Since entering service they have accumulated more than 30,000 in-service miles. Weekly average energy use for all 5 buses has ranged from 2.3 kWh/mi to 3.5 kWh/mi; the over-all average since the beginning of the test is 3.2 kWh/mi. The route on which these buses operate has a slower average speed (9 MPH) than the LACMTA fleet average speed (12 MPH). Prior modeling conducted by the authors indicates that projected average energy use for these buses on a 12 MPH route would be 2.8kWh/mi.

Electric bus energy economy testing conducted by the Federal Transit Authority's New Model Bus Testing program indicates that there is a significant range in average energy use (kWh/mi) for different commercially available buses today⁵. One of the tested buses averaged 15% less energy per mile on the test routes than the bus model which LACMTA is currently operating in service.

In addition, all bus manufacturers interviewed indicated that electric buses will become more efficient over time, as the technology continues to mature.

Based on all of the above information, this analysis assumes that MY2025 – MY2034 electric buses will use an average of 2.5_kWh/mi in LACMTA service, MY2035 – MY2044 electric buses will use an average of 2.4 kWh/mi, and MY2045+ electric buses will use an average of 2.3 kWh/mi. These values reflect a 5% reduction in "industry average" energy usage per decade, compared to current buses.

The above values were used to calculate electricity use and cost. To calculate expected range per charge 10% was added to these figures, to account for driver and route variability.

2.1.3 Battery Life & Depth of Discharge

One electric bus manufacturer currently offers a 12-year warranty on their batteries, which guarantees that after 12 years in service the battery pack will retain at least 70% of its original name plate capacity (kWh). This implies 2.5% loss of capacity per year. This manufacturer also indicated that there is no restriction on daily depth of discharge.

The other manufacturers are less aggressive with respect to claims of battery life, offering only a standard 5-year warranty which guarantees no less than 80% of initial name plate capacity after that time, and recommending 80% depth of discharge as a planning factor in order to maximize effective battery life. One manufacturer indicated that actual capacity loss after 6 years in service indicates the possibility of a 10-year life, but they are not ready to guarantee that level of performance. This manufacturer also indicated that their battery management system limits depth of discharge to no more than 80% in the first few years of bus life, but opens that up over time, to allow 95% depth of discharge after year 5. In this way, buses are able to achieve consistent daily range even though the pack is losing effective capacity over time.

LACMTA currently keeps their buses in service for 14 years. For electric buses to be reliably usable over their entire life, the expected capacity loss must be included in calculations of the practical range

⁵ Bus Testing and Research Center, Pennsylvania Transportation Institute; Federal Transit Bus Test; Report Number LTI-BT-R1307, June 2014; Report Number LTI-BT-R1405, July 2015; Report Number LTI-BT-R1406, May 2015.

per charge. One option is to assume that batteries will last 14 years without replacement, but the range calculation would then need to assume a usable capacity of only 65% - 70% of battery nameplate capacity. The other option would be to assume that batteries will be replaced at bus mid-life (7 years). Under this scenario LACMTA will incur additional costs for battery replacement, but they will need fewer buses because range per charge can be based on approximately 80% of battery nameplate capacity.

Analysis indicates that buying fewer buses, but planning to replace the battery packs at 7 years, will be the least costly option for LACMTA. Thus, this is the scenario on which projected range per charge was calculated for this analysis.

2.1.4 Electric Bus Range per Charge

Based on projected nameplate battery capacity, protected in-service energy use, and expected battery degradation, as discussed above, this analysis assumes that the practical, reliable electric bus range per charge for buses used in LACMTA service will be 126 miles for MY2025-MY2034 buses, 142 miles for MY2035 -2044 buses, and 161 miles for buses purchased after MY2045. These values represent expected range per charge at the end of year 7 with 95% depth of discharge.

2.2 LACMTA Bus Assignments & Electric Bus Replacement Ratio

Figures 2 and 3 show a summary of LACMTA's week-day scheduled bus assignments. An "assignment" is a piece of work encompassing the time and mileage from when a bus first leaves a depot and enters service to when that bus returns to the depot. Figure 2 plots the weekday bus assignments based on accumulated mileage (miles) before the bus returns to the depot, and Figure 3 plots the assignments based on the accumulated time (hours) before the bus returns to the depot.

There are 2,878 daily bus assignments handled by 1,908 peak buses. That means that approximately 938 buses (49%) do one assignment per day, and 970 buses (51%) do two assignments per day. In general buses that do two assignments per day go out early in the morning to cover the morning peak period, return to the depot in late morning, and then leave the depot again in mid-afternoon to cover the afternoon peak. These buses generally spend three to six hours parked at the depot during mid-day and most will also be parked at the depot for three to six hours again in the late evening/early morning.

As shown on Figures 2 and 3, about 30% of all assignments are longer than 12 hours and 125 miles, and these are the assignments that are typically handled by buses that do only one assignment per day. These assignments average 165 miles and 15 hours per day in service. The remaining 70% of assignments, which are typically handled by buses that do two assignments per day, average 62 miles and 4.7 hours per day in service. That means that the buses that handle these assignments (two per day) generally average 124 miles and 9.4 hours per day in service.

Figure 2. LACMTA Weekday Bus Assignments, Percent versus Accumulated Miles in Service

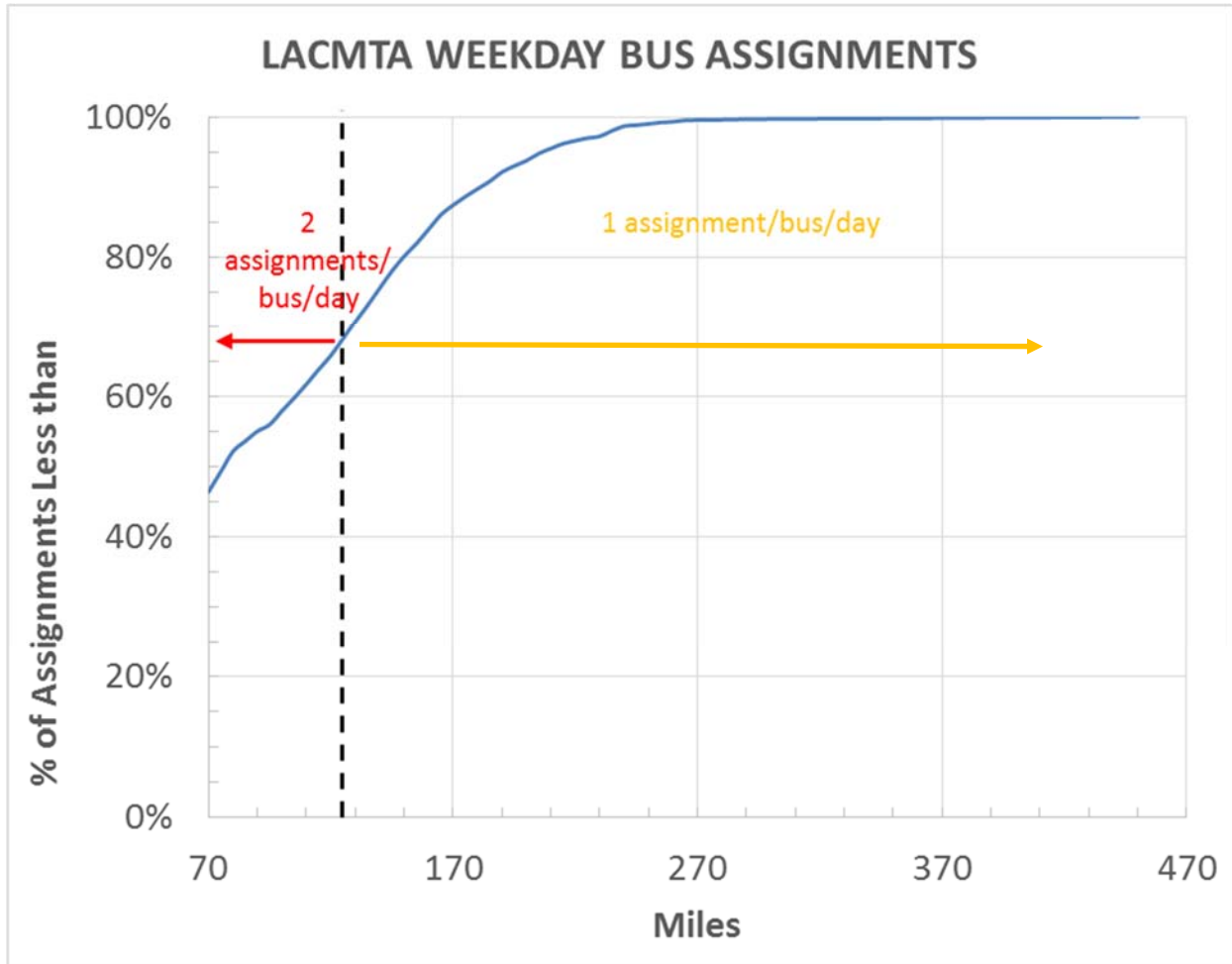
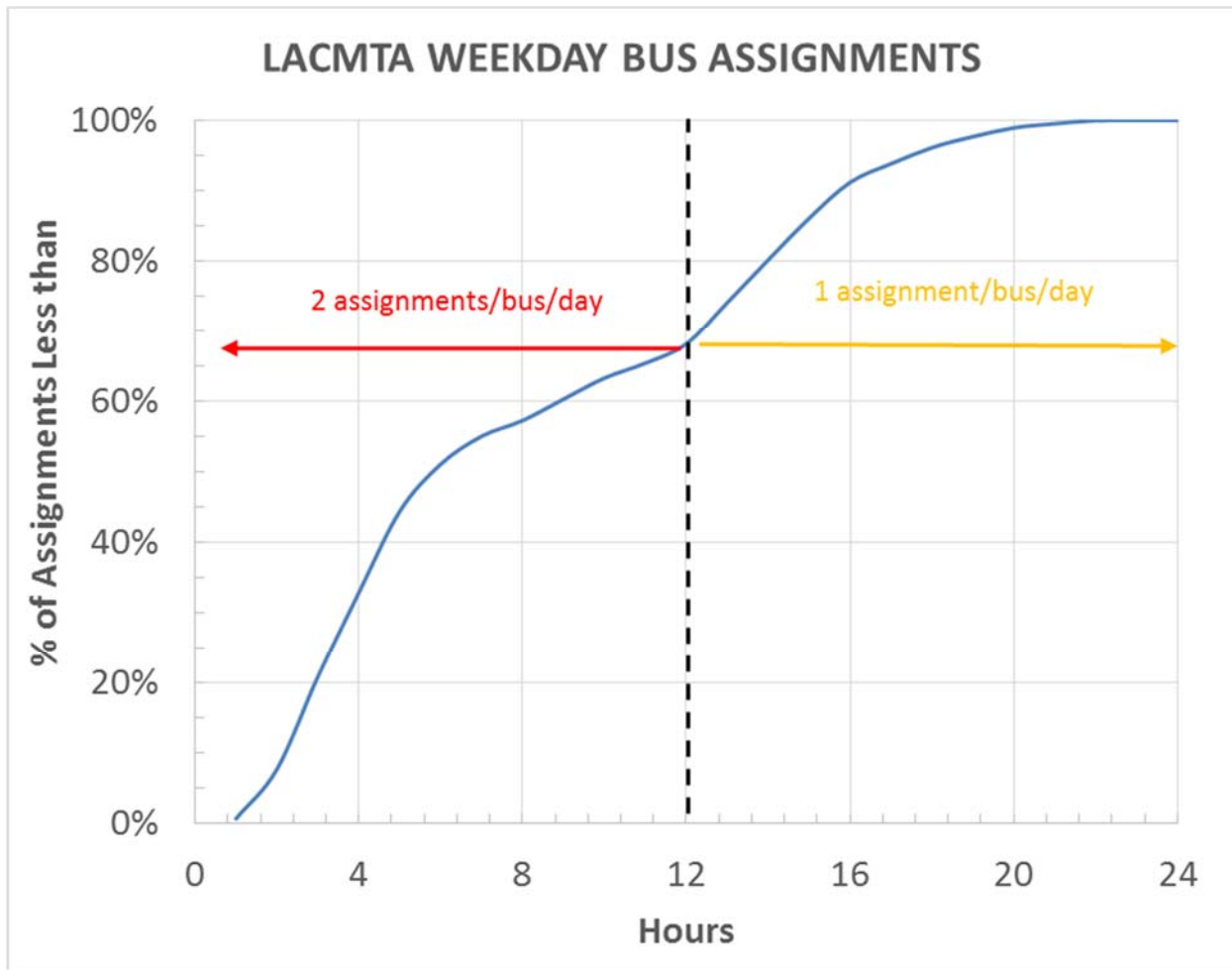


Figure 3. LACMTA Weekday Bus Assignments, Percent versus Accumulated Time in Service



When at the depot, LACMTA buses are parked nose-to-tail in adjacent parking lanes. As such, bus pull-outs for service are based on first-in, first-out; i.e. when a bus operator leaves for his or her assignment they take the first bus in line. When they return from service they park the bus in whatever spot is available. Given this, it is difficult, if not impossible, to dedicate specific buses to specific routes or assignments, except on a limited basis. Every bus of a given size assigned to a depot must be usable for every assignment operated from the depot on which that size bus is used. This means that in practical terms: 1) electric buses must have sufficient range per charge to handle every daily assignment, or 2) long assignments (miles) must be broken up into shorter assignments to accommodate actual electric bus range, or 3) depot charging of electric buses must be supplemented by in-route charging. Option 2, the break-up of long bus assignments into shorter assignments will increase the number of peak buses required compared to the current fleet of CNG buses (i.e. the electric bus replacement ratio will be greater than 1).

As discussed above in Section 2.1, this analysis assumes that model year 2025 – 2034 electric buses will have a practical, reliable range of 124 miles/charge in LACMTA service throughout their service life. This is a 34% increase from the current generation of electric buses (model year 2016) which are

estimated to have a reliable range of 85 – 100 miles per charge in LACMTA service⁶. The analysis assumes that battery technology will continue to improve in future years, such that model year 2035 – 2044 electric buses will have a reliable range of 142 miles/charge and model year 2045 – 2055 electric buses will have a reliable range of 161 miles/charge.

Electric buses can replace current CNG buses one-for-one on daily bus assignments, or combinations of assignments, with shorter accumulated mileage than the assumed range per charge. Daily bus assignments longer than the assumed range per charge will need to be reconfigured to create more, shorter assignments, thus increasing the total number of peak buses required, if only depot charging is used.

To determine the number of electric buses required to replace CNG buses in the depot-charging only scenario, the authors calculated the percentage of current daily bus assignments shorter than the assumed range per charge, and then calculated the percentage of peak buses that would be used for these assignments. The percentage of peak buses is smaller than the percentage of assignments, because most if not all buses used for these short assignments do two assignments per day. Next the authors calculated the average daily mileage for all assignments longer than the assumed miles/charge, and the electric bus replacement ratio that would be required to accommodate these longer assignments. Finally the authors calculated a fleet average electric bus replacement ratio, which is a weighted average of peak buses needed to accommodate short assignments (1:1 replacement) and buses needed to accommodate the current long assignments (greater than 1:1 replacement ratio). The results of this analysis are shown in Table 4.

Table 4. Estimated Electric Bus Replacement Ratio for Depot charging-only Scenario

	Model Year 2016	Model Year 2025 - 2034	Model Year 2035 - 2044	Model Year 2045 - 2054
Projected Electric Bus range/charge [miles]	93 mi	126 mi	142 mi	161 mi
% of Bus Assignments <range/charge	55%	68%	75%	84%
% of Peak Buses with daily mileage < range per charge	42%	51%	55%	59%
Average Daily Mileage for Bus Assignments > range/charge	152 mi	168 mi	177 mi	190 mi
Replacement Ratio for Assignments > range/charge	1.70	1.34	1.27	1.19
FLEET AVERAGE REPLACEMENT RATIO	1.41	1.17	1.12	1.08

⁶ Projected range varies by bus manufacturer based on differences in installed battery capacity (kWh) and projected average energy use (kWh/mi).

As shown in Table 4, in the 2025 – 2034 time frame 1.17 electric buses would be required to replace one CNG bus if charging is done only at the depot. In the 2035 – 2044 time frame this electric bus replacement ratio drops to 1.12, and it drops further to 1.08 after 2045.

2.3 Other Assumptions

Table 5 lists the major assumptions used in the fleet cost and emissions models, as well as the source of these assumptions.

All costs in Table 5 are shown in 2015\$. For each year the model escalates these values based on assumed annual inflation, to calculate yearly total costs in nominal dollars. For net present value calculations these annual nominal dollar totals are then discounted back to 2015\$ based on an assumed discount rate.

Table 5a. Major Assumptions and Data Sources Used in Fleet Cost & Emissions Model – LACMTA System Characteristics

5A: LACMTA SYSTEM CHARACTERISTICS		
<i>Metric</i>	<i>Data Sources</i>	<i>Values/Notes</i>
Average Annual Total Miles per bus	LACMTA, National Transit database, 2013	38,000 miles
Average Annual Revenue Miles per bus	LACMTA, National Transit database, 2013	32,000 miles
Fleet Spare Factor	LACMTA policy	20%
Average Daily Total Miles per Bus	MJB&A analysis	130 miles; (annual miles/bus ÷ (365 day/yr x (1-spare factor)))
Average In-service Bus Speed (MPH)	LACMTA, National Transit database, 2013	12.1 MPH; total bus miles ÷ total bus hours
Average Daily in-Service Hours per bus	LACMTA, National Transit database, 2013; MJB&A analysis	10.8 hours; average daily miles ÷ average in-service speed
Bus Retirement age	LACMTA policy	14 years
In-service Bus Lay-over Time	LACMTA Service Planning	10 minutes per hour of driving
Total Lay-over (Terminal) Locations, System-wide	LACMTA Service Planning	280 = 140 bus lines x 2 Terminal/line (one at each end)
2015 Bus Operator Labor Cost (\$/hr)	LACMTA Service Planning	\$33.50/hour; includes direct fringe benefits
Bus Operator Availability (%)	LACMTA Service Planning	80%
Bus Operator % of shift time driving	LACMTA Service Planning	83%

Table 5b. Major Assumptions and Data Sources Used in Fleet Cost & Emissions Model – Fuel Costs

5B: FUEL COSTS		
Metric	Data Sources	Values/Notes
Natural Gas (2015)	LACMTA Fuel report	Actual average cost for 2015, \$0.780/therm, includes cost of fuel station maintenance and operation. This price implicitly includes California Low Carbon Fuel Standard (LCFS) credits that can be earned by the natural gas supplier, and which are wholly or partially passed on to LACMTA via commercial market pricing.
Renewable Natural Gas (2015)	LACMTA Procurement	Assume that purchase cost of renewable natural gas will be the same as standard natural gas, at \$0.780/therm in 2015. This is based on LACMTA market research showing that there are multiple providers willing to provide renewable gas at this rate today. This price implicitly includes California Low Carbon Fuel Standard (LCFS) credits that can be earned by the RNG fuel supplier, and which are wholly or partially passed on to LACMTA via commercial market pricing.
Electricity (2015)	Southern California Edison, <i>Schedule TOU-8, Time-of-Use General-Service Large; Cal. PUC Sheet No. 53221-E</i> California Air Resources Board, Final Regulation Order, Subchapter 10 Climate Change, Article 4 Regulations to Achieve Greenhouse Gas Emission Reductions, Subchapter 7 Low Carbon Fuel Standard MJB&A Analysis	TOU-8 is the electric rate applicable to large commercial customers in Los Angeles with expected usage greater than 500 kW. The rate is composed of delivery and generation energy charges (\$/KWh) which vary by time of day (off-peak, mid-peak, and high-peak) and season (summer, winter). There are also monthly facility demand charges (\$/kW) based on overall peak demand within the month and monthly time-based demand charges (\$/kW) based on monthly peak demand within each daily rate period (off-peak, mid-peak, and high-peak) over the month. Based on an analysis of scheduled daily LACMTA service (% of buses in service and at the depot by time of day), MJB&A determined that approximately 64%, 32%, and 5% of electric bus depot charging would occur during off-peak, mid-peak, and high-peak periods, and that approximately 24%, 65%, and 11% of in-route charging would occur during off-peak, mid-peak, and high-peak periods.

5B: FUEL COSTS		
Metric	Data Sources	Values/Notes
		<p>Based on this charging distribution the average annual cost of electricity in 2015 under Southern California Edison's TOU-8 rate would be \$0.172/kWh for depot charging and \$0.143/kWh for in-route charging.</p> <p>Based on an assumption of constant daily production during only off-peak and mid-peak hours the average annual cost of electricity for hydrogen production in 2015 would be \$0.1061/kWh under the TOU-8 rate.</p> <p>LACMTA can earn credits under California's low carbon Fuel Standard (LCFS) for battery electric bus charging. Available credits in each year were calculated using the procedures outlined in the LCFS Final Regulation Order, and assuming a credit value of \$100 per metric ton of CO₂ reduction, which is the current market value of LCFS credits. These credits were then deducted from LACMTA's projected cost of purchasing electricity, to yield their net cost of electricity for battery bus charging. Projected LCFS credits are \$0.118/kWh in 2015, increasing to \$0.127/kWh in 2055 as the projected carbon intensity of electricity production falls over time. LACMTA's net electricity costs for battery bus charging are projected to be \$0.053/kWh for depot charging and \$0.025/kWh for in-route charging in 2015.</p>
Hydrogen (2015)	<p>National Renewable Energy Laboratory, <i>H2FAST: Hydrogen Financial Analysis Scenario Tool</i>, April, 2015, Version 1.0</p> <p>California Air Resources Board, Final Regulation Order, Subchapter 10 Climate Change, Article 4 Regulations to Achieve Greenhouse Gas Emission Reductions,</p>	<p>Hydrogen production via steam reforming (SMR) assumes 1.7 therms NG and 10 kWh electricity input per kg of hydrogen produced. The model also assumes \$0.25/kg maintenance and operating cost, which equates to approximately \$300,000 per station/year with one station per depot.</p> <p>Hydrogen production via electrolysis assumes 50 kWh electricity input per kg hydrogen produced in 2015, falling to 44.7 kWh/kg in 2025 and later years. The 2025 value is consistent with US Department of Energy research and development targets and equates to 75% net efficiency (the theoretical minimum energy requirement is 33 kWh/kg). The model also assumes \$0.35/kg maintenance and operating</p>

5B: FUEL COSTS		
<i>Metric</i>	<i>Data Sources</i>	<i>Values/Notes</i>
	<p>Subchapter 7 Low Carbon Fuel Standard</p> <p>MJB&A Analysis</p>	<p>cost, which equates to approximately \$420,000 per station/year with one station per depot.</p> <p>Using these assumptions LACMTA's cost of hydrogen production is projected to be \$2.64/kg using SMR and \$5.65/kg using electrolysis in 2015, not including amortized capital costs for the production equipment, which is calculated separately and included in capital costs.</p> <p>LACMTA can earn credits under California's low carbon Fuel Standard (LCFS) for fuel cell bus hydrogen production. Available credits in each year were calculated using the procedures outlined in the LCFS Final Regulation Order, and assuming a credit value of \$100 per metric ton of CO₂ reduction, which is the current market value of LCFS credits. These credits were then deducted from LACMTA's projected cost of producing hydrogen, to yield their net cost of producing hydrogen. Projected LCFS credits are \$1.03/kg in 2015, resulting in net hydrogen production costs in 2015 of \$1.60/kg for SMR and \$4.62/kg for electrolysis.</p>
Annual Fuel Cost Inflation	<p>Energy Information Administration, Annual Energy Outlook 2016 early release, <i>Table 3.9, Energy Prices by Sector & Source, Pacific region, May 2016</i></p>	<p>Projections for % change in annual nominal price of natural gas and electricity used for transportation (reference case), through 2040; for 2041 – 2055 assumed average rate for 2031 – 2040.</p>

Table 5c. Major Assumptions and Data Sources Used in Fleet Cost & Emissions Model – Emissions Factors

5C: EMISSIONS FACTORS		
Metric	Data Sources	Values/Notes
CNG bus tailpipe NO _x , PM, CH ₄ (g/mi)	California Air Resources Board, EMFAC2014	Season - annual; Sub area - Los Angeles (SC); vehicle class – UBUS; Fuel – NG; Process – RUNEX; Speed Time - Weighted average of bins 5 through 30 to simulate urban bus duty cycle with 12.5 MPH average speed. Values calculated for each model year in each calendar year.
Low NO _x CNG bus tailpipe NO _x , PM, CH ₄ (g/mi)	California Air Resources Board Executive Orders A-021-0631 and A-021-0629	NO _x , PM, and CH ₄ g/mi emissions assumed to be proportionally lower than emissions from standard CNG buses of the same model year based on model year 2016 certified engine emissions for Low NO _x and standard CNG engines. NO _x emissions assumed to be 92% lower (0.01 g/bhp-hr vs 0.13 g/bhp-hr), CH ₄ g/mi emissions assumed to be 72% lower (0.56 g/bhp-hr vs 1.97 g/bhp-hr) and PM emissions assumed to be 50% lower (0.001 g/bhp-hr vs 0.002 g/bhp-hr).
CNG and Low NO _x CNG bus tailpipe CO ₂ (g/mi)	U.S. Department of Energy, <i>Alternative Fuels & Advanced Vehicles Data Center</i> (www.afdc.energy.gov/afdc/fuels/properties.html)	5,593 g CO ₂ /therm, assuming NG with 22,453 btu/lb (high heating value) and 75.5% carbon by weight (90% methane and 10% ethane by volume). Gram/mile emissions = Fuel use (therm/mi) x g CO ₂ /therm.
Natural Gas Upstream CO ₂ , NO _x , PM, CH ₄ (g/therm)	Argonne national Laboratory, <i>The Greenhouse Gases, Regulated Emissions, and Energy Use in Transportation (GREET) Model</i> , as modified by California Air Resources Board to reflect California conditions (CAGREET)	CA GREET was used to calculate upstream emission rates (g/mmmbtu, g/therm) for pipeline natural gas and renewable natural gas. The emission rates for renewable natural gas assume the following mixture of production sources: 100% landfill, 0% animal waste, and 0% wastewater treatment plant. These assumptions are conservative; LACMTA has not yet determined actual production sources for commercially available RNG. Inclusion of gas produced from wastewater treatment plants and/or food waste would further reduce emissions of both GHG and NO _x compared to current assumptions.
Renewable Natural Gas Upstream CO ₂ , NO _x , PM, CH ₄ (g/therm)		
Hydrogen Production CO ₂ , NO _x , PM, CH ₄ (g/kg)		

5C: EMISSIONS FACTORS		
<i>Metric</i>	<i>Data Sources</i>	<i>Values/Notes</i>
	NREL/TP-5400-60283, July 2014	<p>CA GREET was used to calculate upstream emission rates (g/mmbtu, g/kg) for production of hydrogen using SMR.</p> <p>All upstream emission rates for natural gas, renewable natural gas and SMR hydrogen are assumed to be constant throughout the analysis period.</p> <p>For production of hydrogen using electrolysis, emission rates (g/kg) were determined by multiplying the electrical energy required for production (kWh/kg) by emission rates for electricity generation (g/kWh).</p> <p>For standard natural gas, including the natural gas used for production of hydrogen via SMR, the following components of upstream NOx and PM emissions are assumed to be emitted within the South Coast Air Basin: 7.4% of emissions from “natural gas transmission to fueling station” (50 out of 680 pipeline miles) and 100% of emissions from compression. The following components of natural gas upstream NOx and PM emissions are assumed to be emitted outside of the South Coast Air Basin: 100% of emissions from natural gas recovery and processing; and 92.6% of emissions from natural gas transmission to fueling station (630 out of 680 pipeline miles).</p> <p>For RNG, 25% of NOx and PM emissions from “natural gas transmission to fueling station” (50 out of 200 pipeline miles) are assumed to be in-basin, as well as 100% of emissions from RNG compression. Emissions from production and processing of RNG are attributed as in-basin or out-of-basin depending on the location of the RNG sources. The model assumes that in 2018 100% of RNG will be from out-of-basin sources, but that over time a greater percentage of RNG will be from in-basin sources, rising to 30% by 2055. NREL’s</p>

5C: EMISSIONS FACTORS		
<i>Metric</i>	<i>Data Sources</i>	<i>Values/Notes</i>
		<p>projections of bio-methane potential from all sources shows that approximately 30% of potential bio-methane in California is attributed to sources located within the South Coast Air basin.</p> <p>All emissions from production and compression of hydrogen produced via SMR are assumed to be in-basin.</p>
<p>Electricity Generation CO₂, NO_x, PM, CH₄ (g/kWh)</p>	<p>Argonne national Laboratory, <i>The Greenhouse Gases, Regulated Emissions, and Energy Use in Transportation (GREET) Model</i>, as modified by California Air Resources Board to reflect California conditions (CAGREET)</p> <p>ARB targets for renewable generation through 2050</p> <p>ABB Velocity Suite™ database of electric generating units within CAISO</p>	<p>CA GREET was used to calculate 2015 and 2020 emission rates (g/kWh) for each discrete electric generating source type used in California: wind, solar, geothermal, hydroelectric, nuclear, biomass, natural gas, and coal. For each pollutant in each calendar year the model uses source-weighted average emissions factors calculated by multiplying the emission factor for each source type by the assumed percentage of electricity produced by that source type in California that year. The assumptions for percentage of generation by source type match the California Air Resources Board’s published targets for increases in zero-emitting and renewable resources through 2050. For example, the model assumes that there will be no electricity generation using coal after 2027, and that zero-emitting sources will increase from 46% of total generation in 2015 to 78% in 2050. At the same time, generation with natural gas will fall from 53% of total generation in 2015 to 22% in 2050.</p> <p>CA Greet indicates that emission rates (g/kWh) of NO_x, PM, CO₂, and CH₄ will fall between 2015 and 2020 for nuclear, natural gas, biomass, and coal generating sources, presumably based on improvements in efficiency and/or addition of emission controls in response to regulation. The difference in emission rates between 2015 and 2020 were used to calculate an annual adjustment factor for each pollutant and generating source,</p>

5C: EMISSIONS FACTORS		
<i>Metric</i>	<i>Data Sources</i>	<i>Values/Notes</i>
		<p>which was applied in each year of the analysis – i.e. emission rates were assumed to continue to improve at the same annual rate through 2055, which is a conservative assumption.</p> <p>To determine the percentage of NOx and PM emissions emitted within the South Coast Air Basin from electricity generation under each scenario, the ABB Velocity Suite™ database was used to determine the percentage of current generation (MWh) within the California Independent System Operator (CAISO) territory produced by generating plants located in the South Coast Air Basin. In 2013 approximately 22.2% of total CAISO generation by natural gas-fired plants was from plants within the basin, while 0% of coal generation was from plants within the basin and 9.4% of biomass generation was from plants within the basin. These percentages were applied separately to the emission factors for each type of generation to calculate weighted average NOx and PM emission factors (g/kWh) within and outside the basin. The analysis assumes that total gas generation will fall each year through 2050, while total biomass generation will increase; however the percentage of total generation from plants of each type within the basin is assumed to stay constant.</p>

Table 5d. Major Assumptions and Data Sources Used in Fleet Cost & Emissions Model – CNG Buses

5D: CNG BUSES		
<i>Metric</i>	<i>Data Sources</i>	<i>Values/Notes</i>
Purchase Cost (2015 \$)	LACMTA Maintenance Department	\$490,000 per bus. This is the actual price paid by LACMTA for 40-ft CNG bus purchases in 2013.
Mid-Life Overhaul Cost (2015 \$)	LACMTA Maintenance Department	\$35,000 per bus. This is the actual average cost for overhauls completed in 2014.
Maintenance Cost (\$/mi)	LACMTA maintenance records for 2013 - 2014	Average cost of \$0.850/mile for buses near mid-life (7 years old). 35% of costs (\$0.30/mi) attributed to propulsion system (engine, transmission, brakes) and 65% attributed to all other bus systems (\$0.55/mi).
Fuel Use (therm/mi)	LACMTA fueling records	Average of 0.476 therm/mi.

Table 5e. Major Assumptions and Data Sources Used in Fleet Cost & Emissions Model – Low NOx CNG Buses

5E: LOW NOx CNG BUSES		
<i>Metric</i>	<i>Data Sources</i>	<i>Values/Notes</i>
Purchase Cost (2015 \$)	Environ discussion with Cummins, Inc.	Incremental cost of Low NOx CNG bus compared to standard CNG bus \$10,000 through MY2035, falling to \$5,000 after MY2045 due to technology maturity.
Repower Cost (2015 \$)	LACMTA Maintenance Department	Assume \$112,000/bus for repowers in 2015 – 2034, falling to \$102,000/bus for repowers in 2045 – 2054. Current cost of repowering LACMTA CNG buses averages \$100,000/bus. Low NOx repowers assumed to be more expensive due to incremental cost of Low NOx engine (\$10,000) and \$2,000/bus for up-front engineering and design work (\$200,000 spread over 1,000 buses). Incremental cost of Low NOx engine assumed to decline over time as technology matures.
Mid-Life Overhaul Cost (2015 \$)	LACMTA Maintenance Department	Assume that mid-life overhauls for Low NOx engine buses will be \$38,000/bus, which is \$3,000/bus greater than current mid-life overhaul costs for standard CNG buses. Costs assumed to be higher due to higher cost for re-building Low NOx engine.
Maintenance Cost (\$/mi)	LACMTA Maintenance Department	Assume that non-propulsion maintenance costs will be the same as current CNG buses (\$0.553/mi) and that propulsion related maintenance costs will be 10% higher (\$0.327/mi) for Low NOx engines purchased 2015 – 2024, due to technology immaturity. Assumes that by MY2035 propulsion related maintenance costs for Low NOx engines will be the same as for current buses.
Fuel Use (therm/mi)	California Air Resources Board Executive Orders A-021-0631 and A-021-0629	Assume that fuel use for Low NOx engines will be 0.4% higher than fuel use of current NG engines, based on certified CO ₂ emissions of model year 2016 Low NOx engines compared to standard engines (465 g/bhp-hr vs 463 g/bhp-hr).

Table 5f. Major Assumptions and Data Sources Used in Fleet Cost & Emissions Model – Electric Buses

5F: ELECTRIC BUSES		
Metric	Data Sources	Values/Notes
Purchase Cost (2015 \$)	<p>Air Resources Board, Mobile Source Control Division, <i>Advanced Clean Transit</i>, May 2015</p> <p>BYD bus purchase quote to LACMTA</p> <p>Discussion with battery electric bus manufacturers, BYD, Proterra, and New Flyer</p>	<p>Current costs (MY2016) are estimated to be \$760,000 per bus for depot-only charging and \$810,000 per bus for depot and in-route charging. The increased cost for in-route charging is for inductive charge receiver on the bus.</p> <p>Based on discussion with bus manufacturers, industry average battery bus purchase costs (depot charging, 2015\$) are projected to fall to \$657,000 in MY2025, \$632,000 in MY2035, and \$631,000 in MY2045. These costs reflect significant projected reductions in battery pack costs (\$/kWh, 2015\$), but also significant increases in battery pack size (kW) over time, based on increased energy density.</p> <p>The model assumes no reduction in costs (2015\$) over time for bus systems other than the battery pack; the majority of the cost of a bus is in items and systems (steel structure, doors, windows, suspension system, etc.) that will be common between electric and CNG buses, which are not expected to change.</p> <p>Increases in battery energy density are projected based on current research efforts by battery manufacturers. Reductions in battery costs are projected based on research efforts as well as projected increases in manufacturing volume, primarily based on increased sales of light-duty electric vehicles.</p> <p>Cell level battery costs are projected to fall from an industry average of \$417/kWh (2015\$) today to \$150/kWh in 2025 and \$100/kWh in 2035 and later years (2015\$). Total battery pack costs (including physical structure, battery management system, and manufacturing labor and overhead) are projected to fall from an industry average of \$740/kWh today to \$358/kWh in 2025, \$275/kWh in 2035, and \$258/kWh in 2045 (all in 2015\$).</p>

5F: ELECTRIC BUSES		
Metric	Data Sources	Values/Notes
		<p>Installed battery pack size is projected to increase from an industry average of 330 kWh today to 420 kWh in 2025, 450 kWh in 2035, and 482 kWh in 2045.</p> <p>The above values represent a conservative, but realistic assessment of industry average costs. There was a significant range of values provided by different bus manufacturers, with some stated projections significantly more optimistic than others (lower battery cost and higher energy density).</p>
Mid-Life Overhaul Cost (2015 \$)	<p>BYD purchase quote to LACMTA</p> <p>Discussion with battery electric bus manufacturers, BYD, Proterra, and New Flyer</p>	<p>Based on discussion with bus manufacturers, this analysis assumes that the drive motor and inverter on electric buses will need to be replaced/overhauled at mid-life at a cost of \$30,000. This analysis also assumes that all electric buses will have their battery packs overhauled at mid-life by replacing the battery cells (but not the physical structure). See discussion of battery life in section 2.1.3. Mid-life battery overhaul costs are based on pack size (kW) and assumed cell costs (\$/kWh) discussed above under electric bus Purchase Cost, plus 30% for labor.</p> <p>This results in total mid-life overhaul costs of \$84,600 for MY2025-MY2034 electric buses, \$88,500 for MY2035 – MY2044 electric buses, and \$92,700 for MY2045 – MY2054 electric buses.</p>
Maintenance Cost (\$/mi)	MJB&A analysis	<p>Non-propulsion related costs assumed to be same as CNG, \$0.553/mi.</p> <p>Propulsion-related costs (drive motor, inverter, brakes) assumed to be half the cost of CNG buses (\$0.149/mi).</p>
Fuel Use (kWh/mi)	<p>40-ft electric bus in-service test at LACMTA Bus Testing and Research Center, Pennsylvania Transportation Institute; Federal Transit Bus Test;</p>	<p>MY 2025 electric buses used in LACMTA service are projected to average 2.5 kWh/mi energy use; this fleet average is projected to fall to 2.4 kWh/mi for MY2035 buses and 2.3 kWh/mi for MY2045 buses.</p> <p>See section 2.1.2 for discussion of how these values were derived.</p>

5F: ELECTRIC BUSES		
<i>Metric</i>	<i>Data Sources</i>	<i>Values/Notes</i>
	Report Number LTI-BT-R1307, June 2014; Report Number LTI-BT-R1405, July 2015; Report Number LTI-BT-R1406, May 2015 Discussion with electric bus manufacturers BYD, Proterra, and New Flyer MJB&A Analysis	
Range (mi/charge)	Discussion with battery electric bus manufacturers, BYD, Proterra, and New Flyer MJB&A Analysis	MY 2025 electric buses are assumed to have range per charge of 126 miles, increasing to 142 miles for MY2035 and 161 miles for MY2045. These values represent industry average, reliable daily range at bus mid-life. See Section 2.1 for a full discussion of how these values were derived.

Table 5g. Major Assumptions and Data Sources Used in Fleet Cost & Emissions Model – Fuel Cell Buses

5G: FUEL CELL BUSES		
Metric	Data Sources	Values/Notes
Purchase Cost (2015 \$)	Letter from New Flyer to Air Resources Board Air Resources Board, Mobile Source Control Division, <i>Advanced Clean Transit</i> , May 2015 E. den Boer, et al, CE Delft, <i>Zero emissions trucks: An overview of state-of-the-art technologies and their potential</i> , Report Delft, July 2013	Current cost (MY 2016) is \$1,300,000 per bus. Per a letter from New Flyer to Air Resource Board the cost for MY2025 buses (2015\$) is assumed to be \$920,000, falling to \$690,000 in MY2035 (-25%) and \$598,000 in MY2045 (-35%). Assumed cost reductions for MY2035 and MY2045 are per estimates by CE Delft.
Mid-Life Overhaul Cost (2015 \$)	LACMTA Maintenance Department E. den Boer, et al, CE Delft, <i>Zero emissions trucks: An overview of state-of-the-art technologies and their potential</i> , Report Delft, July 2013 MJB&A Analysis	Mid-life overhaul costs assumed to be the same as for CNG bus mid-life plus the cost of replacing the fuel cell stack. Fuel cell stack replacement assumed to be \$300,000 for MY2025 – MY2034 buses, \$125,000 for MY2035 – MY2044 buses, and \$50,000 for MY2045 – MY2054 buses, based on projected future cost differential between CNG and fuel cell buses at time of overhaul.
Maintenance Cost (\$/mi)	L. Eudy and M. Post, National Renewable Energy Laboratory, <i>Zero Emission Bay Area (ZEBA) Fuel Cell Bus Demonstration Results: Fourth Report</i> , July 2015	Non-propulsion related costs assumed to be same as CNG, \$0.553/mi. Current generation fuel cell buses have propulsion related costs at least 33% higher than diesel buses. For this analysis propulsion related costs assumed to be 20% higher than CNG buses for MY2025 – MY2034 buses, falling to only 10% higher for MY2045-MY2054 buses due to technology maturity.

5G: FUEL CELL BUSES		
<i>Metric</i>	<i>Data Sources</i>	<i>Values/Notes</i>
H ₂ Fuel Use (kg/mi)	L. Eudy and M. Post, National Renewable Energy Laboratory, <i>Zero Emission Bay Area (ZEBA) Fuel Cell Bus Demonstration Results: Fourth Report</i> , July 2015	Average H ₂ fuel use for current generation buses is 0.156 kg/mi. This value used for MY2025 – MY2034 buses. Assumed 5% reduction for MY2035-MY2044 buses, and 10% reduction for MY2045 -MY2054 buses due to technology maturity.

Table 5h. Major Assumptions and Data Sources Used in Fleet Cost & Emissions Model – Fueling Infrastructure – Electric Buses

5H: FUELING INFRASTRUCTURE – ELECTRIC BUSES		
<i>Metric</i>	<i>Data Sources</i>	<i>Values/Notes</i>
Depot Chargers (\$/kW)	J. Agenbroad, Rocky Mountain Institute, <i>Pulling Back the Veil on EV Charging Station Costs</i> , April 29, 2014 http://blog.rmi.org/blog_2014_04_29_pulling_back_the_veil_on_ev_charging_station_costs	LACMTA facilities department estimates a cost of \$500/kW to upgrade depot electrical infrastructure, plus \$10,000 per bus for the charge adapter, based on a full depot roll-out of electric buses. This equates to \$30,000/bus for required 40 kW chargers. Model assumes 2,000 depot chargers will be required, one for each daily in-service bus. Daily in-service buses = Fleet assignment x (1-spare factor %). Annual maintenance costs for depot chargers are assumed to be 10% of installed capital cost.
In-route Chargers (\$/kW)	Recent LACMTA experience installing chargers for BYD electric buses	Installed cost of \$4,000/kW, based on \$80,000 for public, 20 kW DC inductive fast-charger. In-route chargers assumed to be more expensive than depot-based chargers due to need to secure right-of-way, longer feeder runs, and installation of inductive charging pad. Model assumes that 308 in-route chargers will be required, which is one at each terminal point of 140 bus routes, plus 10%; some existing terminal locations routinely hold more than one bus at a time and would require more than one charger. Annual maintenance costs for in-route chargers are assumed to be 10% of installed capital cost.
Size (kW)	MJB&A analysis	Charger size (depot and in-route) based on average daily energy requirement (kWh) and available charging time (hr). Average daily energy requirement based on average daily miles times average energy use (kWh/mi). Depot charger size is 40 kW; In-route charger size is 20 kW.

Table 5i. Major Assumptions and Data Sources Used in Fleet Cost & Emissions Model – Fueling Infrastructure – Fuel Cell Buses

5I: FUELING INFRASTRUCTURE – FUEL CELL BUSES		
<i>Metric</i>	<i>Data Sources</i>	<i>Values/Notes</i>
SMR Cost (\$/kg/day)	M. Melaina and M. Penev, National Renewable Energy Laboratory, <i>Hydrogen Station Cost Estimates, Comparing Hydrogen Station Cost Calculator Results with other Recent Estimates</i> , Technical Report NREL/TP-5400-56412, September 2013	\$5,150/kg/day for stations built 2025 – 2034, and \$3,370/day for stations built after 2034. These values represent a 70% and 80% reduction in costs, respectively, compared to recently built hydrogen fuel stations.
Electrolyzer Cost (\$/kg/day)		
Required Capacity (kg/day)	MJB&A analysis	Required hydrogen production/dispensing capacity based on number of buses, daily mileage (mi/day), and average fuel use (kg/mi). Early buses will require 20 kg/bus/day and later buses will require only 18 kg/bus/day based on improved fuel economy due to technology maturity.

Table 5j. Major Assumptions and Data Sources Used in Fleet Cost & Emissions Model – Depot Expansion and Modifications

5J: DEPOT EXPANSION AND MODIFICATIONS		
<i>Metric</i>	<i>Data Sources</i>	<i>Values/Notes</i>
Depot Expansion (\$/incremental bus)	LACMTA Engineering Department	\$67,500/bus, applicable only to fleet expansion for electric buses with depot-only charging. Fleet expansion is required because electric buses cannot replace current buses one-for one due to limited range. This cost is based on \$500/sf for depot maintenance bays and \$100/sf for bus parking areas, but is discounted by 50% due to potential excess capacity within the system based on future operational changes.
Depot Parking Expansion (\$/charger)	LACMTA Engineering Department	Assumes that each depot-based electric charger will require 200 square feet of space for installation in depot parking areas. This will require expansion of parking areas to maintain bus parking capacity. Cost of new bus parking areas assumed to be \$100/sf. Total cost of additional bus parking space is \$20,000 per charger.
Maintenance & Diagnostic Equipment (\$/bus)	BYD electric bus quote to LACMTA for electric bus diagnostic equipment	Average cost of \$200/bus, applicable to all new Electric and Fuel Cell buses, based on recent BYD quote.
H ₂ Detection and Ventilation Upgrade Cost (\$/bus)	L. Eudy and M. Post, National Renewable Energy Laboratory, <i>Zero Emission Bay Area (ZEBA) Fuel Cell Bus Demonstration Results: Fourth Report</i> , July 2015	Average costs of \$28,000/bus, applicable to all new Fuel Cell buses. This is based on costs of \$350,000 per maintenance bay incurred by AC Transit, and an average of one maintenance bay per 12.6 buses.

Table 5k. Major Assumptions and Data Sources Used in Fleet Cost & Emissions Model – Global Economic Assumptions

5K: GLOBAL ECONOMIC ASSUMPTIONS		
<i>Metric</i>	<i>Data Sources</i>	<i>Values/Notes</i>
Annual Inflation, Bus and Infrastructure Purchase and Maintenance and Bus Operator Labor	Energy Information Administration, Annual Energy Outlook 2016, <i>early release, Table 20 Macroeconomic Indicators</i>	Projections for average annual % change in annual Wholesale Price Index, Industrial Commodities Excluding Energy (reference case), through 2040; value used is 1.8%.
Discount Rate for Net Present Value Calculations	LACMTA Policy	Value of 4% intended to represent average borrowing cost for LACMTA capital bonds. Note that this rate is generally consistent with the Energy Information Administration’s projection of interest rates for 10-year treasury notes over the next 25 years (AEO2016 reference case).
Methane Global Warming Potential (GWP ₁₀₀)	Intergovernmental Panel on Climate Change, <i>Fifth Assessment Report, 2013</i>	Global warming potential of methane over 100 years relative to CO ₂ . Value is 25.

3. RESULTS

This section summarizes the detailed results of the fleet cost and emissions analysis for each modeled bus technology/fuel purchase scenario.

3.1 Fleet Costs 2015 - 2055

Table 6 summarizes the total estimated fleet costs from 2015 – 2055 under each scenario in nominal dollars, during the transition to the different bus and fuel technologies. Incremental costs for each scenario compared to baseline are also plotted in Figure 4. See the Executive Summary for the net present value of estimated fleet costs in current dollars (2015).

As shown, the use of RNG by itself is not projected to increase total fleet costs. The use of RNG and the transition to LNOx buses is projected to increase total fleet costs over the next 40 years by \$297 million, an increase of 0.8% over projected baseline costs. The increased costs are due to slightly higher fuel and maintenance costs, as well as slightly higher bus purchase and overhaul costs.

The transition to electric buses is projected to increase total fleets costs by \$764 million - \$1.82 billion over the next 40 years, an increase of 2.1% - 4.9% over projected baseline costs. Exclusive depot charging is projected to be more expensive than depot and in-route charging during the transition.

The electric bus scenarios have increased costs relative to the baseline projection primarily due to increased capital costs for bus purchase and overhaul and for required depot modifications and installation of required fueling infrastructure.

For electric buses total operating costs are projected to be lower than baseline operating costs due to reduced fuel and maintenance costs. For depot-only charging these operating cost reductions are offset by higher bus operator labor costs due to the need to operate a greater number of buses because of electric bus operating range restrictions. Depot-only charging is projected to be more expensive than depot and in-route charging due to this increase in operator labor, as well as increased costs for purchasing a greater number of buses, which more than offsets higher infrastructure costs for route-based chargers.

Table 6. LACMTA Zero Emission Bus Estimated Total Fleet Costs 2015 - 2055 (nominal \$ million)

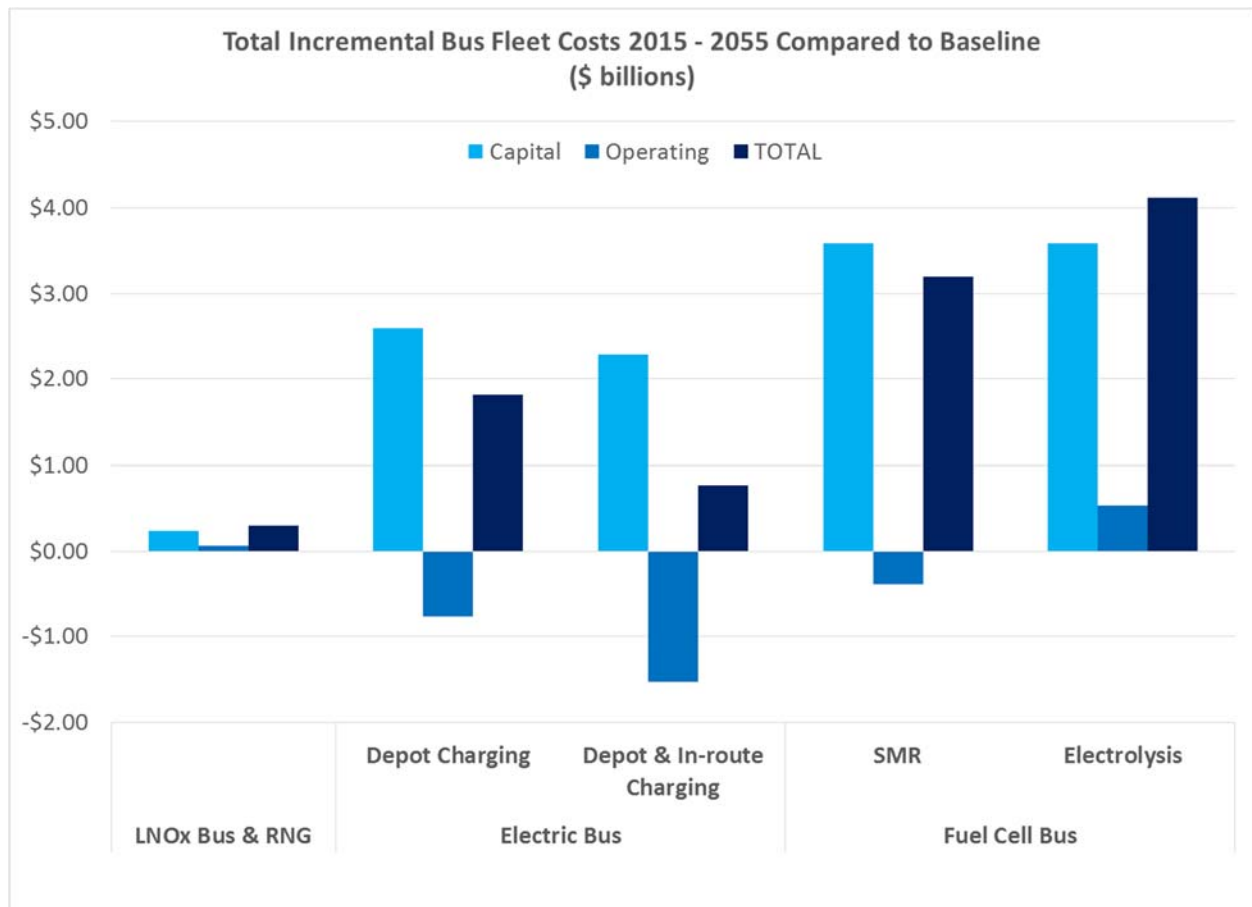
Cost Element		BASELINE	RENEW NG	LOW NOx CNG BUS & REPOWER		ELECTRIC BUS		FUEL CELL BUS	
		Std CNG Bus Conv NG	Std CNG Bus RNG	LNOx Bus Conv NG	LNOx Bus RNG	Depot Charging	Depot & In- Route Charging	H ₂ by SMR	H ₂ by Electrolysis
Capital	Bus Purchase	\$5,177.9	\$5,177.9	\$5,250.0	\$5,250.0	\$7,094.2	\$6,889.2	\$7,101.5	\$7,101.5
	Bus Repower			\$135.7	\$135.7				
	Bus mid-life OH	\$369.9	\$369.9	\$395.1	\$395.1	\$823.4	\$744.1	\$1,603.6	\$1,603.6
	Depot Mods					\$118.7	\$72.8	\$100.8	\$100.8
	Fuel Infra	\$0.0	\$0.0	\$0.0	\$0.0	\$99.4	\$127.7	\$324.9	\$324.9
	<i>sub-total</i>	<i>\$5,547.8</i>	<i>\$5,547.8</i>	<i>\$5,780.9</i>	<i>\$5,780.9</i>	<i>\$8,135.7</i>	<i>\$7,833.7</i>	<i>\$9,130.7</i>	<i>\$9,130.7</i>
Operating	BO Labor	\$23,515.6	\$23,515.6	\$23,515.6	\$23,515.6	\$24,174.3	\$23,515.6	\$23,515.6	\$23,515.6
	Fuel	\$2,958.4	\$2,958.4	\$2,968.8	\$2,968.8	\$1,733.3	\$1,680.5	\$2,396.6	\$3,317.9
	Maintenance	\$4,793.8	\$4,793.8	\$4,846.9	\$4,846.9	\$4,591.7	\$4,549.5	\$4,968.8	\$4,968.8
	<i>sub-total</i>	<i>\$31,267.8</i>	<i>\$31,267.8</i>	<i>\$31,331.3</i>	<i>\$31,331.3</i>	<i>\$30,499.3</i>	<i>\$29,745.6</i>	<i>\$30,881.0</i>	<i>\$31,802.2</i>
TOTAL		\$36,815.6	\$36,815.6	\$37,112.2	\$37,112.2	\$38,635.0	\$37,579.3	\$40,011.7	\$40,933.0
INCREASE		NA	\$0.00	\$296.59	\$296.59	\$1,819.44	\$763.73	\$3,196.17	\$4,117.40

The transition to fuel cell buses is projected to increase total fleets costs by \$3.2 - \$4.1 billion over the next 40 years, an increase of 8.7% - 11.2% over projected baseline costs.

Fuel cell buses are projected to have slightly higher maintenance costs and significantly higher capital costs than the baseline. Fuel costs are projected to be either lower or higher than the baseline, depending on the method of hydrogen production; making hydrogen using electrolysis is projected to be significantly more expensive than making hydrogen using SMR.

Capital costs are higher due to the projected cost of fueling infrastructure, as well as significantly higher bus purchase and overhaul costs.

Figure 4. LACMTA Zero Emission Bus Estimated Incremental Fleet Costs 2015 - 2055 (nominal \$)



3.2 Annual Fleet Costs After 2055

Table 7 summarizes the total estimated fleet costs in 2055 under each scenario in nominal dollars. Incremental costs for each scenario compared to baseline are also plotted in Figure 5. This data represents projected on-going annual costs for each bus/fuel technology after fully transitioning the fleet.

As shown, the use of RNG by itself is not projected to increase on-going annual fleet costs. The use of RNG and LNOx buses is projected to increase on-going annual fleet costs by \$3.3 million (2055 \$), an increase of 0.3% over projected baseline annual costs. The increased costs are due to slightly higher annual fuel costs, as well as slightly higher annual bus purchase and overhaul costs.

The use of electric buses with depot-only charging is projected to increase on-going annual fleet costs by \$31 million, an increase of 2.5% over projected baseline costs. The use of electric buses with depot and in-route charging is projected to increase on-going annual fleet costs by \$2.7 million, an increase of 0.2% over projected baseline costs.

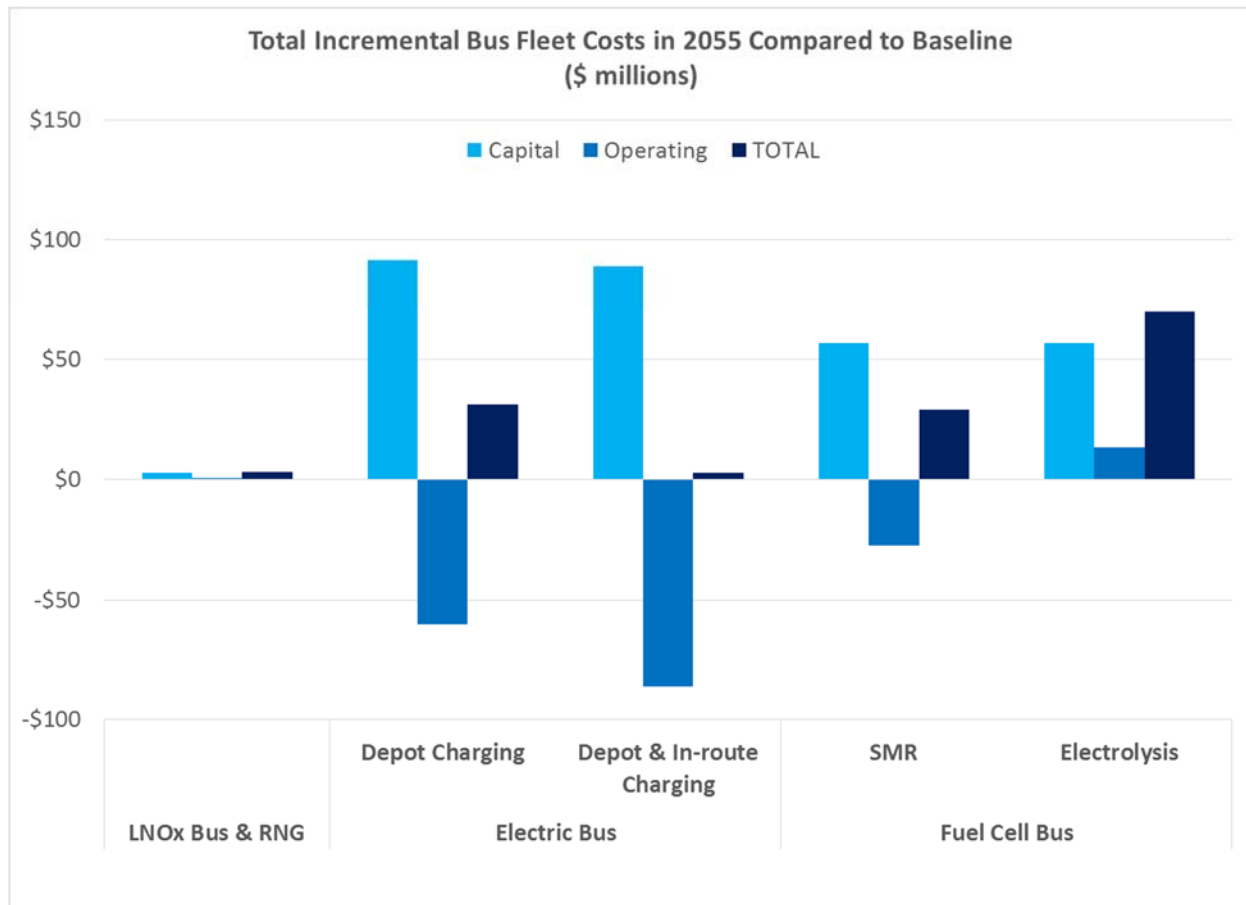
The electric bus scenarios have increased on-going annual costs relative to the baseline projection primarily due to continuing higher annual capital costs for bus purchase and overhaul. These scenarios

have significantly lower annual operating costs for fuel and maintenance, but these savings do not outweigh the increase in amortized capital costs.

Table 7. LACMTA Zero Emission Bus Estimated Annual Fleet Costs in 2055 (nominal \$ million)

Cost Element		BASELINE	RENEW NG	LOW NOx CNG BUS & REPOWER		ELECTRIC BUS		FUEL CELL BUS	
		Std CNG Bus Conv NG	Std CNG Bus RNG	LNOx Bus Conv NG	LNOx Bus RNG	Depot Charging	Depot & In- Route Charging	H ₂ by SMR	H ₂ by Electrolysis
Capital	Bus Purchase	\$175.3	\$175.3	\$177.1	\$177.1	\$243.6	\$243.7	\$213.9	\$213.9
	Bus Repower			\$0.0	\$0.0				
	Bus mid-life OH	\$12.5	\$12.5	\$13.6	\$13.6	\$35.8	\$33.1	\$30.4	\$30.4
	Depot Mods					\$0.0	\$0.0	\$0.0	\$0.0
	Fuel Infra	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0
	<i>sub-total</i>	\$187.8	\$187.8	\$190.6	\$190.6	\$279.3	\$276.9	\$244.3	\$244.3
Operating	BO Labor	\$796.0	\$796.0	\$796.0	\$796.0	\$818.9	\$796.0	\$796.0	\$796.0
	Fuel	\$114.6	\$114.6	\$115.1	\$115.1	\$45.8	\$43.8	\$80.8	\$121.5
	Maintenance	\$162.3	\$162.3	\$162.3	\$162.3	\$147.7	\$146.6	\$168.8	\$168.8
	<i>sub-total</i>	\$1,072.9	\$1,072.9	\$1,073.3	\$1,073.3	\$1,012.4	\$986.5	\$1,045.5	\$1,086.2
TOTAL		\$1,260.7	\$1,260.7	\$1,264.0	\$1,264.0	\$1,291.7	\$1,263.3	\$1,289.8	\$1,330.5
INCREASE		NA	\$0.00	\$3.32	\$3.32	\$31.08	\$2.67	\$29.13	\$69.88

Figure 5. LACMTA Zero Emission Bus Estimated Incremental Annual Costs in 2055 (nominal \$)



The use of fuel cell buses is projected to increase on-going annual fleet costs by \$29 - \$70 million, an increase of 2.3% - 5.5% over projected baseline costs.

The fuel cell bus scenarios have increased on-going annual costs relative to the baseline projection primarily due to continuing higher annual capital costs for bus purchase and overhaul, as well as slightly higher annual maintenance costs.

On-going annual fuel costs for fuel cell buses are projected to be lower than the baseline projection if hydrogen is produced using SMR, but higher than baseline fuel costs if hydrogen is produced using electrolysis.

3.3 Fleet Emissions 2015 - 2055

Annual estimated fleet emissions of in-basin NOx, out-of-basin NOx, in-basin PM, out-of-basin PM CH4, CO2, and GHG between 2015 and 2055 under each bus technology/fuel purchase scenario are shown in figures 6 – 12.

As shown in these figures, under the baseline scenario there is a significant reduction in annual in-basin NOx emissions, and a smaller reduction in CH4 and GHG emissions, between 2015 and 2020, while CO2, out-of-basin NOx, and in-basin and out-of-basin PM hold steady. This NOx and CH4 reduction is due to the retirement of LACMTA’s oldest CNG buses, which have significantly higher

tailpipe NOx and CH₄ emissions than the new CNG buses that will replace them under the baseline scenario. After 2020 the baseline scenario shows only minor year-to-year changes in annual emissions of all pollutants from the LACMTA bus fleet.

Figure 6. Estimated Annual Fleet Emissions of in-basin NOx (tons), 2015 – 2055

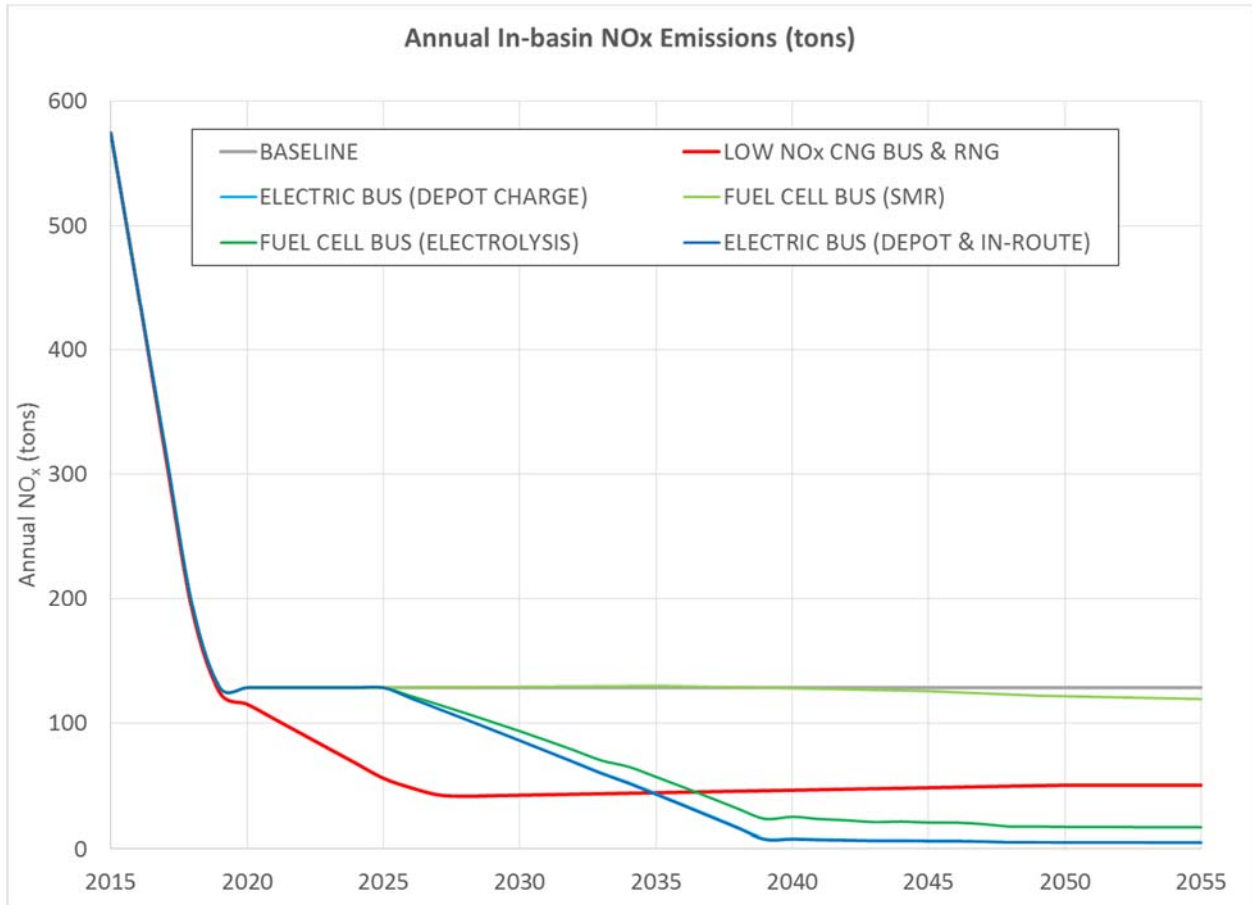


Figure 7. Estimated Annual Fleet Emissions of out-of-basin NOx (tons), 2015 – 2055

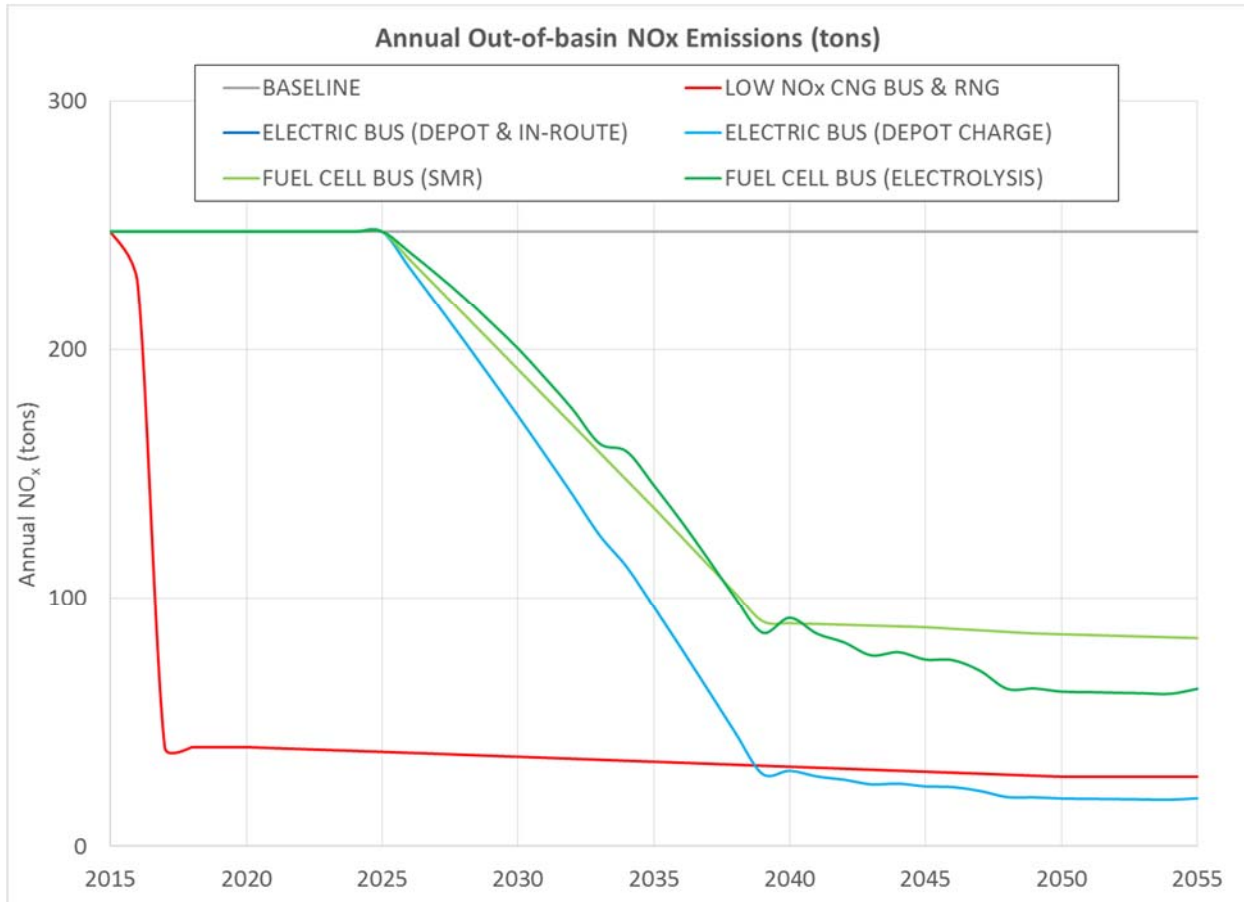


Figure 8. Estimated Annual Fleet Emissions of in-basin PM (tons), 2015 - 2055

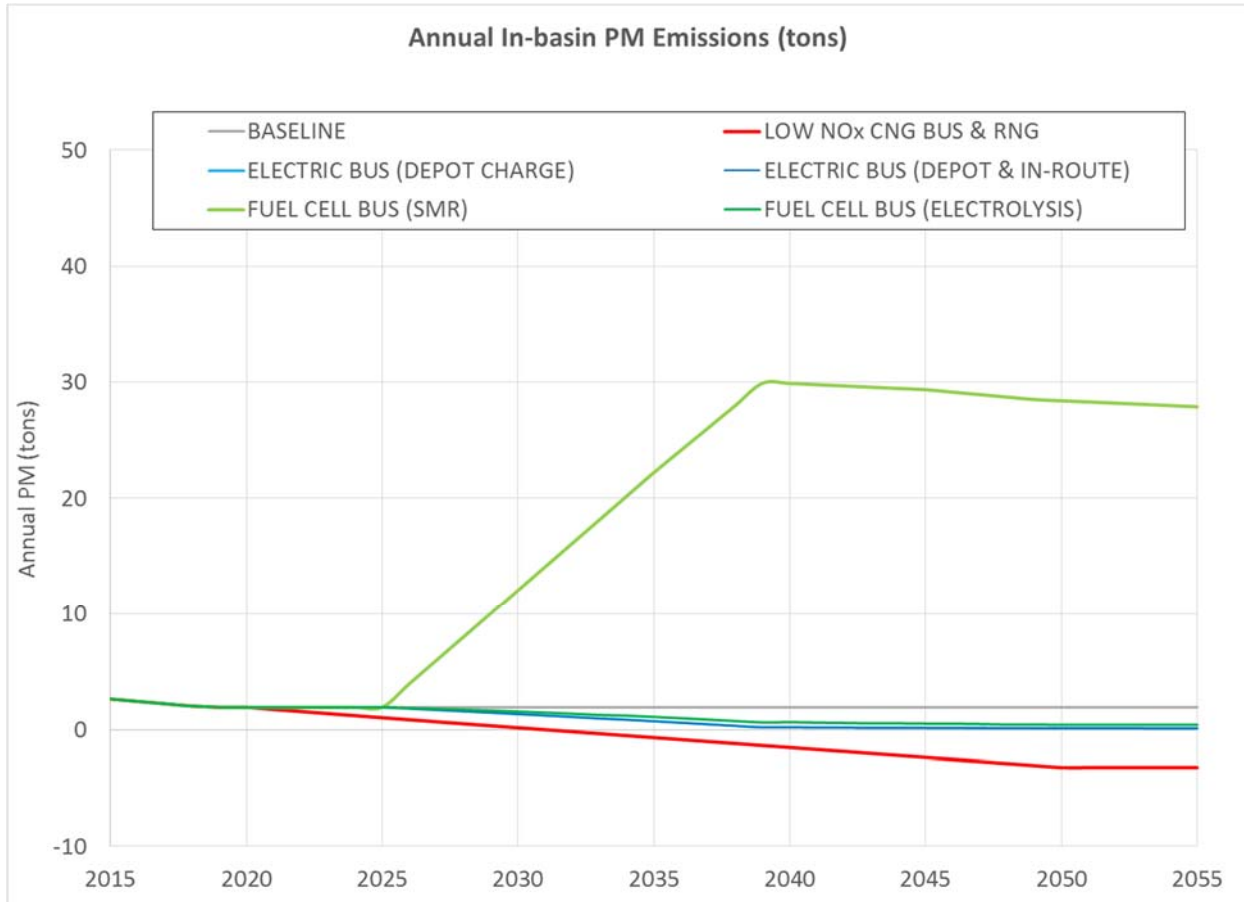


Figure 9. Estimated Annual Fleet Emissions of out-of-basin PM (tons), 2015 - 2055

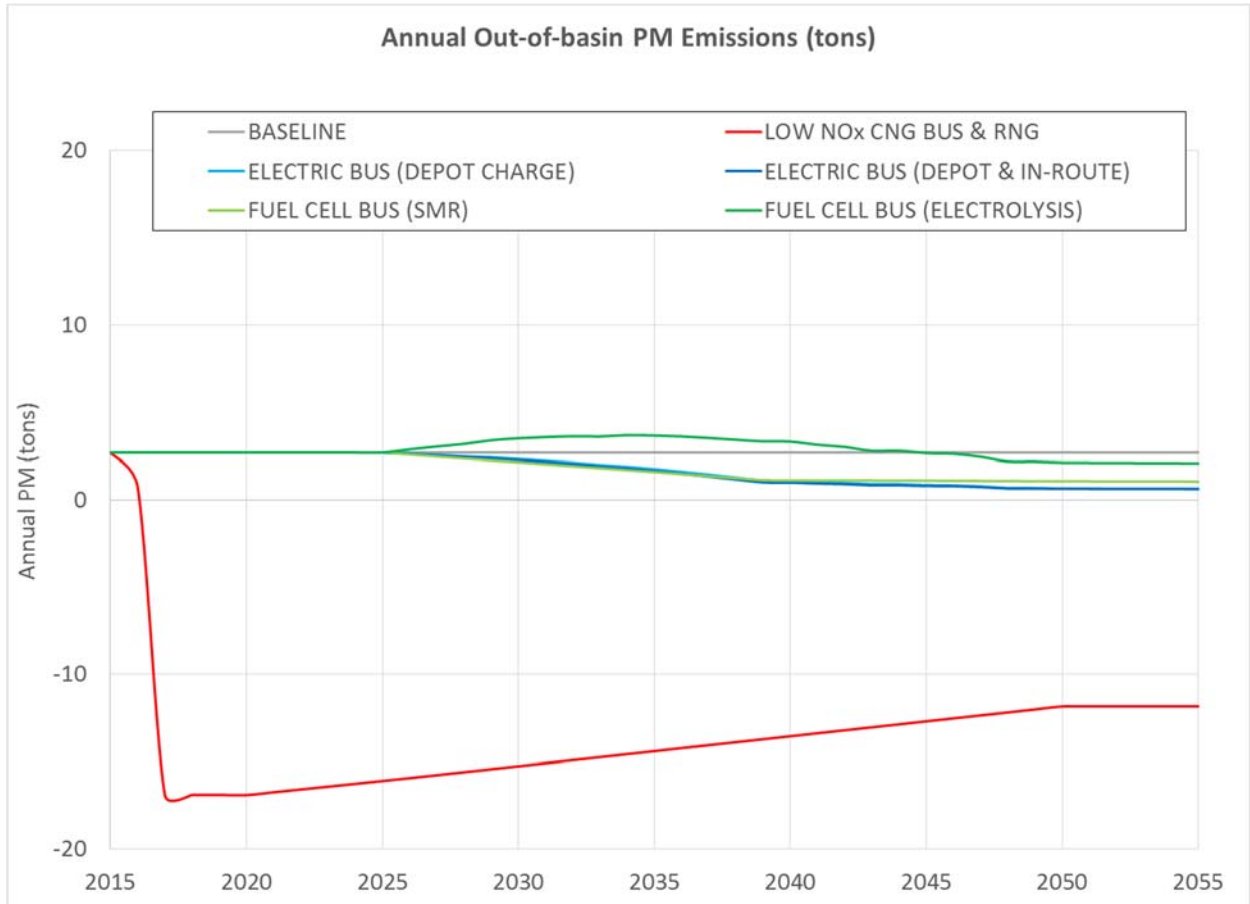


Figure 10. Estimated Annual Fleet Emissions of CH₄ (tons), 2015 - 2055

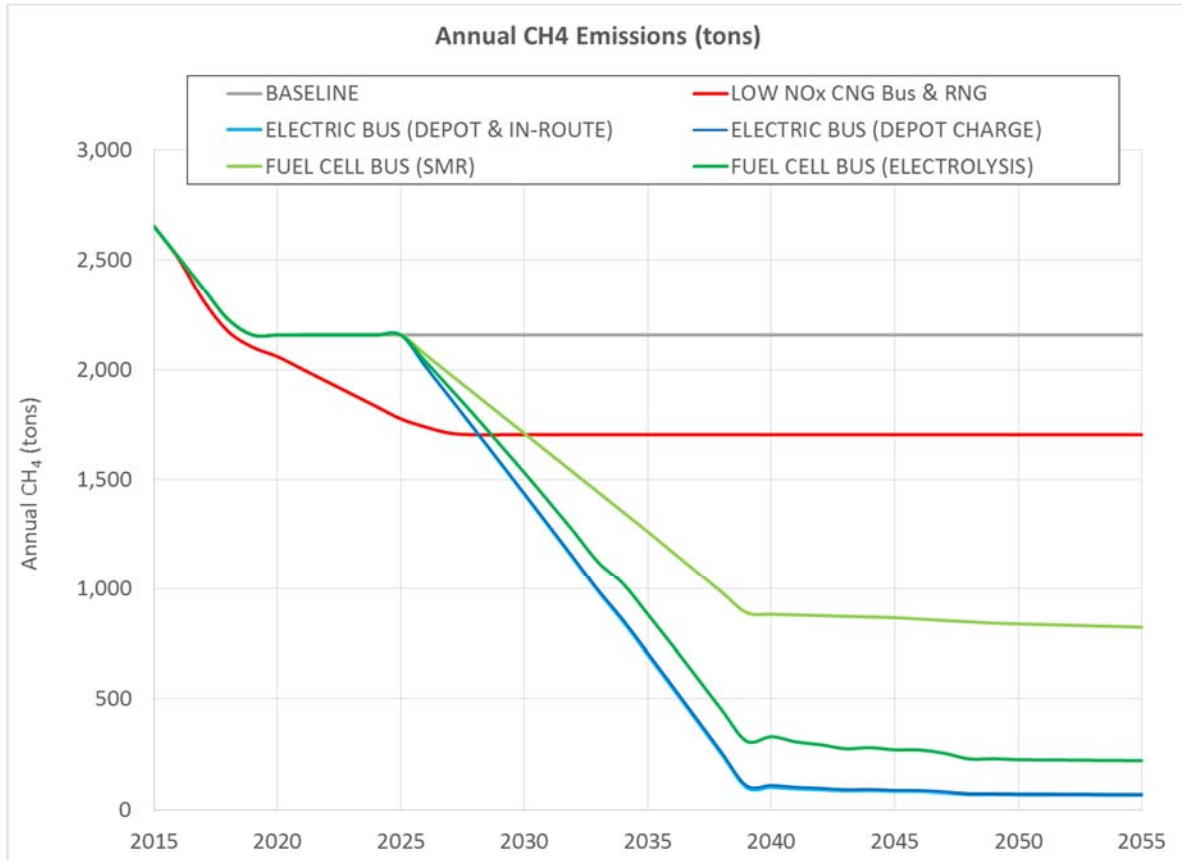


Figure 11. Estimated Annual Fleet Emissions of CO₂ (tons), 2015 - 2055

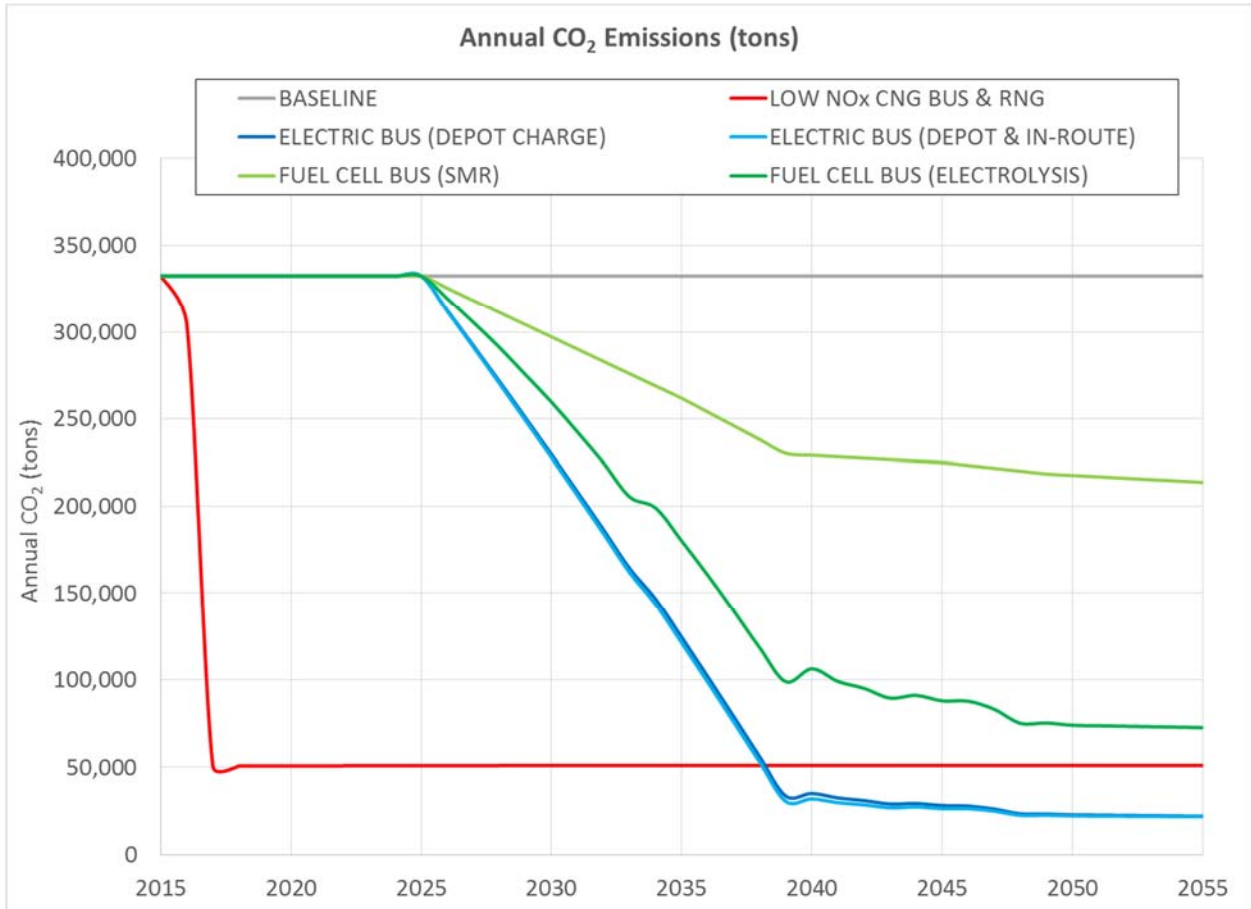
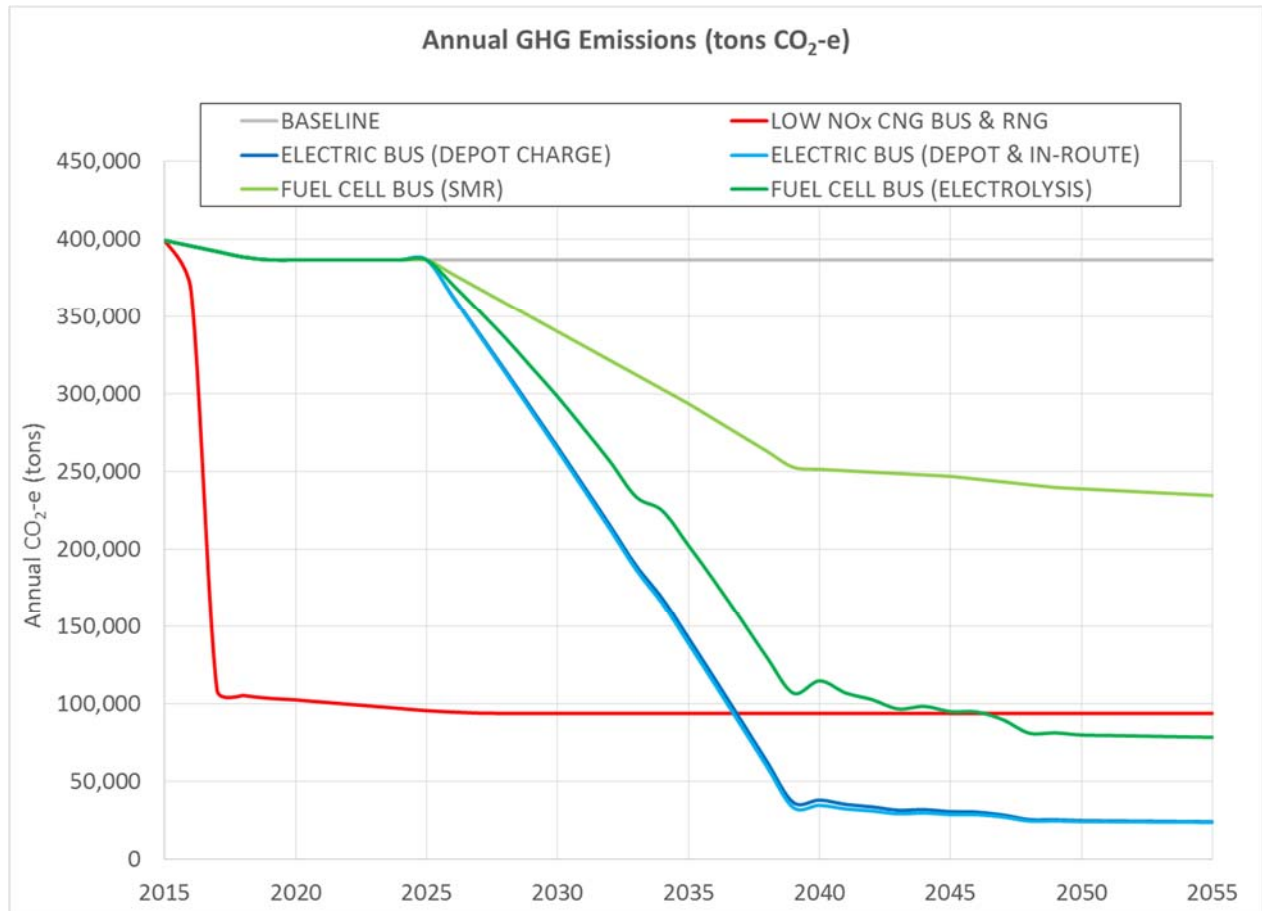


Figure 12. Estimated Annual Fleet Emissions of GHG (tons CO₂-e), 2015 - 2055



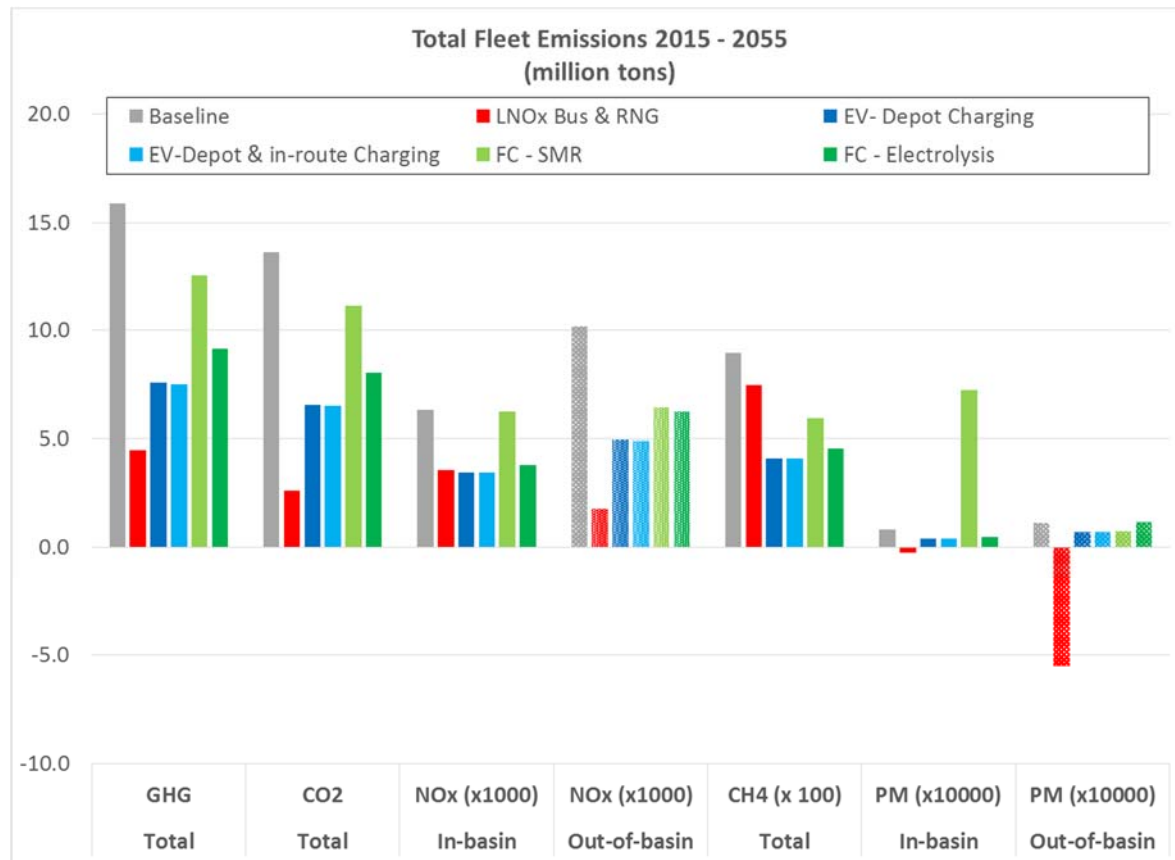
Under the LNOx Bus + RNG scenario annual estimated out-of-basin NOx and PM, CH₄, CO₂ and GHG emissions fall dramatically between 2016 and 2018 compared to the baseline, as the entire existing bus fleet is transitioned to RNG. These reductions are the result of lower upstream emissions from RNG production and transport compared to production and transport of standard natural gas. Annual out-of-basin PM emissions from this scenario are negative due to upstream PM credits for RNG production. Over the time period 2018 – 2028 annual in-basin NOx, in-basin PM, and CH₄ emissions continue to fall as the bus fleet transitions from standard natural gas engines to Low NOx natural gas engines with lower tailpipe emissions of NOx, PM, and CH₄. Between 2028 and 2055 in-basin PM and NOx under this scenario increase slightly year-to-year, while out-of-basin PM and NOx decrease slightly, due to assumed transition to a greater percentage of RNG produced by in-basin sources.

Under the electric bus and fuel cell bus scenarios annual NOx, CH₄, CO₂, and total GHG emissions start to fall in 2025 compared to the baseline, with significant year-to-year reductions through 2038 as the fleet transitions to electric or fuel cell buses. After 2038 annual emissions continue to fall, but at a lower rate. These continuing annual reductions after 2038 are due to continuing reductions in upstream emission rates (g/kWh) for electricity production, based on greater use of zero-emission renewable energy sources (solar, wind). With the exception of the fuel cell scenario with hydrogen fuel produced via SMR the electric and fuel cell scenarios produce significant reductions in both in-basin and out-of-basin NOx. When hydrogen is produced via SMR, out-of-basin NOx emissions fall

year-to-year, but annual in-basin NOx emissions are similar to those under the baseline scenario throughout the analysis period.

With the exception of the fuel cell scenario when hydrogen is produced via SMR the electric and fuel cell scenarios also show reduced in-basin and out-of-basin PM emission compared to the baseline. When hydrogen production is by SMR out-of-basin PM emissions fall relative to the baseline, but in-basin PM emission increase significantly year-to-year through 2039 and then start to fall slightly. These increased in-basin PM emissions are due to the upstream emissions from producing hydrogen via SMR at the depots, and they outweigh reductions in tailpipe PM emissions from CNG buses.

Figure 13. LACMTA Zero Emission Bus Total Fleet Emissions (million tons) 2015 -2055



Total fleet emissions from each scenario over the period 2015 – 2055 are summarized in Figure 13. As shown, over the next 40 years total estimated fleet emissions of in-basin and out-of-basin PM, out-of-basin NOx, CO₂, and GHG are projected to be lower from the use of RNG and transition to LNOx buses than from transition to electric or fuel cell buses, while total fleet emissions of in-basin NOx are projected to be slightly higher and total fleet emissions of CH₄ are projected to be moderately higher.

Note that this analysis assumes that the RNG purchased by LACMTA will be 100% landfill gas, with 100% sourced from outside of the South Coast Air Basin in the near term, transitioning to 30% sourced from within the basin after 2050. According to the California Air Resources Board⁷ RNG produced from wastewater treatment plants or food waste would have lower NOx and lower GHG

⁷ California Low Carbon Fuel Standard

emissions than landfill gas. The use of RNG from these sources could further reduce total GHG and NOx emissions for the LNOx Bus + RNG scenario, compared to the data shown in Figure 11. The proportion of total NOx emitted in-basin and out-of-basin under the LNOx Bus + RNG scenario would be affected by both the RNG source type and the RNG source location.

3.4 Fleet Emissions After 2055

Table 8 summarizes the total estimated fleet emissions in 2055 under each scenario; this data is also plotted in Figure 14. This data represents projected on-going annual LACMTA fleet emissions for each bus/fuel technology after fully transitioning the fleet.

Table 8. Projected LACMTA Annual Fleet Emissions in 2055 (tons)

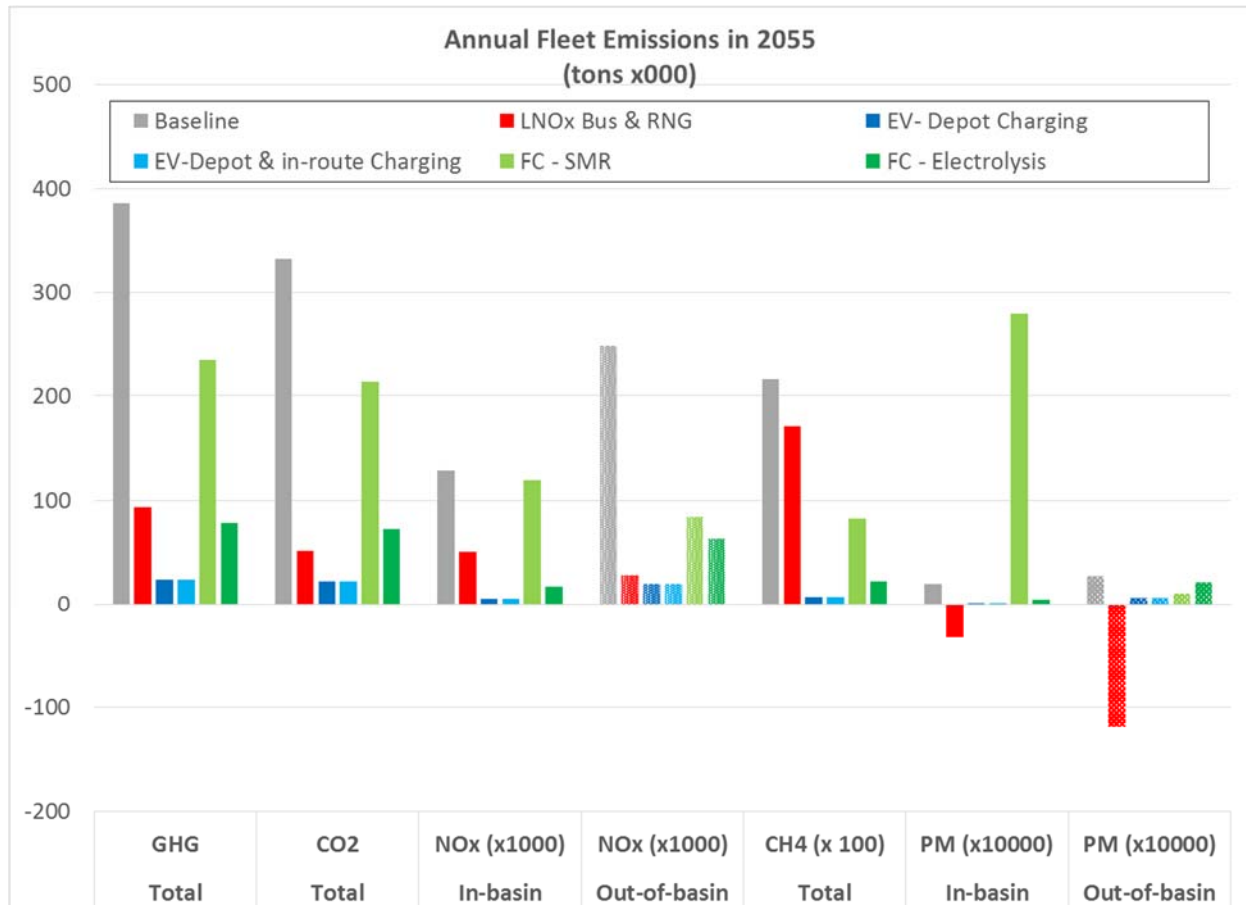
Pollutant	BASELINE		RENEW NG		LOW NOx CNG BUS & REPOWER		ELECTRIC BUS		FUEL CELL BUS	
	Std CNG Bus Conv NG	Std CNG Bus Renew NG	LNOx Bus Conv NG	LNOx Bus Renew NG	Depot Charging	Depot & In- Route Charging	H ₂ by SMR	H ₂ by Electrolysis		
NOx (in-basin)	128.6	136.6	42.5	50.5	5.1	5.1	119.6	16.9		
PM (in-basin)	1.94	-3.13	1.87	-3.22	0.13	0.13	27.87	0.42		
CH₄	2,157.3	2,101.8	1,759.4	1,703.7	67.1	66.3	824.2	220.2		
CO₂	332,622	50,795	333,958	50,999	22,151	21,896	213,790	72,708		
GHG (CO₂-e)	386,554	103,340	377,942	93,591	23,829	23,554	234,395	78,213		
NOx (Out-of-basin)	247.7	27.9	248.7	28.0	19.3	19.1	83.8	63.4		
PM (out-of-basin)	2.69	-11.83	2.70	-11.88	0.63	0.63	1.05	2.08		

In 2055 and later years electric buses are projected to have the lowest annual GHG emissions, approximately 94% lower than the baseline, and 75% lower than RNG plus LNOx buses. Fuel cell buses are projected to have GHG emissions 16% lower than RNG plus LNOx buses if the hydrogen fuel is produced by electrolysis, but 148% higher if the hydrogen fuel is produced by SMR.

Despite higher annual emissions after 2055, total cumulative GHG emissions would be lower from the transition to RNG and LNOx buses than from the transition to electric buses through 2099 due to lower emissions between 2015 and 2055. After 2099 electric buses would start to accrue net GHG reductions relative to RNG and LNOx buses.

Fuel cell buses would not start to accrue net GHG reductions relative to RNG and LNOx buses until 2358, even if hydrogen fuel was produced using electrolysis.

Figure 14. Projected LACMTA Fleet Emissions in 2055 (tons x000)



In 2055 and later years electric buses are projected to have the lowest annual in-basin and out-of-basin NOx emissions, approximately 96% and 92% lower than the baseline respectively. In 2055 in-basin NOx emissions from electric buses are projected to be 90% lower than from RNG plus LNOx buses. Fuel cell buses are projected to have in-basin NOx emissions 66% lower than RNG plus LNOx buses if the hydrogen fuel is produced by electrolysis, but 136% higher if the hydrogen fuel is produced by SMR.

ATTACHMENT E

Identified ZEB Suppliers

Company	Buy America	Location	Models	Battery
BYD	Y	46147 BYD Blvd, Lancaster, CA	20,30, 40, 45, 60 ft battery electric	up to 520 kWh
CCW	Y	1863 Service Ct, Riverside, CA	30, 35, 40 ft rebuilt	311 kWh
ebus	Y	9250 Washburn Rd, Downey, CA	22, 40 ft battery electric	
El Dorado	Y	9670 Galena St, Riverside, CA	40' battery bus	
GreenPower	N	37-2 Haijing East Road, China. ST 240-209 Carrall St, Vancouver , BC	30, 40, 45, 60 ft battery electric	210-400 kWh
Linkker	N	Koritie 2, 15540 Villahde, Finland	12 m, low floor battery electric	48 kWh
NFA	Y	6200 Glenn Carlsen Dr., St. Cloud, MN	40' 60' battery buses	
Proterra	Y	1815 Rollins Rd., Burlingame, CA	35', 40' battery bus	Up to 300kWh
Van Hool	N	Bernard Van Hoolstraat 58, Loningshooikt, Belgium	40' fuel cell bus	H2
Nova/Volvo	Y	260 Banker Rd, Plattsburgh, NY	40' battery bus	40 kWh

NOISE LEVEL COMPARISON OF CONVENTIONAL AND ZEB's

Altoon test data												
Measured in dBA Scale	CNG						Electric				Difference for Electric Buses	
	New Flyer XN40 - 2014	Nova Bus LFS 40 - 2013	NABI 40- LFW - 2013	Orion EPA 10 - 2011	New Flyer XN60 - 2011	Average	Proterra BE40 - 2014	New Flyer XE40 - 2014	BYD K9 - 2013	Average		
Interior												
Driver	71.7	71.4	74.8	75.5	71.5	73.0	74.8	69.3	68.3	70.8	-2.2	
Passengers	75.8	79.5	74.8	77.9	74.0	76.4	75.6	70.2	71.1	72.3	-4.1	
Exterior												
Curb Side	73.6	72.4	67.9	71.3	71.5	71.3	66.1	66.1	63.0	65.1	-6.3	
Street Side	73.9	72.2	68.9	71.5	77.7	72.8	66.6	66.1	61.3	64.7	-8.2	

Weekday Metro Bus Mileage Summary by Division
June 26, 2016

ATTACHMENT G

Div.	Line	Weekday Bus Mileage Totals						Shortest Run Time	Longest Run Time	Weekday Ridership	Off-Street Terminals	Comments
		One-Way Trip Mi.	Total Blocks	<150	> 150 <200	> 200 <250	<250 and UP					
Div 1	16	12.6	20	17	3	0	0	0:57	21:53	16,821	1	Maple Lot
Div 1	18	13.0	31	30	1	0	0	0:45	17:46	14,042	2	6th and Oxford & Montebello Metro Link Sta
Div 1	20	17.5	15	15	0	0	0	1:23	17:19	8,223	1	Maple Lot
Div 1	45	20.2	12	9	3	0	0	2:04	18:03	13,034	0	
Div 1	53	16.6	25	20	4	1	0	1:47	19:19	8,617	1	Beaudry & Temple
Div 1	62	26.3	13	6	5	2	0	2:15	19:40	3,681	1	Beaudry & Temple
Div 1	66	13.0	25	24	1	0	0	1:03	19:20	35,663	2	6th and Oxford & Montebello Metro Link Sta
Div 1	460	40.3	12	9	3	0	0	3:23	16:11	2,290	2	Maple Lot & Disneyland
Div 1	760	11.5	12	6	6	0	0	1:40	16:30	2,290	0	
Division 1 Vehicle Totals			165	136	26	3	0			104,661		
Division 1 Percentages				82%	16%	2%	0%					
Div 2	4	20.7	7	7	0	0	0	3:25	15:25	15,869	1	Terminal 28
Div 2	10	19.9	13	9	4	0	0	1:51	19:31	13,036	1	On-Street Adjacent to Division 7
Div 2	55	13.2	14	10	4	0	0	1:36	17:36	8,566	1	Rosa Parks/Willowbrook Station
Div 2	51	17.6	45	39	6	0	0	1:28	15:34	26,191	3	Harbor Gateway TC, MLK TC Compton, 6th & Shatto Pl
Div 2	60	25.6	31	30	1	0	0	1:42	16:10	15,678	1	Artesia Blue Station
Div 2	105	16.0	16	12	4	0	0	2:44	19:08	11,280	2	Division 7 Yard & Vernon Yard
Div 2	200	6.3	17	16	1	0	0	1:44	20:44	13,291	0	
Div 2	611	14.6	4	2	2	0	0	3:41	17:12	1,647	0	
Div 2	612	16.3	4	2	0	2	0	8:30	20:24	1,374	2	Clockwise Shuttle with Terminal at Willowbrook Station.
Div 2	705	14.8	9	8	1	0	0	2:08	15:51	6,363	2	Division 7 Yard & Vernon Yard
Division 2 Vehicle Totals			160	135	23	2	-			113,295		
Division 2 Percentages				84%	14%	1%	0%					
Div 3	28	21.1	13	11	2	0	0	0:41	16:04	10,996	0	
Div 3	45	20.2	15	15	0	0	0	1:59	15:05	16,149	0	
Div 3	81	19.9	27	17	7	3	0	1:53	19:55	16,090	0	
Div 3	83	15.1	7	7	0	0	0	1:32	17:18	2,888	1	Terminal 28
Div 3	175	5.2	2	2	0	0	0	1:08	4:06	864	0	
Div 3	180	18.6	16	11	4	1	0	2:44	20:40	8,710	2	Hollywood Vine Sta. (Sierra Madre Villa Sta - Rte 181 only)
Div 3	201	11.6	3	2	1	0	0	15:02	15:20	1,166	1	Wilshire / Vermont Red Line Station
Div 3	206	14.0	5	4	1	0	0	2:09	15:52	13,145	0	
Div 3	251	14.6	15	13	2	0	0	0:51	17:11	8,739	1	On-Street adjacent to Division 3
Div 3	252	8.9	5	2	3	0	0	0:52	16:12	2,453	0	
Div 3	258	28.4	7	0	1	6	0	14:19	17:30	1,771	0	
Div 3	751	10.2	9	9	0	0	0	3:27	14:52	5,533	2	Palm / Seville & On Street adjacent to Division 3
Div 3	780	22.1	21	9	12	0	0	2:40	15:31	9,095	1	Washington / Fairfax Terminal
Division 3 Vehicle Totals			145	102	33	10	0			97,599		
Division 3 Percentages				70%	23%	7%	0%					
Div 5	102	18.5	7	4	2	1	0	3:54	19:46	2,614	2	Lax City Bus Terminal & Palm and Seville Terminal
Div 5	108	24.1	34	21	10	3	0	1:59	18:39	16,770	0	
Div 5	110	21.2	22	18	4	0	0	2:02	18:36	9,598	0	
Div 5	204	12.6	12	12	0	0	0	2:07	15:55	22,173	0	
Div 5	206	14.0	12	7	4	1	0	3:16	20:13	13,145	0	
Div 5	207	14.2	12	10	1	1	0	2:12	21:37	18,048	0	
Div 5	209	14.7	3	0	3	0	0	13:52	16:10	1,059	1	Oxford & 6th Terminal
Div 5	212	14.7	26	23	3	0	0	1:52	20:00	13,476	1	On-Street adjacent to Hollywood / Vine Station.
Div 5	740	12.7	9	4	5	0	0	1:45	17:41	2,781	1	South Bay Transit Center
Div 5	754	12.5	20	17	3	0	0	2:31	16:30	20,575	0	
Div 5	757	14.3	20	16	4	0	0	2:00	15:09	13,104	0	
Division 5 Vehicle Totals			177	132	39	6	0			133,343		
Division 5 Percentages				75%	22%	3%	0%					

Weekday Metro Bus Mileage Summary by Division
June 26, 2016

Div.	Line	Weekday Bus Mileage Totals						Shortest Run Time	Longest Run Time	Weekday Ridership	Off-Street Terminals	Comments
		One-Way Trip Mi.	Total Blocks	<150	> 150 <200	> 200 <250	<250 and UP					
Div 7	2	28.9	25	22	3	0	0	1:25	19:25	15,909	1	Terminal 28.
Div 7	4	20.7	11	9	2	0	0	2:09	19:03	15,869	1	Terminal 28.
Div 7	10	19.9	16	14	2	0	0	1:30	15:39	13,036	1	On-street adjacent to Division 7
Div 7	14	19.8	41	38	3	0	0	1:31	18:24	19,054	1	Washington / Fairfax Terminal
Div 7	16	12.6	23	21	1	1	0	2:23	21:53	22,938	1	Maple Lot
Div 7	20	17.5	11	11	0	0	0	3:44	15:18	15,455	1	Maple Lot
Div 7	28	21.1	13	12	1	0	0	1:17	17:50	10,996	0	
Div 7	30	15.3	7	7	0	0	0	2:15	16:48	13,807	1	On-street adjacent to Division 7
Div 7	33	19.6	8	8	0	0	0	2:48	13:20	11,062	2	Maple Lot & Jackson st. Terminal
Div 7	35	15.0	17	13	4	0	0	2:07	18:58	9,715	2	Washington / Fairfax Terminal
Div 7	217	14.5	15	15	0	0	0	0:58	17:14	7,002	1	On-street adjacent to Hollywood & Vine Terminal
Div 7	534	26.5	16	12	4	0	0	2:03	8:30	2,689	1	Washington / Fairfax Terminal
Div 7	704	19.7	9	8	1	0	0	2:44	15:54	12,389	1	Jackson Street Terminal
Div 7	705	14.8	8	6	0	1	1	2:06	19:44	6,363	2	On-street adjacent to Division 7 Yard & Vernon Yard.
Div 7	733	19.7	5	5	0	0	0	4:27	4:46	11,451	1	Jackson Street Terminal
Division 7 Vehicle Totals			225	201	21	2	1			187,735		
Division 7 Percentages				89%	9%	1%	0%					
Div 8	150	18.1	20	10	8	1	1	2:12	21:59	9,189	2 / 4	Universal / Studio City Sta./ On-Street Warner Cntr (2 of 4 Terms)
Div 8	152	24.4	17	12	4	1	0	0:45	17:48	11,780	1	North Hollywood Station
Div 8	155	13.4	2	2	0	0	0	7:33	8:40	1,659	1	Burbank Station
Div 8	158	18.9	5	2	2	1	0	2:04	16:13	2,321	1	Chatsworth Wtation
Div 8	161	22.4	8	5	2	1	0	1:42	13:28	1,344	2	Thousand Oaks Transit Center & On-Street Warner Center
Div 8	163	17.2	6	6	0	0	0	4:21	13:08	9,605	1/3	North Hollywood Station (1 of 3 Terminals)
Div 8	164	23.5	12	8	1	3	0	2:15	18:06	6,696	1	Burbank Station
Div 8	165	22.9	18	13	1	3	1	1:21	18:58	8,252	1	Burbank Station
Div 8	166	16.7	9	6	1	2	0	1:47	18:12	2,865	2	Diviion 15 & Chatsworth Metrolink Station
Div 8	169	33.1	7	2	2	3	0	0:59	17:02	2,497	2	On Street Warner Center & Burbank RITC
Div 8	236	16.6	9	4	3	2	0	1:56	18:24	2,499	1	Sylmar Station
Div 8	237	22.2	3	0	2	1	0	13:38	16:36	N/A	0	
Div 8	239	16.1	2	2	0	0	0	2:15	6:08	976	0	
Div 8	243	19.0	7	4	2	1	0	1:29	15:06	1,857	0	
Div 8	245	16.5	12	10	2	0	0	1:04	15:14	3,170	2	Chatsworth Station on both ends of the line.
Div 8	750	16.1	12	7	2	3	0	1:52	16:58	3,170	2	On Street Warner Center & Universal City Red Line Sta.
Div 8	901	19.8	33	10	9	14	0	2:12	15:21	25,979	3/3	On Street Warner Center, North Hollywood Sta & Chatsworth Sta.
Division 8 Vehicle Totals			182	103	41	36	2			93,859		
Division 8 Percentages				57%	23%	20%	1%					
Div 9	70	16.5	17	9	8	0	0	1:58	18:10	11,064	2	El Monte Station & Terminal 28
Div 9	71	8.3	7	6	1	0	0	3:17	15:39	1,737	1	Terminal 28
Div 9	76	16.3	17	14	3	0	0	2:04	18:12	9,393	2	El Monte Station & Terminal 28
Div 9	78	18.2	27	18	7	1	1	1:44	20:55	70,026	1	Terminal 28
Div 9	176	20.7	5	0	5	0	0	14:16	16:20	1,797	2	Terminal 28 to El Monte Station
Div 9	260	28.5	21	9	5	7	0	1:55	20:08	11,149	1	Artesia Blue Line Station
Div 9	265	16.3	4	1	0	3	0	6:14	17:25	1,705	1	Jackson Street
Div 9	267	17.6	8	0	5	3	0	14:16	16:30	3,217	1	El Monte Station
Div 9	268	23.0	15	11	2	2	0	1:15	17:32	1,906	1	El Monte Station
Div 9	487	31.6	18	11	4	3	0	1:45	15:43	3,709	1/3	El Monte Station (1 of 3 terminals)
Div 9	665	6.7	2	1	1	0	0	6:18	15:53	758	1	Cal State L.A On-Street Transit Station.
Div 9	687	5.9	4	1	3	0	0	15:05	17:40	1,426	0	
Div 9	762	25.0	11	4	2	5	0	2:25	16:32	4,120	1	Artesia Blue Line Station
Div 9	770	16.6	16	6	9	1	0	2:33	16:12	7,651	2	Terminal 28 to El Monte Station
Div 9	910	38.9	33	21	0	4	8	2:19	21:04	16,355	2/3	El Monte Sta, Harbor Gateway Sta (2 of 3 terminals)
Division 9 Vehicle Totals			205	112	55	29	9			53,793		
Division 9 Percentages				55%	27%	14%	4%					

Weekday Metro Bus Mileage Summary by Division
June 26, 2016

<u>Weekday Bus Mileage Totals</u>											<u>Off-Street</u>	<u>Comments</u>
<u>Div.</u>	<u>Line</u>	<u>One-Way</u> <u>Trip Mi.</u>	<u>Total</u> <u>Blocks</u>	<u><150</u>	<u>> 150</u> <u><200</u>	<u>> 200</u> <u><250</u>	<u><250</u> <u>and UP</u>	<u>Shortest</u> <u>Run Time</u>	<u>Longest</u> <u>Run Time</u>	<u>Weekday</u> <u>Ridership</u>		
Div 10	2	28.9	5	5	0	0	0	2:25	11:05	15,909	1	Terminal 28
Div 10	30	15.3	3	3	0	0	0	1:26	5:26	13,807	2/3	Division 7 Yard & Pico Rimpau Terminal (2 of 3 terminals)
Div 10	33	19.6	4	4	0	0	0	2:16	7:39	11,062	2/3	Maple Lot & Jackson Street Terminal (2 of 3 terminals)
Div 10	68	11.3	4	4	0	0	0	1:08	14:02	5,737	3/4	Dozier/Rowan, Maple Lot, ELAC Transit CTR (3 of 4 terminals)
Div 10	106	7.5	2	2	0	0	0	15:05	15:27	N/A	2	ELAC Transit Ctr. & On Street USC Medical Center.
Div 10	704	19.7	11	10	1	0	0	2:18	15:32	12,389	1	Jackson Street
Div 10	728	13.3	16	14	2	0	0	2:04	17:35	5,979	1	Jackson Street
Div 10	733	19.7	20	14	6	0	0	2:26	15:46	11,451	1	Jackson Street
Div 10	745	11.3	8	6	2	0	0	2:00	15:59	6,278	2	Jackson Street & Figueroa and 117th (Green Line Station)
Division 10 Vehicle Totals			73	62	11	0	0			82,612		
Division 10 Percentages				85%	15%	0%	0%					
Div 13	2	28.9	25	20	5	0	0	1:31	19:22	12,689	1	Terminal 28.
Div 13	4	20.7	9	7	2	0	0	2:56	20:17	15,869	1	Terminal 28.
Div 13	30	15.3	13	12	1	0	0	3:13	20:14	13,807	2/3	Division 7 Yard & Pico Rimpau Terminal (2 of 3 terminals)
Div 13	33	19.6	12	12	0	0	0	2:27	14:17	11,062	2/3	Maple Lot & Jackson Street Terminal (2 of 3 terminals)
Div 13	55	13.2	4	3	1	0	0	4:31	15:49	8,566	1	Rosa Parks / Wilmington Blue Line Station.
Div 13	68	11.3	7	5	2	0	0	3:16	21:11	5,767	3/4	Dozier/Rowan, Maple Lot, ELAC Transit CTR (3 of 4 terminals)
Div 13	704	19.7	7	3	4	0	0	7:35	18:52	12,389	1	Jackson Street
Div 13	720	24.6	64	47	11	6	0	2:15	21:13	35,512	0	
Div 13	733	19.7	5	3	2	0	0	9:51	19:20	11,451	1	Jackson Street Terminal
Div 13	745	11.3	9	7	2	0	0	2:14	14:38	6,278	2	Jackson Street & Figueroa and 117th (Green Line Station)
Division 13 Vehicle Totals			155	119	30	6	0			133,390		
Division 13 Percentages				77%	19%	4%	0%					
Div 15	90	32.4	18	7	8	2	1	0:51	19:45	7,856	1	Terminal 28.
Div 15	92	14.3	12	5	7	0	0	3:45	18:05	5,191	1	Burbank Station
Div 15	94	26.0	13	4	2	4	3	2:50	21:34	5,084	1	Terminal 28.
Div 15	152	24.4	10	5	5	0	0	2:00	12:53	11,780	1	North Hollywood Station
Div 15	154	18.0	3	0	3	0	0	14:09	15:20	1,021	1	Burbank Station
Div 15	155	13.4	4	1	3	0	0	13:41	14:38	1,659	1	Burbank Station
Div 15	163	17.2	14	11	3	0	0	2:11	16:36	9,605	1/3	North Hollywood Station (1 of 3 Terminals)
Div 15	164	23.5	5	1	0	4	0	1:30	18:00	6,696	1	Burbank Station
Div 15	165	22.9	7	5	1	1	0	1:46	17:07	8,252	1	Burbank Station
Div 15	166	16.7	11	9	2	0	0	1:29	13:33	5,865	2	Division 15 & Chatsworth Metrolink Station
Div 15	183	22.4	6	2	3	1	0	3:05	17:39	2,175	1	Glendale Transportation Center
Div 15	222	17.4	10	7	1	1	1	1:00	20:58	1,801	0	
Div 15	224	16.9	12	10	1	0	1	2:40	21:12	7,681	1	Universal City Red Line Station
Div 15	230	15.4	11	7	3	1	0	0:56	18:27	4,626	0	
Div 15	233	13.7	16	13	3	0	0	2:29	19:13	12,105	0	
Div 15	234	28.6	10	4	2	2	2	2:09	21:17	5,576	0	
Div 15	237	22.2	6	4	2	0	0	1:28	15:53	N/A	0	
Div 15	292	13.1	3	0	1	2	0	13:12	17:22	2,374	2	Burbank Station & Sylmar Station
Div 15	734	24.3	14	3	4	7	0	5:23	17:46	6,456	1	Sylmar Station
Div 15	744	23.4	13	2	7	4	0	8:06	18:15	9,587	0	
Div 15	788	20.2	11	11	0	0	0	3:10	6:04	1,807	0	
Div 15	794	26.0	12	4	2	5	1	2:50	17:16	4,569	2	Sylmar Station & Terminal 28.
Division 15 Vehicle Totals			221	115	63	34	9			121,766		
Division 15 Percentages				52%	29%	15%	4%					

Weekday Metro Bus Mileage Summary by Division
June 26, 2016

Div.	Line	Weekday Bus Mileage Totals						Shortest Run Time	Longest Run Time	Weekday Ridership	Off-Street Terminals	Comments	
		One-Way Trip Mi.	Total Blocks	<150	> 150 <200	> 200 <250	<250 and UP						
Div 18	40	20.9	25	17	7	1	0	2:17	20:14	17,671	1	Jackson Street Terminal	
Div 18	111	21.1	23	9	9	5	0	2:25	21:40	16,818	2	LAX City Bus Terminal & Norwalk Green Line Station	
Div 18	115	22.2	29	20	6	3	0	1:58	19:33	15,628	1	Norwalk Green Line Station	
Div 18	117	18.4	13	7	5	1	0	8:42	19:10	8,533	1	LAX City Bus Terminal	
Div 18	120	29.7	9	4	2	3	0	6:35	20:51	4,181	1	LAX Aviation / LAX Station	
Div 18	126	12.2	2	2	0	0	0	3:48	5:05	204	0		
Div 18	127	10.3	3	1	2	0	0	1:12	14:30	938	2	MLK Compton Transit Ctr & Downey Transit Center	
Div 18	202	18.3	3	3	0	0	0	3:16	4:50	245	1	Rosa Parks-Wilmington Station	
Div 18	204	12.6	10	9	1	0	0	2:57	18:15	22,173	0		
Div 18	207	14.2	8	8	0	0	0	2:22	15:12	18,048	0		
Div 18	210	19.5	17	7	7	3	0	2:46	22:07	13,104	1	South Bay Transit Center	
Div 18	211	14.5	5	5	0	0	0	0:52	5:25	770	2	Marine Green Line Station, South Bay Transit Center	
Div 18	246	15.1	9	5	1	1	2	1:42	21:47	2,601	1	Harbor Gateway Transit Center	
Div 18	344	19.4	5	4	1	0	0	1:42	13:18	1,709	1	Harbor Gateway Transit Center	
Div 18	442	17.1	3	3	0	0	0	2:02	5:44	233	1	Jackson Street Terminal	
Div 18	550	23.5	5	3	0	1	1	4:32	18:21	1,546	0		
Div 18	710	15.9	16	10	6	0	0	1:47	15:54	7,285	2	South Bay Transit Center / 6th & Oxford	
Div 18	754	12.5	8	8	0	0	0	2:32	13:10	20,575	0		
Div 18	910	38.9	7	4	0	0	3	2:23	15:16	16,355	2/3	El Monte Sta, Harbor Gateway Sta (2 of 3 terminals)	
Division 18 Vehicle Totals			200	129	47	18	6				168,617		
Division 18 Percentages				65%	24%	9%	3%						
System Vehicle Totals			1908	1350	390	146	27				1,336,780		
System Percentages				71%	20%	8%	1%						

**ELIGIBLE FEDERAL FUNDING SOURCES FOR THE PROCUREMENT OF
ZERO-EMISSION BUSES**

PROGRAM	ELIGIBILITY REQUIREMENTS	AGENCY/TYPE
Section 5307 Urbanized Area Formula Grants ¹	Buses to be procured must have a nexus with the large urbanized areas (UZA, as defined by the US Census) within Los Angeles County to which the funds are apportioned or allocated, as applicable.	FTA/Formula
Section 5309 Capital Investment Grants ¹	Buses to be procured must be included as part of the initial acquisition of rolling stock for a New Starts/Small Starts bus rapid transit (BRT) system or associated with Core Capacity BRT corridor improvements that increase capacity by not less than 10%. The procurement of buses only, and of buses to be assigned to routes operating on high occupancy vehicle lanes or on high occupancy toll lanes, is an ineligible expense.	FTA/Competitive
Section 5310 Enhanced Mobility of Seniors & Individuals with Disabilities Formula Grants	Buses to be procured must be used to assist with meeting the transportation needs of the elderly and persons with disabilities who travel to/from or within the UZA within Los Angeles County to which the funds are apportioned or allocated, as applicable.	FTA/Formula
Section 5311 Rural Areas Formula Grants	Buses to be procured must be used to support public transportation in rural areas in Los Angeles County with populations less than 50,000.	FTA/Formula
Section 5337 State of Good Repair Grants ¹	Buses to be procured must be for replacements that either operate on existing BRT systems or are used for providing transit service on high occupancy vehicle lanes. Buses to be procured solely for expansion are not eligible.	FTA/Formula
Section 5339 Buses and Bus Facilities Formula Grants	Buses to be procured must have a nexus with the large urbanized areas (UZA, as defined by the US Census) within Los Angeles County to which the funds are apportioned or allocated. Acquisition of buses for fleet replacement and expansion are eligible.	FTA/Formula

**ELIGIBLE FEDERAL FUNDING SOURCES FOR THE PROCUREMENT OF
ZERO-EMISSION BUSES**

PROGRAM	ELIGIBILITY REQUIREMENTS	AGENCY/TYPE
Section 5339 Buses and Bus Facilities Competitive Grants	Acquisition of buses for fleet replacement and expansion are eligible.	FTA/Competitive
Section 5339 Low or No Emission Grants	Acquisition of buses for fleet replacement and expansion are eligible.	FTA/Competitive
Section 149 Congestion Mitigation and Air Quality Improvement ¹	CMAQ funds “transferred” from the Federal Highway Administration (FHWA) to FTA may be used for the procurement of zero-emission buses due to their air quality benefit.	FHWA/Formula
Section 133 Surface Transportation Block Grant ¹	STP funds “transferred” from FHWA to FTA may be used for the procurement of zero-emission buses for improving the conditions and performance of surface transportation.	FHWA/Formula
Transportation Investment Generating Economic Recovery Grant	TIGER funds may be used for the procurement of zero-emission buses if included as part of the scope of work of a BRT project that promises significant economic and environmental benefits to an entire metropolitan area or region.	USDOT/Competitive
Vehicle Technologies Multi-Topic	Requires community-based partnerships among state and local governments and the private sector to accelerate the use of commercially available electric drive and alternative fuel vehicles, including zero-emission buses.	US Department of Energy/Competitive

1. Funding source is currently programmed by Metro for other competing uses.

**ELIGIBLE STATE AND LOCAL FUNDING SOURCES FOR THE
PROCUREMENT OF ZERO-EMISSION BUSES**

PROGRAM	ELIGIBILITY REQUIREMENTS	AGENCY/TYPE
Zero-Emission Truck and Bus Pilot Commercial Deployment	Buses to be procured must provide benefits to disadvantaged communities by operating on routes located within, or directly benefitting, these communities. Buses must meet applicable certification requirements of the California Air Resources Board (CARB).	CARB/Competitive
Hybrid and Zero-Emission Truck and Bus Voucher Incentive	Buses to be procured must be located in a disadvantaged community. The voucher amount depends on the gross vehicle weight rating of the buses. The amount per voucher for a zero-emission bus is currently \$110,000 for maximum of 100 buses and \$45,000 for each additional bus (up to a maximum of 200 vouchers per fleet). Buses must demonstrate a thirty-five mile all-electric range. If the bus is fast charge compatible, then it must demonstrate a twenty mile all-electric range. Buses must be CARB-certified.	CARB/First-come, First-served
Transit and Intercity Rail Capital	Buses to be procured must provide a direct, meaningful, and assured benefit within and/or to disadvantaged communities.	California State Transportation Agency/Competitive
Low Carbon Transit Operations	Buses to be procured must be used to support new or expanded service. At least 50% of the total funds an agency receives must be expended on projects that will benefit disadvantaged communities.	California Department of Transportation/Formula
Affordable Housing and Sustainable Communities	Buses to be procured must benefit disadvantaged communities in transit oriented development or integrated community project areas. Requires 50% of available funds to be invested in projects that benefit disadvantaged communities.	Strategic Growth Council/Competitive
Carl Moyer Memorial Air Quality Standards Attainment	The procurement of buses must not be to comply with any regulation, memorandum of understanding, or other legal mandate. The maximum grant amounts for the procurement of each bus for fleet expansion or for replacement are currently limited to 25% of the cost and \$60,000, respectively.	South Coast Air Quality Management District/Competitive

**ELIGIBLE STATE AND LOCAL FUNDING SOURCES FOR THE
PROCUREMENT OF ZERO-EMISSION BUSES**

SOURCE	ELIGIBILITY REQUIREMENTS	AGENCY/TYPE
Local Transportation Fund/Transportation Development Act ¹	Acquisition of buses for fleet replacement and expansion are eligible expenses only under TDA Article 4 and must comply with regional transportation plans.	State Board of Equalization/Formula
State Transit Assistance Fund/Transportation Development Act ¹	Acquisition of buses for fleet replacement and expansion are eligible expenses and must comply with regional transportation plans.	State Controller's Office/Formula
Public Transportation Account ¹	Acquisition of buses for fleet replacement and expansion are eligible expenses funded through the State Transportation Improvement Program.	Caltrans/Formula
General Revenues ¹	Metro revenue from fares, advertisement, lease and other general revenue sources may be used for fleet replacement and expansion.	Metro/Discretionary
Proposition A	Acquisition of buses for fleet replacement and expansion are eligible expenses from the 40% funding allocation category.	Metro/Formula
Proposition C	Acquisition of buses for fleet replacement and expansion are eligible expenses from the 40% funding allocation category.	Metro/Discretionary
Measure R ²	Acquisition of buses for fleet replacement and expansion are eligible expenses from the 35% funding allocation category.	Metro/Discretionary

1. Funding source is currently programmed by Metro for other competing uses.
2. In June 2013 the Metro Board of Directors approved establishing a life-of-project budget of \$30 M for zero-emission buses.



Metro

Los Angeles County
Metropolitan Transportation
Authority
One Gateway Plaza
3rd Floor Board Room
Los Angeles, CA

Board Report

File #: 2016-0732, **File Type:** Oral Report / Presentation

Agenda Number: 24.

**SYSTEM SAFETY, SECURITY AND OPERATIONS COMMITTEE
OCTOBER 20, 2016**

Operations Employees of the Month

October Operations Employees of the Month



Operations Employees of the Month



Transportation

Bus Operator

Herman Gavia



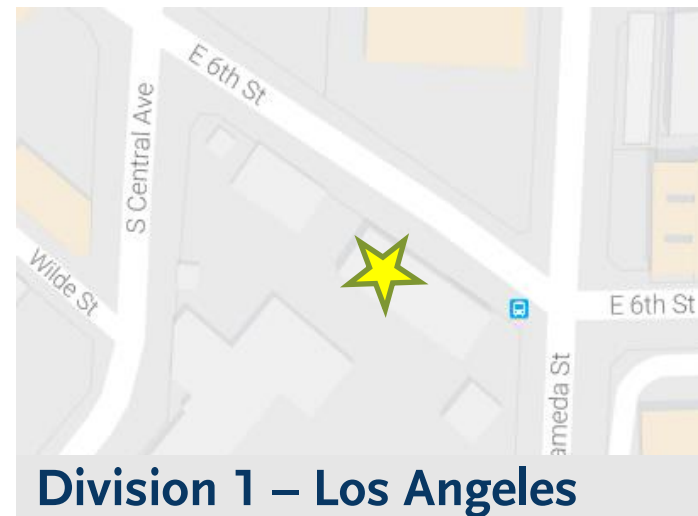
Maintenance

Mechanics

Christopher Valenzuela

Jose Moya

Sergio Ortiz





Metro

Los Angeles County
Metropolitan Transportation
Authority
One Gateway Plaza
3rd Floor Board Room
Los Angeles, CA

Board Report

File #: 2016-0733, **File Type:** Oral Report / Presentation

Agenda Number: 25.

**SYSTEM SAFETY, SECURITY AND OPERATIONS COMMITTEE
OCTOBER 20, 2016**

RECEIVE oral report on System Safety, Security and Operations, update on Metro Bus Buy.

ITEM 25



**October 20, 2016
COO Report
Bus Procurement Updates**



Metro

Overview of Existing Metro Bus Fleet

Bus Type	Series	Delivery	Quantity
40' CNG	3850 New Flyer	2015-2016	350
40' CNG	5600 New Flyer	2014-2015	550
45' Compo CNG	8100 NABI	2008-2012	539
60' Articulated CNG	9200 NABI	2005-2008	389
45' Compo CNG	8000 NABI	2003-2004	100
40' CNG	7000 NABI	2001-2004	311
40' CNG	5000 New Flyer	2001	121
Total Active Fleet			2360*

Average Bus Fleet Age: 7.6 Years

Source: Metro Bus Assignment Report, October 2016
 * Includes buses in Make Ready, and assigned to Contract Services

900th New Flyer 40' CNG Bus



Bus 4199 finishing final assembly at New Flyer, Ontario CA

- Bus 4199, last bus of 900 New Flyer bus order, will be delivered the week of October 24, 2016
- Highest reliability in Metro Bus Fleet (MMBF)
- Enhanced ADA Amenities including Q'Pod securement system, additional space for ADA passengers.
- 2016 Metro Magazine award for “Best Transit Technology Innovation” for dashboard diagnostic touchscreen

Bus Manufacturing and Acceptance Process



- Initial bus structural assembly starts in St. Cloud, MN.
- Buses driven 1,850 miles to New Flyer facility in Ontario, CA
- Final assembly in Ontario, CA includes installation of passenger seating, stanchions, operator barriers.
- Final acceptance inspections conducted by Metro staff.
- Buses delivered and released for “Make Ready” work (farebox and radio system installation, logging each bus into Metro radio communication and tracking systems).



Metro

New Bus Procurement Update

- RFP underway for up to 1000 40' and 60' buses
 - RFP released July 29, 2016
 - Black-Out period in force
 - Up to 400 articulated 60' buses
 - Up to 600 conventional 40' buses
 - Up to 100 40' and 100 60' buses (200 buses in total) may be Zero Emission (ZE) battery electric buses
- Multiple vendors are interested
 - 59 firms are in the plan-holders list that have downloaded the RFP
 - Proposals for 40' and 60' CNG buses now due November 2016
 - Proposals for 40' and 60' ZE battery/electric buses now due January 2017



New Bus Procurement Update

- **CNG Buses (40' and 60')**
 - Award recommendation(s) expected in Feb/March 2017
- **ZEB Battery Electric Buses (40' and 60')**
 - Award recommendations for expected in April 2017





Board Report

File #: 2016-0448, File Type: Contract

Agenda Number: 26.

REVISED
SYSTEM SAFETY, SECURITY AND OPERATIONS COMMITTEE
OCTOBER 20, 2016

SUBJECT: BUS TIRE LEASING & MAINTENANCE SERVICES

ACTION: APPROVE CONTRACT MODIFICATION

RECOMMENDATION

AUTHORIZE the Chief Executive Officer to execute Modification No. 5 for Contract No. OP31202523 with Goodyear Tire & Rubber Company to **extend bus tire leasing and maintenance services for up to twelve (12) months**, for the period covering December 1, 2016 through November 30, 2017, in an amount not to exceed \$7,951,670, increasing the total not to exceed contract amount from \$41,138,647 to \$49,090,317.

ISSUE

This Contract Modification is required as both firms who submitted proposals in response to RFP No. OP14573, issued on April 7, 2016, seeking a new contractor for these services, were deemed non-responsive to the Disadvantaged Business Enterprise requirement.

The extension is needed in order to re-procure these services, evaluate submittals, and make an award recommendation. Outreach discussions with potential contractors will also be conducted during the interim period.

DISCUSSION

Metro's fleet consists of approximately 2,119 buses of which 1,749 have six tires per bus and 370 articulated buses (Artics) have ten tires per bus that require proper maintenance and service on a regular basis for a total of 14,194 tires. This Contract pertains to leased tires for the revenue fleet as well as tire maintenance services for both the revenue and non-revenue fleets. Non-revenue tires are purchased under a separate contract, but are mounted and balanced under the bus tire leasing and maintenance services contract.

Leased costs are based on actual bus (tire) mileage, plus a fixed monthly service rate of a per tire

sales/use tax. Included in this service contract is the remediation of all spent tire castings and a comprehensive tire maintenance program. The tire maintenance program includes tire rotation, mounting, regrooving, recapping, balancing, airing, and wheel refurbishing. Furthermore, the monthly service rate also includes tire maintenance and service for Metro's non-revenue fleet.

DETERMINATION OF SAFETY IMPACT

Approval of the recommendation will have a positive impact on safety. As the buses in Metro's fleet wear through tires, they are regularly replaced as part of a preventative maintenance plan to ensure safe operation of the buses. This Contract Modification guarantees Metro has the capability of replacing tires on its fleet.

FINANCIAL IMPACT

Funding of \$4,638,473 for this Contract Modification is included in the FY17 budget in cost center 3120, Quality Assurance, under project 306002, Operations Maintenance and line item 50421, Tires Revenue Equipment. Since this is a multi-year contract, the Senior Executive Officer and cost center manager will be accountable for budgeting the cost in future years.

Impact to Budget

Funding for this action will come from the Enterprise Operating fund. The source of funds will be from Federal, State and local funding sources that are eligible for Bus and Rail Operating Projects. These funding sources will maximize the use of funds for these activities.

ALTERNATIVES CONSIDERED

There are two alternatives considered. One alternative is a purchase tire program rather than a lease tire program. Additionally, Metro personnel would perform the required tire service. This alternative is not recommended because of the increased labor cost to Metro and the added responsibility of properly disposing thousands of waste tire castings. The second alternative is to have a lease tire program and have Metro personnel provide the required tire service. This alternative is not recommended because of increased labor cost to Metro. Furthermore, the proposed contracting method greatly reduces Metro's risk and eliminates the responsibility for the removal, transportation and disposal of waste tires.

NEXT STEPS

Upon Board approval, staff will execute Modification No. 5 for Contract No. OP31202523 with Goodyear Tire & Rubber Company to continue providing bus tire leasing and maintenance services.

ATTACHMENTS

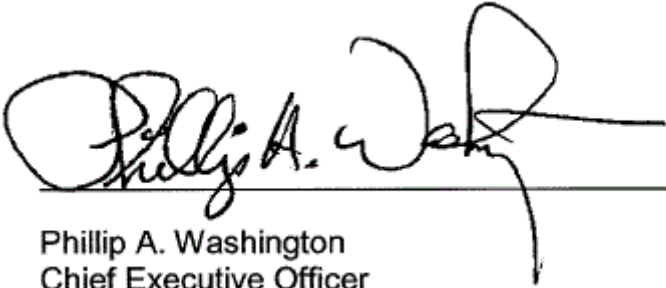
Attachment A - Procurement Summary
Attachment B - Contract Modification/Change Order Log
Attachment C - DEOD Summary

Prepared By: Matt Dake, Sr. Director, Equipment Maintenance, Quality Assurance, 213-922-5797

Chris Reyes, Principal Transportation Planner, 213-922-4808

Reviewed By: James T. Gallagher, Chief Operations Officer, 213-922-4424

Debra Avila, Chief, Vendor/Contract Management Officer, 213-418-3051



Phillip A. Washington
Chief Executive Officer

PROCUREMENT SUMMARY

BUS TIRE LEASING & MAINTENANCE SERVICES / OP31202523

1.	Contract Number: OP31202523		
2.	Contractor: Goodyear Tire & Rubber Company		
3.	Mod. Work Description: Extend Contract expiration and increase contract authority		
4.	Contract Work Description: Bus tire leasing and maintenance services		
5.	The following data is current as of: September 14, 2016		
6.	Contract Completion Status		Financial Status
	Contract Awarded:	9/1/10	Contract Award Amount: \$24,068,859
	Notice to Proceed (NTP):	N/A	Total of Modifications Approved: \$17,069,788
	Original Complete Date:	8/31/15	Pending Modifications (including this action): \$7,951,670
	Current Est. Complete Date:	11/30/16	Current Contract Value (with this action): \$49,090,317
7.	Contract Administrator: Kenneth Takahashi		Telephone Number: (213) 922-1047
8.	Project Manager: James Jimenez		Telephone Number: (213) 922-5870

A. Procurement Background

This Board Action is to approve Contract Modification No. 5 issued in support of services for bus tire leasing and maintenance for revenue and non-revenue vehicles. This Contract Modification will be processed in accordance with Metro's Acquisition Policy and the contract type is a firm fixed unit price.

The competitively procured contract was awarded to Goodyear Tire & Rubber Company in July 2010 for a five-year period, inclusive of two, one-year options. However, the second one-year option term was inadvertently not exercised through a contract modification. Goodyear Tire & Rubber Company continued to provide Metro the bus tire leasing and maintenance services during this time period. Contract Modification No. 5 will rectify this oversight by formally recognizing the exercise of the second option year.

The Contract has been modified four times and will expire on November 30, 2016.

(Refer to Attachment B – Contract Modification/Change Order Log)

B. Cost/Price Analysis

The recommended price has been determined to be fair and reasonable based upon price analysis, comparison with recent proposal submittals, technical evaluation, and fact finding.

Proposal Amount	Metro ICE	Modification Amount
\$7,951,670	\$7,951,670	\$7,951,670

CONTRACT MODIFICATION/CHANGE ORDER LOG

BUS TIRE LEASING & MAINTENANCE SERVICES / OP31202523

Mod. No.	Description	Status (approved or pending)	Date	\$ Amount
1	Administrative notification of responsible contract administrator	Approved	3/3/11	\$0
2	Exercise Option Year <u>Number 1</u>	Approved	8/12/13	\$8,382,470
3	Exercise Option Year 2 Extend period of performance to <u>August 31, 2016</u>	Approved	7/30/15	\$8,687,318
4	Extend period of performance to November 30, 2016	Approved	7/14/16	\$0
5	Extend Period of Performance and Increase Contract Authorization	Pending	Pending	\$7,951,670
	Modification Total:			\$25,021,458
	Original Contract:			\$24,068,859
	Total:			\$49,090,317

DEOD SUMMARY

BUS TIRE LEASING AND MAINTENANCE SERVICES / OP31202523

A. Small Business Participation

The Diversity and Economic Opportunity Department (DEOD) did not recommend a Disadvantaged Business Enterprise Anticipated Level of Participation (DALP) for this solicitation. Meeting the DALP was neither a condition of award nor an issue of responsiveness. Goodyear Tire & Rubber Company did not make a DBE commitment.

B. Living Wage and Service Contract Worker Retention Policy Applicability

The Living Wage and Service Contract Worker Retention Policy is not applicable to this contract.

C. Prevailing Wage Applicability

Prevailing wage is not applicable to this contract.

D. Project Labor Agreement/Construction Careers Policy

Project Labor Agreement/Construction Careers Policy is not applicable to this contract.



Board Report

File #: 2016-0628, File Type: Contract

Agenda Number: 27.

SYSTEM SAFETY, SECURITY AND OPERATIONS COMMITTEE OCTOBER 20, 2016

SUBJECT: LIQUID WASTE REMOVAL SERVICES

ACTION: EXERCISE TWO ONE-YEAR OPTIONS

RECOMMENDATION

AUTHORIZE the Chief Executive Officer to execute Modification No. 1 to Contract No. OP31203099 to exercise the two, one-year options, with Hazardous Technologies Inc., for **liquid waste removal services**, in the total amount of \$1,617,800 increasing the total contract value from \$2,434,400 to \$4,052,200 and extend the contract term from November 1, 2016 to October 31, 2018.

ISSUE

The three-year base term for this Contract with Hazardous Technologies Inc. (HTI) will expire on October 31, 2016.

The proposed Contract Modification will extend the required liquid waste removal services through October 31, 2018.

DISCUSSION

Metro facilities generate approximately 1.4 million gallons of liquid waste each year during the servicing of wastewater processing systems (e.g. clarifiers, sump pits, storage tanks, stormceptors and caustic tanks). These wastewater processing systems collect liquid waste associated with the steam cleaning of bus and rail car components, interior and exterior washing of buses and rail cars, stormceptors and waste storage tanks.

The liquid waste removed from Metro facilities must be evacuated from the wastewater processing systems by a licensed transporter and transported to a fully permitted Treatment, Storage and Disposal Facility (TSDF).

As a generator of hazardous and non-hazardous liquid waste, Metro is required to comply with federal, state and local environmental laws and regulations. This includes ensuring liquid waste is legally removed and transported by a licensed transporter to a permitted TSDF for proper treatment

and disposal. Additionally, the routine servicing of the various wastewater processing systems shall ensure their efficient and effective operation as well as ensure Metro is compliant with applicable hazardous and non-hazardous laws and regulations.

Metro's compliance with environmental laws and regulations will greatly reduce Metro's liability and minimize the possibility of regulatory fines/notice to comply orders and negative publicity. Furthermore, Metro will preserve and protect the safety of the environment, public and Metro staff.

DETERMINATION OF SAFETY IMPACT

The approval of this item will ensure that hazardous and non-hazardous liquid waste is properly transported and disposed at permitted and fully licensed facilities. The services provided under this Contract shall ensure Metro facilities accumulate and schedule the removal of hazardous and non-hazardous liquid waste in compliance with federal, state, and local environmental regulations.

FINANCIAL IMPACT

The funding of \$801,300 for Option Year 1 is included in the FY17 budget in cost center 3120, Quality Assurance, account 50320, Service Contract Services, under project number 306002, 300022, 300033, 300044 and 300055 Bus and Rail Operation Maintenance.

Since this is a two-year Contract Modification, the cost center manager and Senior Executive Officer, Maintenance will ensure that the balance of funds is budgeted for FY18.

Impact to Budget

The current year funding for this action will come from the Enterprise operating fund. The source of funds for this procurement will come from Federal, State and local funding sources including sales tax and fares that are eligible for Bus and Rail Operating Projects. These funding sources will maximize the use of funds for these activities.

ALTERNATIVES CONSIDERED

Metro may engage the services of a contractor to provide liquid waste removal services on an as-needed basis until a contract can be awarded. This alternative is not recommended because without fixed unit-rate pricing and a routine service schedule, costs can vary and pick-up schedules may not meet Metro's service requirements.

We also considered providing the services through Metro in-house staff. However, this alternative is not recommended since a licensed transporter is required to remove and transport hazardous and non-hazardous liquid waste from Metro facilities. Furthermore, the treatment and disposal of the liquid waste can only be performed at a permitted TSDF. Metro does not have the necessary vehicles, facility, equipment, licenses, permits or trained personnel to transport or dispose of hazardous and non-hazardous liquid waste.

NEXT STEPS

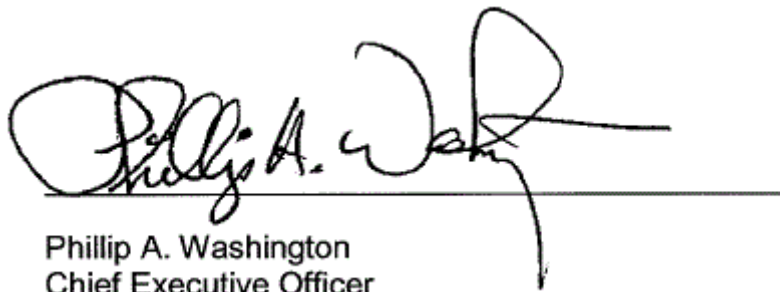
Upon approval by the Board, staff will execute Contract Modification No. 1 to Contract No. OP31203099, with Hazardous Technologies Inc., for liquid waste removal services, to exercise the two, one-year options and extend the period of performance through October 31, 2018.

ATTACHMENTS

- Attachment A - Procurement Summary
- Attachment B - Contract Modification/Change Order Log
- Attachment C - DEOD Summary

Prepared by: Matt Dake, Senior Director Equipment Maintenance, (213) 922-5797
James Jimenez, Senior Manager Environmental Compliance & Services, (213) 922-5870
Chris Reyes, Transportation Planning Manager III, (213) 922-4808

Reviewed by: James T. Gallagher, Chief Operations Officer, (213) 922-4424
Debra Avila, Chief, Vendor/Contract Management Officer, (213) 418-3051



Phillip A. Washington
Chief Executive Officer

PROCUREMENT SUMMARY

LIQUID WASTE REMOVAL SERVICES / OP31203099

1.	Contract Number: OP31203099		
2.	Contractor: Hazardous Technologies, Inc.		
3.	Mod. Work Description: Exercise Option Years 1 and 2		
4.	Contract Work Description: Removal, transportation, and disposal of liquid hazardous and non-hazardous waste from Metro clarifiers, sump pits, trenches, hoists, water/oil separators, waste fuel tanks, storage tanks and caustic tanks located at Metro facilities.		
5.	The following data is current as of: September 14, 2016		
6.	Contract Completion Status		Financial Status
	Contract Awarded:	9/19/13	Contract Award Amount: \$2,434,400
	Notice to Proceed (NTP):	N/A	Total of Modifications Approved: \$0
	Original Complete Date:	10/31/16	Pending Modifications (including this action): \$1,617,800
	Current Est. Complete Date:	10/31/18	Current Contract Value (with this action): \$4,052,200
7.	Contract Administrator: Aielyn Dumaua		Telephone Number: (213) 922-7320
8.	Project Manager: James Jimenez		Telephone Number: (213) 922-5870

A. Procurement Background

This Board Action is to approve Contract Modification No. 1 issued to continue the removal, transportation, and disposal of liquid hazardous and non-hazardous waste from Metro clarifiers, sump pits, trenches, hoists, water/oil separators, waste fuel tanks, storage tanks and caustic tanks located at Metro facilities by exercising Option Years 1 and 2.

This Contract Modification will be processed in accordance with Metro's Acquisition Policy and the contract type is a firm fixed unit rate.

On September 19, 2013, the Board approved a five-year contract, inclusive of two, one-year options, to Hazardous Technologies, Inc., the lowest, responsive and responsible bidder, to provide liquid waste disposal services throughout Metro facilities. The original contract award amount is \$2,434,400 for the three-year base period, \$801,300 for the first option year (November 1, 2016 through October 31, 2017) and \$816,500 for the second option year (November 1, 2017 through October 31, 2018).

(Refer to Attachment B – Contract Modification/Change Order Log)

B. Cost/Price Analysis

The recommended price for the option years has been determined to be fair and reasonable based upon rates that were established and evaluated as part of the competitive contract award. The negotiated rates for the Option Years increased by an average of 1.2%, which is lower than the 2.7% reported Employment Cost Index of the Bureau of Labor and Statistics for waste management and remediation services for the 12-month period ending June 2016. Therefore, exercising the options is in the best interest of Metro. The Contract was a result of a competitive IFB in which the option years were evaluated and award was made to the lowest responsive, responsible bidder.

	OPTION YEAR AMOUNT	METRO ICE	MODIFICATION AMOUNT
1	\$1,617,800	\$1,617,800	\$1,617,800

ATTACHMENT B

CONTRACT MODIFICATION/CHANGE ORDER LOG
LIQUID WASTE REMOVAL SERVICES / OP31203099

Mod. No.	Description	Status (approved or pending)	Date	\$ Amount
1	Exercise Option Year One and Year Two	Pending	Pending	\$1,617,800
	Modification Total:			\$1,617,800
	Original Contract:			\$2,434,400
	Total:			\$4,052,200

DEOD SUMMARY

LIQUID WASTE REMOVAL SERVICES / OP31203099

A. Small Business Participation

The Diversity and Economic Opportunity Department (DEOD) established a 17% Disadvantaged Business Enterprise Anticipated Level of Participation (DALP) for this procurement. Hazardous Technologies, Inc. (HTI) made no DALP commitment. Achieving the goal was neither a condition of award nor an issue of responsiveness.

B. Living Wage and Service Contract Worker Retention Policy Applicability

The Living Wage and Service Contract Worker Retention Policy is not applicable to this contract.

C. Prevailing Wage Applicability

Prevailing wage is not applicable to contract.

D. Project Labor Agreement/Construction Careers Policy

Project Labor Agreement/Construction Careers Policy is not applicable to this contract.



Board Report

File #: 2016-0658, File Type: Policy

Agenda Number: 28.

**SYSTEM SAFETY, SECURITY AND OPERATIONS COMMITTEE
OCTOBER 20, 2016**

SUBJECT: TITLE VI SERVICE MONITORING REPORT

ACTION: ADOPT FINDINGS

RECOMMENDATION

ADOPT the findings of a **Title VI Triennial Review of FTA required service standards that found no disparate impact** in the attainment of service standards relative to minority and non-minority services operated by Metro. This review was conducted for Metro bus and rail service during the fourth quarter of fiscal year 2016:

- A. Finding that the Metro bus system conforms to the adopted Bus Passenger Loading Standards and results in no disparate impact on minorities. The Rail Passenger Loading Standards cannot accurately be determined, due to the Metro Rail ridership data collection methodology. It relies on a limited number of staff counting the boarding and alighting passengers while riding a limited number of rail cars. (Attachment A); and
- B. Finding that the Metro bus system and rail system conform to the adopted Headway Standards and result in no disparate impact. (Attachment B); and
- C. Finding that while Metro bus lines are not in conformance with the adopted In-Service On-Time Performance Standards (ISOTP) of 80%, there was no disparate impact. The system wide average bus ISOTP was 73.0% on weekdays, 71.6% on Saturdays, and 76.8% on Sundays. The percentage of bus lines meeting this standard were 43.5% of weekday, 42.4% on Saturday and 54.8% during Sunday. All rail lines meet the standard of 90% for light rail and 95% for heavy rail. The assessment of the current findings are contained in (Attachment C); and
- D. Finding that Metro and its fixed route operating partners are in conformance and no disparate impact with the adopted System Accessibility Standard. (Attachment D); and
- E. Finding that Metro bus and rail service passenger facilities are in conformance and no disparate impact with the adopted Passenger Amenities Standards. (Attachment E); and
- F. Finding that the Metro bus system is in conformance and no disparate impact with adopted Vehicle Assignment Standards. Conformity of the Metro rail system was reviewed in early May

2016 and was impacted by the initial delivery of new light rail vehicles and the recent start of operation of the Metro Gold Line Foothill Extension. Only 15 of 235 new vehicles had been accepted at that time with most, of necessity, assigned to the Metro Gold Line. Metro rail system conformance should be reviewed at a later time after new vehicle deliveries are substantially complete. (Attachment F)

ISSUE

Federal Transit Administration (FTA) requires a review of conformance with specified transit performance standards at least once every three years.

DISCUSSION

Federal Transit Administration Circular 4702.1B provides requirements and guidelines for Title VI and Environmental Justice obligations of federal funds recipients. Page IV-9 of these guidelines requires “transit providers to monitor the performance of their transit system relative to their system-wide service standards and service policies (i.e. passenger load, vehicle type and age assignment, transit amenities, etc.) not less than every three years”. Per the guidelines, system-wide standards must be established and monitored, which are discussed in this report.

Operators are required to establish a threshold of significance for when the difference in attainment of minority and non-minority lines would constitute a disparate impact. Metro’s current standard establishes a disparate impact whenever the attainment of non-minority lines exceeds that of minority lines by more than 10%. In the event that a disparate impact is identified “the transit provider shall take corrective action to remedy the disparities to the greatest extent possible, and shall discuss in the Title VI program these disparate impacts and actions taken to remedy the disparities”.

Findings

Approval of the findings for the service monitoring evaluations fulfills a Title VI obligation of Metro. There is no Environmental Justice requirement for service monitoring.

DETERMINATION OF SAFETY IMPACT

There are no safety issues associated with completing Title VI evaluations.

FINANCIAL IMPACT

Fulfilling Title VI obligations ensures continued eligibility for federal funding. Failure to do so could have an adverse impact on budgeted expenditures.

ALTERNATIVES CONSIDERED

The FTA service monitoring requirement must be fulfilled to maintain federal funding eligibility. There are no practical alternatives to the performance of these analyses and the adoption of their findings.

NEXT STEPS

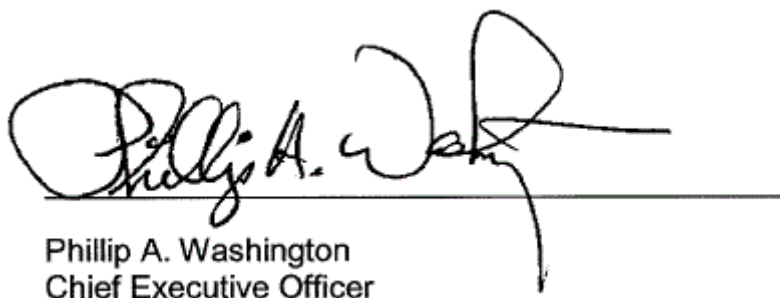
Approval of the findings of the service monitoring evaluations will be submitted to FTA along with the supporting evaluations.

ATTACHMENTS

- Attachment A - Passenger Loading Standards
- Attachment B - Headway Standards
- Attachment C - On-Time Performance Standards
- Attachment D - Accessibility Standards
- Attachment E - Passenger Amenities Standards
- Attachment F - Vehicle Assignment Standards

Prepared by: Jon Hillmer, Senior EO, Svc. Development, Scheduling & Analysis
(213) 418-3232
Scott Page, Senior Director, Service Performance & Analysis
(213) 418-3400
Dana Woodbury, Manager, Transportation Planning
(213) 922-4207

Reviewed by: Dan Levy, Chief, Civil Rights Programs Name, Title,
(213) 922-8891
James T. Gallagher, Chief Operations Officer,
(213) 922-4424



Phillip A. Washington
Chief Executive Officer

ATTACHMENT A PASSENGER LOADING STANDARDS

Passenger Loading Standards were recently revised in October 2015 to provide for variation by time of day and frequency of service. The current standards are depicted in Table A-1. A line must meet the applicable standard in at least 95% of all time periods monitored.

Table A-1
Passenger Loading Standards by Service Type

Weekday AM and PM Peak Periods					Off-Peak and Weekends						
		Psgrs per Seat	Max Peak Loads (per car)					Psgrs per Seat	Max Off-Peak Loads (per car)		
Heavy Rail		2.30	124			Heavy Rail		1.60	86		
Light Rail		1.75	133			Light Rail		1.25	95		
Bus Types					Bus Types						
Frequency Range in Minutes	Psgrs per Seat	40-foot	45-Foot	60-Foot	Frequency Range in Minutes	Psgrs per Seat	40-foot	45-Foot	60-Foot		
		Max Peak Loads					Max Off-Peak Loads				
1-10	1.40	56	65	80	1-10	1.30	52	60	74		
11-20	1.30	52	60	74	11-20	1.25	50	58	71		
21-40	1.20	48	55	69	21-40	1.10	44	51	63		
41-60	1.10	44	51	63	41-60	1.00	40	46	57		
60+	1.00	40	46	57	60+	0.75	30	35	43		

Effective October 2015

Each line must meet standard at least 95% of all hours monitored

The conformance of Metro bus lines to these standards is summarized in Table A-2 for weekday peak and off-peak periods, Saturdays and Sundays. Overall, 136 of 139 weekday bus lines (97.8%), 107 of 108 Saturday bus lines (99.1%), and all of 101 Sunday bus lines (100.0%) meet the standard by not exceeding the relevant load ratio in at least 95% of all time periods operated.

The adopted standard for when the disparity between minority and non-minority conformance would constitute a disparate impact is a difference of more than 10%. In this instance conformance is consistently high for all categories.

An evaluation of Metro Rail conformity with the Passenger Loading Standards is not yet possible as rail passenger data is obtained through aggregation of small samples over a period of time. This sampling method does not permit evaluation of passenger loading. New rail cars are now being delivered with APC capability which should permit evaluation of passenger loading in the future.

Table A-2
 Metro Bus Passenger Loading Standards Conformance

WEEKDAY	Minority Bus Lines	Non- Minority Bus Lines
# of Lines Monitored	110	29
# of Lines Exceeding Std.		3
% Compliance	100.0%	89.7%
SATURDAY		
# of Lines Monitored	82	26
# of Lines Exceeding Std.	1	
% Compliance	98.8%	100.0%
SUNDAY		
# of Lines Monitored	76	25
# of Lines Exceeding Std.		
% Compliance	100.0%	100.0%

Monitoring Data from Jan-Mar 2016
 Must meet standard at least 95% of all time periods

ATTACHMENT B HEADWAY STANDARDS

The adopted standard establishes the maximum scheduled headway (in minutes) between trips in the peak direction at the maximum load point of a line by time of day. Table B-1 depicts the peak and off-peak standard by service type. These standards should not be exceeded for at least 90% of all hourly periods.

Table B-1
Headway Standards by Service Type

Service Type	Peak	Off-Peak
Heavy Rail	10	20
Light Rail	12	20
BRT	12	30
Rapid	60	60
Express	30	60
Limited	60	60
Local & Shuttle	60	60

As of October 2015

Standard should be met at least 90% of the
time at the max load point in peak direction

How Metro bus lines conform to these standards is summarized below in Table B-2 for weekday peak and off-peak periods, Saturdays and Sundays. Overall, 142 of 150 weekday bus lines (94.7%), 106 of 108 Saturday bus lines (98.1%), and 95 of 101 Sunday bus lines (94.1%) are above the standard of 90%.

Metro has established a 10% threshold for when the disparity between minority and non-minority compliance is considered significant. On Sundays non-minority compliance is significantly less than minority compliance. Because minority compliance is higher on Sundays there is no disparate impact.

An evaluation of Metro Rail conformity with the Headway Standard found all rail lines meeting the standard. All five Metro Rail lines are considered minority lines.

Table B-2
Metro Bus Headway Standards Conformance

WEEKDAY	Minority Bus Lines	Non-Minority Bus Lines
# of Peak Period Lines	115	35
# of Lines Not Meeting Std.	7	1
% Compliance	93.9%	97.1%
# of Off-Peak Period Lines	105	35
# of Lines Exceeding Std.	0	0
% Compliance	100.0%	100.0%
SATURDAY		
# of Lines	82	26
# of Lines Not Meeting Std.	1	1
% Compliance	98.8%	96.2%
SUNDAY		
# of Lines	76	25
# of Lines Not Meeting Std.	2	4
% Compliance	97.4%	84.0%

Schedule Data from Jan 31 2016

Must meet standard at least 90% of all hourly periods

Table B-2
Metro Rail Headway Standards Conformance

WEEKDAY	Minority Rail Lines	Non-Minority Rail Lines
# of Peak Period Lines	5	
# of Lines Not Meeting Std.		
% Compliance	100.0%	
# of Off-Peak Period Lines	5	
# of Lines Not Meeting Std.		
% Compliance	100.0%	
SATURDAY		
# of Lines	5	
# of Lines Not Meeting Std.		
% Compliance	100.0%	
SUNDAY		
# of Lines	5	
# of Lines Not Meeting Std.		
% Compliance	100.0%	

Schedule Data from Feb 21 2016

Must meet standard at least 90% of all hourly periods

ATTACHMENT C ON-TIME PERFORMANCE STANDARDS

On-Time Performance Standards were last revised in the October 2015 Transit Service Policy. The current standards are depicted in Table C-1. As the policy states, ninety percent of bus lines must meet the standard in at least 90% of all time periods monitored (originally established in 2011). Rail lines are expected to achieve the standard or better on a daily basis. Monitoring data is from the January-March 2016 time period.

Table C-1
On-Time Performance Standards by Service Type

Service Type	Standard
Heavy Rail	95%
Light Rail	90%
Bus	80%

As of October 2015
90% of bus lines should achieve
the standard for at least 90% of
monitored hours

These standards however are systemwide, and the standard of 80% ISOTP (In Service On Time Performance) 90% of the time is difficult to achieve in the operating environment of Los Angeles. Increasing traffic congestions related to low gas, high car sales, and a large number of newly issued driver licenses. Traffic congestion continues to worsen resulting in bus service being slowed down.

To improve Metro's compliance with our ISOTP standards, staff is surveying methods used by other agencies.

Table C-2
 FY 2017 ISOTP Targets by Division

Bus FY17 ISOTP Goal	
FY17 Division	FY17 Target
1	74.85%
2	77.05%
3	77.84%
5	77.75%
6	0.00%
7	75.49%
8	86.28%
9	80.37%
10	74.92%
13	75.36%
15	79.66%
18	75.64%
Metro	78.00%
95	80.00%
97	80.00%
98	80.00%
Contract	80.00%
System	78.15%

Bus On-Time Performance

Overall compliance, shown in Table C-3, is low with only 8 of 140 weekday bus lines (5.7%), 8 of 108 Saturday bus lines (7.4%), and 16 of 101 Sunday bus lines (15.8%) meeting the 80% standard at least 90% of all time periods operated. Metro has established a 10% threshold for determining when the disparity between minority and non-minority performance is significant. There are no significant differences in ISOTP compliance.

It should be kept in mind that Metro monitors and reports bus ISOTP on every line. These measurements are also made even during unusual occurrences such as short term street or lane closures, presidential visits to Los Angeles, construction projects and even during rare winter storms.

When conformity is observed by time of day, consistent patterns emerge. ISOTP compliance deteriorates as the day progresses reaching its lowest level of compliance during the PM Peak time period. As the evening progresses compliance continues to improve. This is not uncommon historically, as traffic worsens quickly in the PM peak. Service Planning and Scheduling are reviewing these time periods by line to improve schedule adherence. Also, an All Door Boarding (ADB) demonstration project on the Metro Silver Line has produced very positive results in boarding time savings, thereby improving ISOTP. Once the demonstration period is completed, other Metro services will be reviewed for possible ADB expansion.

Table C-3
Metro Bus On-Time Performance Standards Conformance

WEEKDAY	Minority Bus Lines	Non-Minority Bus Lines
# of Bus Lines	105	35
# of Lines Meeting Std.	6	2
% Compliance	5.7%	5.7%
SATURDAY		
# of Bus Lines	81	27
# of Lines Meeting Std.	4	4
% Compliance	4.9%	14.8%
SUNDAY		
# of Bus Lines	75	26
# of Lines Meeting Std.	10	6
% Compliance	13.3%	23.1%

Observed data from Jan-Mar 2016

90% of lines must meet standard at least 90% of all time periods

Rail On-Time Performance

Conformance for rail lines is summarized below in Table C-4. All rail lines are classified as minority lines, and all lines meet the ISOTP standards of 90% for light rail lines (Blue, Green, Gold, Expo) and 95% for heavy rail lines (Red, Purple).

Table C-4

Metro Rail On-Time Performance Standards

Red/Purple Line	99.45%
Blue Line	96.10%
Green Line	98.52%
Gold Line	97.60%
Expo Line	98.61%

ATTACHMENT D ACCESSIBILITY STANDARDS

The current accessibility standard is shown in Figure D-1 as adopted in December 2011. The standard ensures the availability of fixed route service to virtually all residents of Metro's service area while limiting duplication of service by using services operated by others to meet the standard.

Figure D-1
Accessibility Standard

Service is to be provided within ¼ mile of 99% of Census tracts within Metro's service area having at least three households per acre and/or at least four jobs per acre. Fixed route service provided by other operators may be used to meet this standard.

Metro meets the accessibility standard. There are 2,261 Census tracts within Metro's service area of which 1,971 meet the minimum population and/or jobs thresholds to be entitled to access to fixed route service. Three of the eligible Census tracts (0.2%) are not within one-quarter mile of at least one fixed route bus stop. Two of these are not served by paved roads.

ATTACHMENT E PASSENGER AMENITIES STANDARDS

The current Metro passenger amenities standard is shown in Figure E-1 as adopted by the Metro Board in December 2011. The standard applies to all off-street facilities owned by Metro that permit passenger boardings.

Figure E-1
Passenger Amenities Standards

Shelters:	HR – not applicable LR – at least 80 linear ft. Bus – at least 6 linear ft. per bay
Seating:	HR – at least 12 seats LR – at least 10 seats Bus – at least 3 seats per bay
Info Displays:	HR – at least 12 LR – at least 10 Bus – at least 3
LED Displays:	HR – at least 8 arrival/departure screens LR – not applicable Bus – not applicable
TVMs:	HR/LR – at least 2 Bus – not applicable
Elevators:	HR – at least 2 LR – at least 1 for elevated/underground Bus – at least 1 for multi-level terminals
Escalators:	HR – at least 4 (2 Up / 2 Down) LR – not applicable Bus – not applicable
Waste Receptacles:	HR – at least 6 LR – at least 2 Bus – at least 1 per 3 bays / 2 minimum

As of July 2016, all Metro facilities met these minimum standards. Since the prior triennial review the following facilities have been added:

Expo Line to Culver City	May 2012	10 new LR stations
Orange Line Extension to Chatsworth	July 2012	5 new Bus stations
Gold Line Extension to Azusa	March 2016	6 new LR stations
Expo Line Extension to Santa Monica	May 2016	7 new LR stations

All of the added stations conform to the adopted standard.

ATTACHMENT F VEHICLE ASSIGNMENT STANDARDS

The current vehicle assignment policy is shown in Figure F-1 as adopted in December 2011. The policy ensures that vehicles are assigned in accordance with service requirements.

Figure F-1
Vehicle Assignment Policy

<p><u>Buses</u></p> <p><i>Buses will be assigned to individual facilities on the basis of vehicle size requirements for lines supported by each facility.</i></p> <p><u>Light Rail</u></p> <p><i>Light rail cars will be assigned to individual lines on the basis of compatibility of vehicle controllers with each line's signal system. The number of vehicle types/manufacturers will be kept to no more than two at any facility to minimize parts storage and maximize maintenance expertise.</i></p> <p><u>Heavy Rail</u></p> <p><i>This assignment policy is not applicable to heavy rail as the Red and Purple Lines operate out of the same division and both employ the same vehicle type.</i></p>

All buses are assigned to individual lines in accordance with this policy. The resulting distribution of vehicles as of January 2016 (the time of the last major service change prior to the conduct of this evaluation) is displayed in Tables F-1 and F-2.

Table F-2
Fleet Distribution by Minority Bus Lines Classification – Jan 2016

	# of Peak Buses	Average Age	Average # of Seats
Minority Lines	1,566	7.77	43.4
non-Minority Lines	368	6.88	43.1
Combined	1,934	7.60	43.3

The Minority average bus age is 2.2% higher than the peak fleet average, however the non-Minority average bus age is 9.5% less than the peak fleet average. The adopted standard for what would constitute a disparate impact is a difference greater than 10%. Because the average age of buses assigned to minority lines is significantly older than the age of buses assigned to non-minority lines there is a disparate impact.

With delivery over the last year of approximately 800 new buses, and with the full opening of new bus Division 13, the implementation of the June 2016 Service Change Program bus assignments were significantly realigned. Because of this the assignment analysis was redone using June 2016 bus assignments. The results are shown in Table F-3. It can be seen that there is no longer a disparate impact.

Table F-3
Fleet Distribution by Minority Bus Lines Classification – June 2016

# of Peak Buses	Average Age	Average # of Seats
1,548	6.87	43.5
384	7.04	43.1
1,932	6.91	43.4

Heavy rail vehicle assignment is constrained as both the Red and Purple lines are operated out of Division 20. There are 104 vehicles averaging 19.1 years old. Light rail vehicles support the operation of four rail lines from five facilities. Assignment of light rail vehicles is summarized in Table F-3 as of May 5, 2016.

Table F-4
Light Rail Vehicle Assignments

	# of Vehicles	Average Age
Blue Line	69	21.8
Green Line	29	14.8
Gold Line	62	5.2
Expo Line	26	19.8
	186	14.9

All light rail vehicles are originally provided with 76 seats. Vehicles assigned to the Blue, Green and Gold Lines have five seats removed to accommodate bicycles and other bulky items. The fleet is currently in transition as new car deliveries are being processed and will continue at least through 2017. As of May 5, 2016, 15 of these vehicles had been accepted and placed into service. The total order, including options, is anticipated to be 235 vehicles – a portion will replace older vehicles and some will support further expansion of the system including the Regional Connector and the Crenshaw Line.

The current distribution of vehicles by age is distorted because the Metro Gold Line received almost all of the initially accepted new vehicles to support the Azusa Extension that opened in March 2016; since then over 20 have been delivered and distributed between the Expo and Gold Lines. The Blue and Expo Lines will receive a large complement of new vehicles as they are accepted to support the Expo Extension that opened in late May 2016. Because the current vehicle distribution will be undergoing significant change over the next few months it would be inappropriate to draw any conclusions regarding disparate impacts at this time. It is known that the newest cars currently under construction over the next two years will be assigned to replace the

original Blue Line cars placed into service in 1991. All rail lines are classified as minority lines.

A draft of the proposed Rail Vehicle Management Plan proposes a new standard for rail vehicle assignment. It is proposed that *no line shall have an average fleet age greater than 20% of the average for the mode*. By that standard the Blue and Expo lines would be disparately impacted based upon the March fleet data, though the addition of the Expo Line Santa Monica Extension and the introduction of the remaining 220 new light rail vehicles are not reflected in this analysis. However, three years from now when the next tri-annual audit is conducted, the new cars will be placed on the proper lines to meet the rail vehicle assignment standard.



Board Report

File #: 2016-0721, File Type: Contract

Agenda Number: 29.

SYSTEM SAFETY, SECURITY AND OPERATIONS COMMITTEE OCTOBER 20, 2016

SUBJECT: TREE TRIMMING SERVICES FOR METRO TRANSIT FACILITIES (EXCLUDING METRO ORANGE LINE)

ACTION: APPROVE CONTRACT AWARD

RECOMMENDATION

AUTHORIZE the Chief Executive Officer to award a firm fixed unit rate Contract No. OP5608900 for **tree trimming services throughout Metro bus and rail facilities**, excluding Metro Orange Line covered under a separate maintenance contract, with Great Scott Tree Service Inc., the lowest, responsive and responsible bidder, for a not-to-exceed amount of \$923,040 for the three-year base period inclusive of as-needed services, and \$299,930 for each of the two, one-year options, for a combined total of \$1,522,900, effective January 1, 2017 through December 31, 2021, subject to resolution of protest(s), if any.

ISSUE

The existing contract to perform tree trimming services throughout Metro facilities with the exception of Metro Orange Line (MOL) stations and Right-Of-Way (ROW) covered under a separate maintenance contract is due to expire December 31, 2016.

To continue providing safe, quality and on-time services performing proactive and as-needed tree trimming services throughout Metro facilities, a new contract award is required effective January 1, 2017.

DISCUSSION

Under this new Contract, the contractor is required to provide tree trimming services for trees over thirteen (13) feet tall throughout Metro bus and rail facilities, excluding MOL stations and ROW covered under a separate maintenance contract.

An effective tree trimming maintenance contract is necessary to ensure providing safe travel path with a clear line of visibility for bus and train operators, and mitigate falling tree hazards and service delays. The contractor is also required to provide as-needed services as directed by Metro staff, such as clearing Metro ROW from any fallen trees due to vandalism or vehicular accidents.

DETERMINATION OF SAFETY IMPACT

The approval of this item will ensure meeting Metro maintenance standards in delivering safe and well maintained facilities and properties and provide the necessary as-needed tree trimming services with prompt response time to deliver safe, quality, on-time, and reliable services to our customers and the public.

FINANCIAL IMPACT

Funding of \$200,000 is included in the FY17 budget in cost center 3367 - Facilities Property Maintenance, account 50308, Service Contract Maintenance, under various operating projects.

Since this is a multi-year contract, the cost center manager, project managers, and Sr. Executive Officer, Maintenance and Engineering will ensure that the balance of funds is budgeted in future years.

Impact to Budget

The current year funding for this action will come from the Enterprise operating fund. The source of funds will come from State and local funding sources that are eligible for Bus and Rail Operating Projects. These funding sources will maximize the use of funds for these activities.

ALTERNATIVES CONSIDERED

Staff considered providing this service through in-house staff; however, this would require the hiring and training of additional personnel, purchase of additional equipment, vehicles, and supplies to support the expanded responsibility. Staff's assessment indicates that this is not a cost-effective option for Metro.

NEXT STEPS

Upon approval by the Board, staff will execute Contract No. OP5608900 to Great Scott Tree Service Inc., effective January 1, 2017, to provide the necessary tree trimming services throughout Metro facilities.

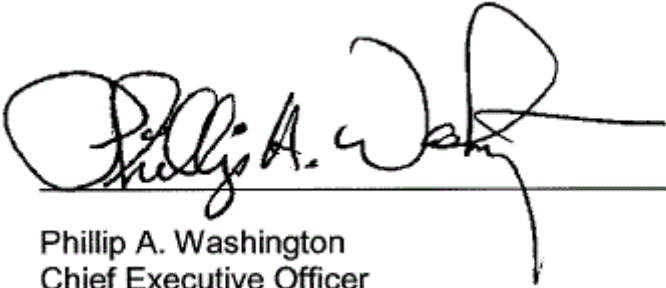
ATTACHMENTS

Attachment A - Procurement Summary
Attachment B - DEOD Summary

Prepared by: Brady Branstetter, DEO, Facilities Maintenance, (213) 922-6767
Lena Babayan, Sr. Director, Facilities Maintenance, (213) 922-6765
Chris Reyes, Principal Transportation Planner, (213) 922-4808

Reviewed by: James T. Gallagher, Chief Operations Officer, (213) 922-4424

Debra Avila, Chief, Vendor/Contract Management Officer, (213) 418-3051



Phillip A. Washington
Chief Executive Officer

PROCUREMENT SUMMARY

TREE TRIMMING SERVICES FOR METRO TRANSIT FACILITIES (EXCLUDING METRO ORANGE LINE) / OP5608900

1.	Contract Number: OP5608900	
2.	Recommended Vendor: Great Scott Tree Service Inc.	
3.	Type of Procurement (check one): <input type="checkbox"/> RFP <input checked="" type="checkbox"/> IFB <input type="checkbox"/> IFB-A&E <input type="checkbox"/> Non-Competitive <input type="checkbox"/> Modification <input type="checkbox"/> Task Order	
4.	Procurement Dates:	
	A. Issued: July 15, 2016	
	B. Advertised/Publicized: July 14, 2016	
	C. Pre-Proposal/Pre-Bid Conference: July 21, 2016	
	D. Proposals/Bids Due: August 11, 2016	
	E. Pre-Qualification Completed: August 29, 2016	
	F. Conflict of Interest Form Submitted to Ethics: August 12, 2016	
	G. Protest Period End Date: October 25, 2016	
5.	Solicitations Picked up/Downloaded: 14	Bids/Proposals Received: 5
6.	Contract Administrator: Rommel Hilario	Telephone Number: (213) 922-4654
7.	Project Manager: Maral Minasian	Telephone Number: (213) 922-5931

A. Procurement Background

This Board Action is to approve contract award in support of Facilities Maintenance to provide tree trimming services throughout Metro bus and rail facilities, excluding Metro Orange Line (MOL) as outlined in Invitation for Bid (IFB) No. PS2195315131-2. Board approval of contract awards are subject to resolution of all properly submitted protests.

The IFB was issued as a competitive procurement in accordance with Metro's Acquisition Policy. The contract type is firm fixed unit price.

One amendment was issued during the solicitation phase of this IFB:

- Amendment No. 1, issued on July 22, 2016, provided pre-bid conference material including sign-in sheets, planholder's list, and living wage information.

A pre-bid conference was held on July 21, 2016. A total of five bids were received on August 11, 2016.

B. Evaluation of Bids

This procurement was conducted in accordance, and complies with Metro's Acquisition Policy for a competitive sealed bid. The five bids received are listed below in alphabetical order:

1. Great Scott Tree Service Inc. (Great Scott)
2. International Environmental Corporation (International Environmental)Parkwood Landscape Maintenance, Inc. (Parkwood)
3. The Jungle Nursery Inc. (Jungle Nursery)
4. Thrifty Tree Service Inc. (Thrifty Tree)

All five firms were determined to be responsive, responsible, and were deemed qualified to perform the services based on the IFB's minimum requirements and technical evaluation by the Project Manager. Further analysis was conducted to review appropriate labor classifications and wage rates for each bid, and all were deemed responsive to the IFB requirements.

C. Cost/Price Analysis

The recommended pricing from Great Scott Tree Service Inc. has been determined to be fair and reasonable based upon adequate competition. Metro's independent cost estimate was based on historical pricing and market average.

BIDDER	BID AMOUNT	SBE PRICE PREFERENCE	METRO ICE	AWARD AMOUNT
Great Scott Tree Service Inc.	\$1,522,900	N/A	\$1,196,750	\$1,522,900
The Jungle Nursery Inc.	\$2,114,928	\$1,903,435.20		
International Environmental Corporation	\$3,164,923	\$3,006,676.85		
Parkwood Landscape Maintenance, Inc.	\$3,438,943	\$3,266,995.85		
Thrifty Tree Service Inc.	\$4,205,200	N/A		

The IFB included an opportunity for bidders to earn a Small Business Price Preference for bidding as a certified small business and/or bidders who met or exceeded the 15% small business goal established in the IFB. Jungle Nursery earned 10% price preference because they are a certified SBE and also subcontracted with a separate SBE firm. International Environmental is a certified SBE firm performing all of the work and, therefore, earned a 5% price preference on their bid. Parkwood met the SBE goal and, therefore, earned a 5% price preference for their bid. Great Scott and Thrifty Tree Service did not meet the 15% SBE goal and, therefore, did not earn a price preference. The small business preference price calculations are for evaluation purposes only. Applying the preference factor does not change the contractor's actual bid or the amount of any subsequent contract

award. As a result, Great Scott Tree Service remains the lowest responsive and responsible bidder.

D. Background on Recommended Contractor

Great Scott, located in Stanton, California, started in 1976 to provide high quality tree maintenance at a competitive cost. Over the years, they have developed a program that incorporates tree maintenance with technology using TrimIT, a GIS program that provides staff with the tools to track work history, project future maintenance and cost, and present the information visually using a geographic information system. Great Scott currently has various contracts for tree services that include the City of Irvine, City of Newport Beach, City of Seal Beach, City of Cypress, City of El Segundo, City of Stanton, City of Chino, and City of West Hollywood. Great Scott is a certified arborist and is registered with the Department of Industrial Relations.

DEOD SUMMARY**TREE TRIMMING SERVICES FOR METRO TRANSIT FACILITIES
(EXCLUDING METRO ORANGE LINE)/OP5608900****A. Small Business Participation**

The Diversity and Economic Opportunity Department (DEOD) established a 15% Small Business Enterprise (SBE) goal for this solicitation. Great Scott Tree Service Inc. did not make a SBE commitment.

According to guidance provided by County Counsel, SBE goals on non-federally funded Invitation for Bids (IFBs) cannot be a condition of award because Metro can only award to the lowest bidder in accordance with Section 130232(5) of the California Public Utilities Code. DEOD staff worked with Government Relations to seek legislative change to the Public Utilities Code through Assembly Bill 2690 (Ridley-Thomas), which was signed by Governor Brown on August 26, 2016.

Effective January 1, 2017, Metro will be authorized to establish SBE/DVBE goals, as a condition of award, on non-federally funded IFBs. Bidders that fail to meet the SBE/DVBE goals will be ineligible for contract award.

B. Living Wage and Service Contract Worker Retention Policy Applicability

The Living Wage and Service Contract Worker Retention Policy (LW/SCWRP) is applicable to this contract. Metro staff will monitor and enforce the policy guidelines to ensure that applicable workers are paid at minimum, the current Living Wage rate of \$16.18 per hour (\$11.27 base + \$4.91 health benefits), including yearly increases of up to 3% of the total wage. In addition, contractors will be responsible for submitting the required reports for the Living Wage and Service Contract Worker Retention Policy and other related documentation to staff to determine overall compliance with the policy.

C. Prevailing Wage Applicability

Prevailing Wage requirements are applicable to this project. DEOD will monitor contractors' compliance with the State of California Department of Industrial Relations (DIR), California Labor Code, and, if federally funded, the U S Department of Labor (DOL) Davis Bacon and Related Acts (DBRA).

D. Project Labor Agreement/Construction Careers Policy

Project Labor Agreement/Construction Careers Policy is not applicable to this contract.



Board Report

File #: 2016-0728, File Type: Contract

Agenda Number: 30.

SYSTEM SAFETY, SECURITY AND OPERATIONS COMMITTEE OCTOBER 20, 2016

SUBJECT: METRO RED/PURPLE LINE TUNNEL WASHING SERVICES

ACTION: APPROVE CONTRACT AWARD

RECOMMENDATION

AUTHORIZE the Chief Executive Officer to award a firm fixed unit rate Contract No. OP6092200 for the **Metro Red/Purple Line Tunnel Washing services** with Parkwood Landscape Maintenance Inc., the lowest, responsive and responsible bidder, for a not-to-exceed amount of \$2,541,217 for the five year period, effective December 1, 2016, subject to resolution of protest(s), if any.

ISSUE

Under this new Contract, the contractor is required to provide complete high pressure washing services throughout Metro Red/Purple Line (MRL) tunnel.

To maintain safe operations and improve MRL tunnel cleanliness, a new contract award is required effective December 1, 2016.

DISCUSSION

The existing MRL heavy rail subway was opened in stages between 1993 and 2000. Since then and until 2013, the MRL twin tunnels including the Purple Line segment have not been cleaned which has resulted in dirt and dust settlements on the internal walls, handrails, tracks, and catwalks.

The entire length of the twin tunnels is 36 miles, both ways combined, requiring pressure washing services to improve the overall conditions and cleanliness. Under this Contract, the contractor is required to provide detailed pressure washing services. The tunnel washing services include cleaning walls, tracks, cover boards, insulators, catwalks and handrails, and within the stations on the entire wall above the third rail while using pressurized water and degreaser solutions as necessary to remove debris and particulates.

Tunnel pressure washing and cleaning of tracks, while removing trash and debris, is necessary to maintain safe and clean train path and mitigate potential fire hazards due to excessive grease and debris accumulation within the heavy rail confined space and next to an energized third rail.

The Metro Red/Purple Line provides heavy rail subway traveling through its 16 stations along the twin tunnels between downtown Los Angeles via the districts of Hollywood and mid-Wilshire to North Hollywood where it connects with the Metro Orange Line.

DETERMINATION OF SAFETY IMPACT

The approval of this item will improve MRL overall safety and cleanliness conditions as well as improve the air quality within the stations in an effort to continue providing, safe, clean, quality, on-time, and reliable services to our customers and the public.

FINANCIAL IMPACT

The annual contract value is \$508,244. Funds are allocated under cost center 3367 - Facilities Property Maintenance, account 50308 - Service Contract Maintenance, under project 300044 - Rail Operations Red Line.

Since this is a multi-year contract, the cost center manager, and the Sr. Executive Officer, Maintenance and Engineering will be accountable for budgeting the cost in future years.

Impact to Budget

The current year funding for this action will come from the Enterprise operating fund. No other sources of funds were considered for this activity because it supports rail operations. This activity is part of Metro facilities on-going maintenance costs.

ALTERNATIVES CONSIDERED

Staff considered providing this service through Metro in-house personnel. This would require the hiring and training of additional personnel and the purchase of additional equipment, vehicles, and supplies to support the expanded responsibility. Staff's assessment indicates that this is not a cost-effective option for Metro.

NEXT STEPS

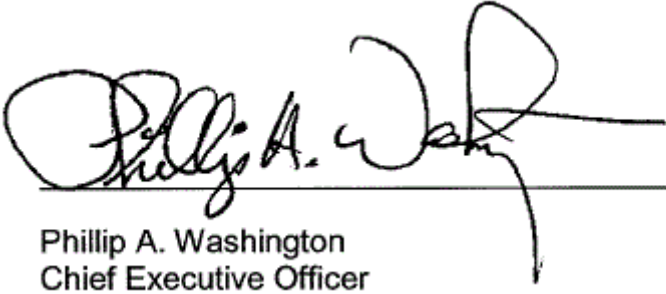
Upon approval by the Board, staff will execute Contract No. OP6092200 to Parkwood Landscape Maintenance Inc., effective December 1, 2016, to provide MRL tunnel washing services.

ATTACHMENTS

Attachment A - Procurement Summary
Attachment B - DEOD Summary

Prepared by: Brady Branstetter, DEO, Facilities Maintenance, (213) 922-6767
Lena Babayan, Senior Director, Facilities Maintenance, (213) 922-6765
Chris Reyes, Principal Transportation Planner, (213) 922-4808

Reviewed by: James T. Gallagher, Chief Operations Officer, (213) 922-4424
Debra Avila, Chief Vendor/Contract Management Officer, (213) 418-3051



Phillip A. Washington
Chief Executive Officer

PROCUREMENT SUMMARY

METRO RED/PURPLE LINE TUNNEL WASHING SERVICES / OP6092200

1.	Contract Number: OP6092200	
2.	Recommended Vendor: Parkwood Landscape Maintenance Inc.	
3.	Type of Procurement (check one): <input type="checkbox"/> RFP <input checked="" type="checkbox"/> IFB <input type="checkbox"/> IFB-A&E <input type="checkbox"/> Non-Competitive <input type="checkbox"/> Modification <input type="checkbox"/> Task Order	
4.	Procurement Dates:	
	A. Issued: July 13, 2016	
	B. Advertised/Publicized: July 13, 2016	
	C. Pre-Proposal/Pre-Bid Conference: July 21, 2016	
	D. Proposals/Bids Due: August 10, 2016	
	E. Pre-Qualification Completed: September 23, 2016	
	F. Conflict of Interest Form Submitted to Ethics: August 12, 2016	
	G. Protest Period End Date: October 23, 2016	
5.	Solicitations Picked up/Downloaded: 14	Bids/Proposals Received: 2
6.	Contract Administrator: Rommel Hilario	Telephone Number: (213) 922-4654
7.	Project Manager: Alberto Garcia	Telephone Number: (213) 922-6760

A. Procurement Background

This Board Action is to approve contract award in support of Facilities Maintenance to provide complete high pressure washing services throughout the Metro Red/Purple Line (MRL) tunnel as outlined in Invitation for Bid (IFB) No. OP28589. Board approval of contract awards are subject to resolution of all properly submitted protests.

The IFB was issued as a competitive procurement in accordance with Metro's Acquisition Policy. The contract type is firm fixed unit price.

Two amendments were issued during the solicitation phase of this IFB:

- Amendment No. 1, issued on July 21, 2016, established the due date for final questions regarding the solicitation.
- Amendment No. 2, issued on July 28, 2016, provided pre-bid conference material including sign-in sheets, planholder's list, and prevailing and living wage information.

A pre-bid conference was held on July 21, 2016. A total of two bids were received on August 10, 2016.

B. Evaluation of Bids

This procurement was conducted in accordance, and complies with, standard Metro's Acquisition Policy for a competitive sealed bid. The two bids received are listed below in alphabetical order:

1. Parkwood Landscape Maintenance, Inc. (Parkwood)
2. Woods Maintenance, Inc. (Woods)

Both firms were determined to be responsive, responsible, and qualified to perform the required services based on the IFB's minimum requirements and technical evaluation by the Project Manager.

C. Cost/Price Analysis

The recommended pricing from Parkwood has been determined to be fair and reasonable based upon adequate competition, comparison with Metro's independent cost estimate, and technical evaluation.

BIDDER	BID AMOUNT	SBE PRICE PREFERENCE	METRO ICE	AWARD AMOUNT
Parkwood Landscape Maintenance, Inc.	\$2,541,217	\$2,414,156.15	\$3,065,400	\$2,541,217
Woods Maintenance, Inc.	\$3,654,900	\$3,472,155.00		

The IFB included an opportunity for bidders to earn a Small Business Price Preference for bidders who met or exceeded the 10% small business goal established in the IFB. Both Parkwood and Woods met the 10% SBE commitment and, therefore, earned a 5% price preference for their bids, as shown above. The small business preference price calculations are for evaluation purposes only. Applying the preference factor does not change the contractor's actual bid or the amount of any subsequent contract award. As a result, Parkwood remains the lowest responsive and responsible bidder.

D. Background on Recommended Contractor

Parkwood, located in Van Nuys, California, has provided professional landscape services in the Los Angeles area for over 48 years. Parkwood currently has contracts with the City of Palmdale, City of Los Angeles, City of Moorpark, Port of Los Angeles, and the City of Ventura. The firm is also Metro's current contractor for graffiti abatement, landscape and irrigation maintenance, trash and vegetation removal services in Regions 2 and 4. Through various contracts, Parkwood has complete high pressure washing experience.

DEOD SUMMARY

METRO RED/PURPLE LINE TUNNEL WASHING SERVICES / OP6092200

A. Small Business Participation

The Diversity and Economic Opportunity Department (DEOD) established a 10% Small Business Enterprise (SBE) goal for this solicitation. Parkwood Landscape Maintenance, Inc. made a 10% SBE commitment.

Small Business Goal	10%SBE	Small Business Commitment	10% SBE
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	SBE Subcontractors	% Committed
1.	Briteworks, Inc.	10%
	Total Commitment	10%

B. Living/Prevailing Wage and Service Contract Worker Retention Policy Applicability

The Living Wage and Service Contract Worker Retention Policy is not applicable to this contract.

C. Prevailing Wage Applicability

Prevailing Wage requirements are applicable to this project. DEOD will monitor contractors' compliance with the State of California Department of Industrial Relations (DIR), California Labor Code, and, if federally funded, the U S Department of Labor (DOL) Davis Bacon and Related Acts (DBRA). Trades that may be covered include: surveying, potholing, field, soils and materials testing, building construction inspection, construction management and other support trades.

D. Project Labor Agreement/Construction Careers Policy

Project Labor Agreement/Construction Careers Policy is not applicable to this contract.

**Board Report**

File #: 2016-0729, **File Type:** Contract

Agenda Number: 31.

**SYSTEM SAFETY, SECURITY AND OPERATIONS COMMITTEE
OCTOBER 20, 2016**

SUBJECT: UNIFORM RENTAL SERVICES

ACTION: APPROVE CONTRACT AWARD

RECOMMENDATION

AUTHORIZE the Chief Executive Officer to award a firm fixed unit rate Contract No. OP6201700 for **uniform rental services** with UniFirst Corporation, for a not-to-exceed amount of \$2,528,837.41 for the three-year base period and \$2,528,837.41 for the one, three year option, for a combined total of \$5,057,674.82 effective November 1, 2016 through October 31, 2022, subject to resolution of protest (s), if any.

ISSUE

Per the current ATU and TCU Collective Bargaining units' agreements, Metro is required to provide each of the units' employees up to 11 uniforms per employee, as well as provide laundry services for such regulation uniforms. Currently, uniform rental services are provided to over 2,300 Metro represented labor employees.

The existing uniform rental services Contract No. OP30002227 with Prudential Overall Supply will expire on March 31, 2017. To avoid uniform rental services interruption, a new contract award is required effective November 1, 2016.

DISCUSSION

Under the existing contract, uniform rental services are provided to over 2,300 Metro represented labor employees, as well as providing vehicle seat covers and laundry services for hand towels and floor mats.

Timely uniform rental, delivery, and laundry services are necessary to ensure compliance with the existing agreements between Metro and the collective bargaining units, meeting garment safety requirements for Metro represented labor employees working within safety sensitive positions, and clearly identify Metro represented labor employees with their different trades.

Although the existing contract is due to expire March 31, 2017, to avoid service interruptions, continue providing the necessary uniform rental program and services, and allow 150 calendar days

to perform all necessary administrative processes associated with contract closeout, changeover, and fitting and ordering new sets of uniforms for over 2,300 Metro represented labor employees, a new contract award is required effective November 1, 2016.

DETERMINATION OF SAFETY IMPACT

The approval of this item will ensure the supply of uniforms that clearly identify Metro represented labor employees and continue delivering safe, quality, on-time and reliable services system-wide.

FINANCIAL IMPACT

Funding of \$1,036,100 for this contract is included in the FY17 budget in multiple maintenance cost centers, account - 50215 (F/B Uniforms), projects 306002 (Bus Operations), 300022 (Blue Line Operations), 300033 (Green Line Operations), 300044 (Red Line Operations), 300055 (Gold Line Operations), 301012 (Orange Line Operations), and 300066 (Expo Line).

Since this is a multi-year contract, the cost center manager, and the Sr. Executive Officer, Maintenance and Engineering will be accountable for budgeting the cost in future fiscal years, including any option(s) exercised.

Impact to Budget

The current year funding for this action will come from the Enterprise operating fund. The source of funds for this procurement will come from Federal, State and local funding sources including sales tax and fares that are eligible for Bus and Rail Operating Projects. These funding sources will maximize the use of funds for these activities.

ALTERNATIVES CONSIDERED

Staff considered purchasing uniforms, hand towels, mats, and vehicle seat covers, along with providing in-house laundry services. This would require the hiring and training of additional personnel, purchase of additional equipment, vehicles, and supplies to support the expanded responsibility. Staff's assessment indicates this is not a cost-effective option for Metro.

NEXT STEPS


Upon approval by the Board, staff will execute Contract No. OP6201700 to UniFirst Corporation effective November 1, 2016, to provide uniform rental services to Metro represented labor employees, as well as provide vehicle seat covers and laundry services for hand towels and floor mats.

ATTACHMENTS

Attachment A - Procurement Summary
Attachment B - DEOD Summary

Prepared by: Brady Branstetter, DEO, Facilities Maintenance, (213) 922-6767
Lena Babayan, Sr. Director, Facilities Maintenance, (213) 922-6765
Chris Reyes, Principal Transportation Planner, (213) 922-4808

Reviewed by: James T. Gallagher, Chief Operations Officer, (213) 922-4424
Debra Avila, Chief Vendor/Contract Management Officer, (213) 418-3051



Phillip A. Washington
Chief Executive Officer

PROCUREMENT SUMMARY

UNIFORM RENTAL SERVICES / OP6201700

1.	Contract Number: OP6201700	
2.	Recommended Vendor : UniFirst Corporation	
3.	Type of Procurement (check one): <input type="checkbox"/> IFB <input checked="" type="checkbox"/> RFP <input type="checkbox"/> RFP-A&E <input type="checkbox"/> Non-Competitive <input type="checkbox"/> Modification <input type="checkbox"/> Task Order	
4.	Procurement Dates:	
	A. Issued: July 21, 2016	
	B. Advertised/Publicized: July 21, 2016	
	C. Pre-Proposal/Pre-Bid Conference: August 11, 2016	
	D. Proposals/Bids Due: August 31, 2016	
	E. Pre-Qualification Completed: September 30, 2016	
	F. Conflict of Interest Form Submitted to Ethics: September 20, 2016	
	G. Protest Period End Date: October 25, 2016	
5.	Solicitations Picked up/Downloaded: 9	Bids/Proposals Received: 2
6.	Contract Administrator: Rommel Hilario	Telephone Number: (213) 922-4654
7.	Project Manager: Alberto Garcia	Telephone Number: (213) 922-6760

A. Procurement Background

This Board Action is to approve a contract award in support of Facilities Maintenance to provide uniform rental services to over 2,300 Metro represented labor employees, as well as provide vehicle seat covers and laundry services for hand towels and floor mats, as outlined in Request for Proposal (RFP) No. OP31277. The existing uniform rental services contract with Prudential Overall Supply will expire on March 31, 2017.

The Diversity and Economic Opportunity Department (DEOD) recommended an 8% Small Business participation goal, inclusive of a Small Business Enterprise (SBE) and a Disadvantaged Veteran Business Enterprise (DVBE), for this procurement. Achieving the 8% goal was a condition of contract award. Proposers were required to make a commitment to utilize SBEs and DVBEs, in any combination, totaling at least 8% of the total contract price.

To educate and assist potential proposers in the uniform industry on how to comply with Metro's SBE and DVBE participation goals and solicitation requirements, two workshops were conducted prior to the release of the RFP.

On June 15, 2016, Metro hosted the first workshop for those firms that were interested in submitting a proposal for the uniform rental services program as the prime contractor. Staff provided a general overview of the Statement of Work and

discussed potential Small Business subcontracting opportunities. A total of five firms participated.

On June 24, 2016, DEOD sponsored a second workshop for potential SBE and DVBE sub-contractors whose trades correlated with the project's NAICS codes. Metro's Small Business program was discussed along with DVBE/SBE specific information within the Statement of Work. A total of nine firms attended the workshop.

The RFP was issued as a competitive negotiated procurement in accordance with Metro's Acquisition Policy. The contract type is firm fixed unit price.

Two amendments were issued during the solicitation phase of this RFP:

- Amendment No. 1, issued on August 12, 2016, provided pre-proposal documents, new pricing sheets, and extended the proposal due date from August 24, 2016 to August 31, 2016.
- Amendment No. 2, issued on August 17, 2016, clarified the Statement of Work.

A pre-proposal conference was held on August 11, 2016. A total of two proposals were received on August 31, 2016.

The two proposers are listed below in alphabetical order:

1. Prudential Overall Supply
2. UniFirst Corporation

B. Evaluation of Proposals

The Proposal Evaluation Team (PET), consisting of staff from OMB, Facilities Maintenance, and Maintenance Division 7 met to a conduct comprehensive review of the technical qualifications of the proposals received.

The proposals were evaluated based on the following evaluation criteria and weights:

- Work Plan 40%
- Degree of Skills – Firm and Personnel Experience 20%
- Cost/Price 40%

The evaluation criteria are appropriate and consistent with criteria developed for similar services procurements. Several factors were considered when developing these weights, giving equal importance to the prime's work plan and their cost/price proposals.

During September 9 through September 16, the PET completed its independent evaluations of the proposals received. Both proposals were determined to be within the competitive range.

During the interviews on September 23, both firms had an opportunity to address the requirements of the RFP and respond to the PET's questions.

The PET recommendation for contract award is UniFirst Corporation as shown below:

1	FIRM	Average Score	Factor Weight	Weighted Average Score	Rank
2	UniFirst Corporation				
3	Workplan	78.33	40.00%	31.33	
4	Degree of Skills – Firm and Personnel Experience	75.50	20.00%	15.10	
5	Cost/Price	100.00	40.00%	40.00	
6	Total		100.00%	86.43	1
7	Prudential Overall Supply				
8	Workplan	78.83	40.00%	31.53	
9	Degree of Skills – Firm and Personnel Experience	73.35	20.00%	14.67	
10	Cost/Price	75.00	40.00%	30.00	
11	Total		100.00%	76.20	2

C. Cost/Price Analysis

The recommended pricing for the Contract is deemed fair and reasonable based on adequate price competition, the ICE, and the program manager's technical evaluation of the proposal.

PROPOSER	PROPOSAL AMOUNT	METRO ICE	AWARD AMOUNT
UniFirst Corporation	\$5,057,674.82	\$5,426,226.00	\$5,057,674.82
Prudential Overall Supply	\$6,744,208.00		

D. Background on Recommended Contractor

UniFirst Corporation

Founded in 1936, UniFirst Corporation (UniFirst) is one of North America's largest work wear and textile service companies, providing managed uniform, protective clothing, and custom corporate image apparel programs to businesses in diverse industries. In addition to outfitting more than 1.5 million workers each day, the firm strives to keep their businesses clean, safe, and healthy through their Facility Service Programs. UniFirst's mission is to be recognized as the leading provider of quality uniform and facility service programs.

For this Contract, UniFirst will operate from their Pacoima branch office which is located in the San Fernando Valley. Furthermore, UniFirst exceeded the 8% SBE goal and made a 27.22% commitment to SBE and DVBE firms for this contract. The firm's current customers include the Los Angeles Department of Water and Power, the City of Pasadena, the Los Angeles County Department of Public Works, and the City of Los Angeles Department of General Services.

DEOD SUMMARY

UNIFORM RENTAL SERVICES / OP6201700

A. Small Business Participation

The Diversity and Economic Opportunity Department (DEOD) established an 8% goal for this solicitation, inclusive of a Small Business Enterprise (SBE) and Disabled Veteran Business Enterprise (DVBE) goal in any combination. UniFirst Corporation exceeded the goal by making a 27.22% commitment, inclusive of 23.67% SBE and 3.55% DVBE.

Small Business Goal	8% SBE/DVBE	Small Business Commitment	23.67% SBE 3.55% DVBE
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	SBE/DVBE Subcontractors	% Committed
1.	DI Technology Group (SBE)	23.67%
2.	Vanguard Armory (DVBE)	3.55%
	Total SBE/DVBE Commitment	27.22%

B. Living Wage and Service Contract Worker Retention Policy Applicability

The Living Wage and Service Contract Worker Retention Policy (LW/SCWRP) is applicable to this contract. Metro staff will monitor and enforce the policy guidelines to ensure that applicable workers are paid at minimum, the current Living Wage rate of \$16.18 per hour (\$11.27 base + \$4.91 health benefits), including yearly increases of up to 3% of the total wage. In addition, contractors will be responsible for submitting the required reports for the Living Wage and Service Contract Worker Retention Policy and other related documentation to staff to determine overall compliance with the policy.

C. Prevailing Wage Applicability

Prevailing wage is not applicable to this contract.

D. Project Labor Agreement/Construction Careers Policy

Project Labor Agreement/Construction Careers Policy is not applicable to this contract.

**Board Report**

File #: 2016-0711, **File Type:** Contract**Agenda Number:** 45.

**SYSTEM SAFETY, SECURITY AND OPERATIONS COMMITTEE
OCTOBER 20, 2016****SUBJECT: CITATION PROCESSING SERVICES****ACTION: APPROVE CONTRACT AWARD****RECOMMENDATION**

AUTHORIZE the Chief Executive Officer to award and execute a five-year, firm fixed unit rate Contract No. **OP608960027253** to Axiom xCell Inc., **for services related to the processing, adjudication and collection of transit and parking citations** in an amount not-to-exceed \$1,586,533 effective January 1, 2017 through December 31, 2021, subject to resolution of protest(s), if any.

ISSUE

In July 2010, the Board established an administrative Transit Court to resolve fare related, parking and other citations issued for violations under Metro's Customer Code of Conduct and Parking Ordinance. The Board action also established an administrative review process to ensure patrons could dispute citations believed to have been issued in error. The goal of Metro's Transit Court is to provide patrons with an administrative rather than criminally punitive adjudication process.

DISCUSSION

Metro's Transit Court requires great efficiency to process and adjudicate the volume of citations issued for fare evasion, improper parking and other violations. State of the art information systems will allow staff to better manage correspondence, records, payments, and the disposition of citations. Advancements in the analysis of information supports better records management and enables Metro to leverage latest smart phone technology to issue citations. These processes will now be made available to Transit Court staff to provide patrons with the information needed in regards to citation.

Citation processing services allows law enforcement and Transit Security to enforce Metro's Customer Code of Conduct and Parking Ordinance. Code enforcement includes high visibility teams to ride trains and buses at corridors to combat quality of life issues on the Metro system. Numerous complaints of people illegally vending, eating, drinking, smoking, riding their bicycles, skateboarding

on the platforms, evading fare and committing other Metro code of conduct violations are received on a daily basis. Daily high visibility foot patrol saturation may result in the issuance of citations in order to address these complaints occurring on Metro's rails and stations. Law enforcement and Transit Security make numerous contacts during these operations enhancing passenger safety.

The current citation processing services contract will expire on December 31, 2016.

Axiom xCell, Inc. is able to provide and meet the needs for citation processing because the firm has a track record of providing design and strategic development of integrated software and mobile application services to government agencies in the California transit industry. In addition Axiom's ongoing projects at Metro are in satisfactory standing. Moreover Axiom is able to provide expertise in various aspects of software engineering including Android based platforms, program management and system engineering.

DETERMINATION OF SAFETY IMPACT

Citation processing plays a direct role in Metro's effort to improve the ridership experience. As law enforcement and Metro's security team take action to address fare evasion, illegal parking and other violations of Metro's Customer Code of Conduct, the efficient processing of these citations ensures that violations can be promptly addressed, while concurrently providing patrons with an option to resolve or dispute citations on-line, in person or by mail.

FINANCIAL IMPACT

The total five-year contract amount is \$1,586,533. The contract costs for the balance of the fiscal year is \$317,307 and is included in the FY17 budget under Cost Center 2412, Transit Court. Since this is a multi-year contract, the System Security and Law Enforcement Department will update its budget on an annual basis to fund years two (2) through five (5).

Impact to Budget

Funding for this project will come from Citation revenues collected. These funds are eligible for bus and rail operating and capital expenses.

ALTERNATIVES CONSIDERED

The Board may decline to approve the contract award. This alternative is not recommended because Metro does not have the internal staff resources to provide citation processing services. Further, this would result in an interruption of code enforcement by law enforcement and Metro security.

NEXT STEPS

Upon approval by the Board, staff will execute Contract No. **OP608960027253** with Axiom xCell, Inc. to provide citation processing services.

ATTACHMENTS

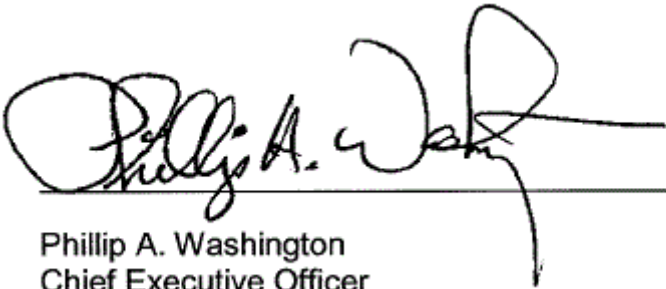
Attachment A - Procurement Summary

Attachment B - DEOD Summary

Prepared by: Alex Z. Wiggins - Chief, System Security and Law Enforcement (213) 922-4433

Reviewed by: Debra Avila, Chief, Vendor/Contract Management Officer,
(213) 418-3051

Stephanie Wiggins, Deputy Chief Executive Officer, (213) 922-1023



Phillip A. Washington
Chief Executive Officer

PROCUREMENT SUMMARY

CITATION PROCESSING SERVICES / CONTRACT NO. OP608960027253

1.	Contract Number: OP608960027253	
2.	Recommended Vendor: Axiom xCell, Inc.	
3.	Type of Procurement (check one): <input type="checkbox"/> IFB <input checked="" type="checkbox"/> RFP <input type="checkbox"/> RFP-A&E <input type="checkbox"/> Non-Competitive <input type="checkbox"/> Modification <input type="checkbox"/> Task Order	
4.	Procurement Dates:	
	A. Issued: April 28, 2016	
	B. Advertised/Publicized: April 28, 2016	
	C. Pre-Proposal/Pre-Bid Conference: May 12, 2016	
	D. Proposals/Bids Due: June 3, 2016	
	E. Pre-Qualification Completed: June 27, 2016	
	F. Conflict of Interest Form Submitted to Ethics: June 6, 2016	
	G. Protest Period End Date: October 22, 2016	
5.	Solicitations Picked up/Downloaded: 18	Bids/Proposals Received: 3
6.	Contract Administrator: Aielyn Dumaua	Telephone Number: (213) 922-7320
7.	Project Manager: Helen Valenzuela	Telephone Number: (213) 922-6928

A. Procurement Background

This Board Action is to approve Contract No. **OP608960027253** to provide an electronic citation processing application for smartphones, handheld ticket printers and citation processing services to support citation administration and Metro Transit Court. Board approval of contract awards are subject to resolution of all properly submitted protests.

RFP No. OP27253 was issued as a competitively negotiated procurement in accordance with Metro's Acquisition Policy and the contract type is a firm fixed unit rate. This RFP was issued with an SBE/DVBE Goal of 10% of the total contract price (7% SBE and 3% DVBE).

Three amendments were issued during the solicitation phase of this RFP:

- Amendment No. 1, issued on May 5, 2016, informed potential proposers that the pre-proposal conference shall be made available via tele-conference and revised "Section 3 - Evaluation Criteria" to clarify the evaluation process and basis of award.
- Amendment No. 2, issued on May 13, 2016, provided electronic copies of the Planholders' List and pre-proposal conference materials, clarified the SBE/DVBE forms to be submitted together with the Cost Proposal, extended the proposal due date and final date for questions, deleted "IP-02 Bidders List Form" of the Instruction to Proposers as it not applicable, and clarified the items that count toward the page limit of "Volume I - Technical Proposal".

- Amendment No. 3, issued on May 19, 2016, revised certain sections of “Exhibit A - Statement of Work” to clarify the contractor’s duties and responsibilities.

A pre-proposal conference was held on May 12, 2016, and was attended by 11 participants representing eight firms. There were 80 questions received and responses were provided prior to the proposal due date.

A total of three proposals were received on the due date of June 3, 2016, and are listed below in alphabetical order:

1. Axiom xCell, Inc.
2. INET, Inc. dba iParq
3. Xerox State and Local Solutions, Inc.

B. Evaluation of Proposals/Bids

A Proposal Evaluation Team (PET) consisting of staff from Metro Transit Court, System Security and Law Enforcement, and the Inspector General was convened and conducted a comprehensive technical evaluation of the proposals received.

The proposals were evaluated based on the following evaluation criteria and weights:

- | | |
|--------------------------------------------------|------------|
| • Qualifications of the Firm/Team | 15 percent |
| • Qualifications and Experience of Key Personnel | 10 percent |
| • Operating Methodology/Work Plan | 40 percent |
| • Cost Proposal | 35 percent |

The evaluation criteria are appropriate and consistent with criteria developed for similar services procurements. Several factors were considered when developing these weights, giving the greatest importance to the operating methodology/work plan.

On June 6, 2016, the PET met to review the evaluation criteria package, process confidentiality and conflict forms and take receipt of the three responsive proposals to initiate the evaluation phase.

On June 21, 2016, the PET reconvened then invited all three firms for an oral presentation on July 6, 2016. Each firms’ project managers and key team members had an opportunity to demonstrate the proposed citation processing system, E-ticket application and E-ticket printer; present each team’s qualifications and respond to the PET’s questions.

The bulk of each team’s oral presentation focused on the features and functionalities of the proposed citation processing system, E-ticket application and E-ticket printer

and how the proposed systems/applications meet Metro requirements. The teams also discussed the availability and commitment of key personnel, specific role of the subcontractors, proposed strategies to meet the SBE/DVBE goal and foreseen issues/obstacles in the performance of the statement of work including strategies or solutions to overcome these issues/obstacles.

Qualifications Summary of Firms Within the Competitive Range:

Axiom xCell, Inc.

Axiom xCell, Inc. was founded in 2004 as a partner for testing Qualcomm’s BREW mobile application platform. It has implemented innovative computer information system solutions for a variety of transportation agencies including LA Metro, Los Angeles 511, Federal Highway Administration, Hawaii 511 and Walk San Diego. Other clientele include Hewlett Packard, Disney, Qualcomm, Electronic Arts, Warner Brothers, Yahoo, and Real Networks.

INET, Inc. dba iParq.

iParq, established in 1999, is based in Las Vegas, Nevada. It is well known for its web-based parking management system. iParq provides services to a diverse group of cities (Norwalk, San Diego and Baltimore), law enforcement agencies, universities, colleges (Citrus College and Contra Costa Community College), and private parking operators across the country.

Xerox State and Local Solutions , Inc.

Xerox State and Local Solutions, Inc. has been in business for over 30 years, administering transit and parking citation programs. It currently provides citation processing services to Metro. Other clientele include the San Francisco Municipal Transportation Authority, Los Angeles Department of Transportation and various cities outside of California such as City of Newton, MA City of New Orleans, and City of Indianapolis.

At the conclusion of the evaluation process, including oral presentations, Axiom xCell, Inc. was determined to be the top ranked firm. The following is a summary of the PET’s scores:

1	Firm	Average Score	Factor Weight	Weighted Average Score	Rank
2	Axiom xCell, Inc				
3	Qualifications of the Firm/Team	95.00	15.00%	14.25	
4	Qualifications and Experience of Key Personnel	90.00	10.00%	9.00	

5	Operating Methodology/Work Plan	97.33	40.00%	38.93	
6	Cost Proposal	76.17	35.00%	26.66	
7	Total		100.00%	88.84	1
8	INET, Inc. dba iParq				
9	Qualifications of the Firm/Team	88.33	15.00%	13.25	
10	Qualifications and Experience of Key Personnel	85.00	10.00%	8.50	
11	Operating Methodology/Work Plan	72.00	40.00%	28.80	
12	Cost Proposal	100.00	35.00%	35.00	
13	Total		100.00%	85.55	2
14	Xerox State and Location Solutions, Inc.				
15	Qualifications of the Firm/Team	83.33	15.00%	12.50	
16	Qualifications and Experience of Key Personnel	82.50	10.00%	8.25	
17	Operating Methodology/Work Plan	80.00	40.00%	32.00	
18	Cost Proposal	55.46	35.00%	19.41	
19	Total		100.00%	72.16	3

C. Cost/Price Analysis

The recommended price has been determined to be fair and reasonable based on adequate price competition, price analysis, and technical analysis. Metro's ICE is higher than the recommended price because it was primarily based on higher unit rates currently paid by Metro for citation processing services, which included manual data input. In addition, the proposer's recommended technology based efficiencies significantly reduced manual citation inputs, which resulted in the lower recommended price.

	Proposer Name	Proposal Amount	Metro ICE	Award Amount
1.	Axiom xCell, Inc.	\$1,595,934	\$5,344,750	\$1,586,533
2.	INET, Inc. dba iParq	\$1,215,700		
3.	Xerox State and Location Solutions, Inc.	\$2,192,078		

D. Background on Recommended Contractor

The recommended firm, Axiom xCell, Inc. (Axiom) is a Metro certified SBE firm headquartered in San Diego, California. It provides design and strategic development of integrated software and mobile application services to government agencies in the California transit industry. Ongoing and completed projects at Metro include:

- **Go Metro** – Metro mass transit application used by more than 200,000 commuters everyday
- **Go 511** – LA Safe’s traffic and transit mobile application
- **MMAPI Server** – provides Application Program Interface (API) to display traffic, incidents, roadwork, cameras and alerts
- **TAP Mobile Phone Validator** – deployed to 600+ TAP Fare Inspectors and Law Enforcement Officers

Axiom’s performance on the above Metro projects is satisfactory.

For this project, Axiom has partnered with Choice Technical Services, a DVBE subcontractor based in Cerritos, to provide the handheld mobile ticket printers.

The proposed Project Manager has over 17 years’ of experience with various aspects of software engineering, program management, systems engineering, field engineering and software validation.

DEOD SUMMARY

CITATION PROCESSING SERVICES / CONTRACT NO. OP608960027253

A. Small Business Participation

The Diversity and Economic Opportunity Department (DEOD) established a 10% goal for this solicitation, inclusive of a 7% Small Business Enterprise (SBE) and 3% Disabled Veteran Business Enterprise (DVBE). Axiom xCell, Inc., a SBE Prime, exceeded the goal by making a 95.08% commitment, inclusive of 88.69% SBE and 7.39% DVBE.

Small Business Goal	7% SBE 3% DVBE	Small Business Commitment	87.69% SBE 7.39% DVBE
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	SBE/DVBE Subcontractors	% Committed
1.	Axiom xCell, Inc. (SBE Prime)	87.69%
2.	Choice Technical Service (DVBE)	7.39%
	Total Commitment	95.08%

B. Living Wage and Service Contract Worker Retention Policy Applicability

The Living Wage and Service Contract Worker Retention Policy is not applicable to this contract.

C. Prevailing Wage Applicability

Prevailing wage is not applicable to this contract.

D. Project Labor Agreement/Construction Careers Policy

Project Labor Agreement/Construction Careers Policy is not applicable to this contract.