

# Appendix B - Title VI Baseline

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**To:** Hart Migdal, Lane Transit District (LTD)  
**From:** Daniel Costantino, Jarrett Walker + Associates  
**Date:** May 11, 2018  
**Subject:** Title VI Methods and Baseline

Title VI of the Civil Rights Act of 1964 prohibits discrimination to persons based on their race, color, or national origin by a federally-funded recipient in the administration and execution of an activity. The Environmental Justice Order (Executive Order 12898) of 1994 further requires that the activity not have a disproportionately high and adverse impact on minority or low-income populations without practical alternative mitigation.

This memo provides the following:

- Outline of Lane Transit District's current Title VI policy thresholds.
- Description of LTD's current methodology for Title VI analysis of changes to fixed-route transit service.
- Description of the People-Trips service equity analysis methodology, showing how it can be used to meet LTD policy standards.
- Baseline Title VI analysis using the People-Trips method, showing how future service or network changes could be reviewed.
- Review of new access-based Title VI methodologies as a potential next step in better capturing how transit service changes affect the network's utility change to Title VI populations.

## I - LTD Title VI Policy Standards

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Lane Transit District's (LTD) current Title VI policy standards break down into two key parts. The first part identifies what qualifies as a 'Major Service Change' that triggers the need to conduct an equity analysis. The second part assesses whether proposed changes breach disparate impact and disproportionate burden thresholds, which would require LTD to correct or mitigate the impacts of the proposed service change.

### MAJOR SERVICE CHANGES

The LTD policy on fixed-route service defines a major service change as:

- " 1. A change in service of:
- a. 25 percent or more of the number of route miles, or;
  - b. 25 percent or more of the number of a routes revenue hours of service on a daily basis for the day of the week for which a change is made, or;
  - c. Any changes in the routing of a bus route, when it is in service that alters 40 percent or more of the route's miles, or;
2. A new transit route is established, or;
3. A transit route is discontinued without reasonable access alternatives, or;
4. Restructuring of service throughout a sector as defined by LTD, or;
5. Decrease in the level of transit service (span in days and/or hours, and/or frequency) and/or decreased access to transit service defined as an increase of the access distance to beyond one-quarter mile of bus stops."

## DISPARATE IMPACTS & DISPROPORTIONATE BURDEN

Whenever a planned service change triggers any of the Major Service Change thresholds, LTD must conduct a service equity analysis to determine whether the impacts on minority or low-income people are disproportionate to those borne by of the non-minority and non-low-income population.

LTD considers that a disparate impact or disproportionate burden is in evidence if:

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- *Benefits are being provided to minority or low-income populations at a rate less than 80% of the rate at which benefits are provided to non-minority or non-low-income populations; or*
- *Adverse effects are being borne by non-minority or non-low-income populations at a rate less than 80% of the rate of adverse effects being borne by minority or low-income populations.”*

In cases where a disparate impact or disproportionate burden is being borne by low-income or minority populations, requiring LTD to correct or mitigate impacts.

## II - LTD Title VI Methodology

Under the existing service equity analysis methodology, disparate impacts or burdens to minority and low-income populations are determined as a function of the minority and low-income populations within a set distance of the impacted routes, as compared to the minority and low-income populations within the whole District's boundaries.

### STEP 1: ESTABLISHING IMPACTED POPULATIONS (MINORITY, LOW-INCOME, NON-MINORITY, AND NON-LOW-INCOME)

The method assumes that a transit route serves the population located within ¼ mile on each side of a route providing 'local' service, and ½ mile on each side of a bus rapid transit (BRT) route.

The population within this buffer is estimated using an address points data set maintained by the by Lane Council of Governments (Central Lane Metropolitan Planning Organization, MPO). This allows block group level populations estimates from ACS to be allocated to specific households within the service areas.

In addition, the address points data set contains information on the location of group quarters. Group quarters include group living arrangements such as college residence halls, residential treatment centers, skilled nursing facilities, group homes, military barracks, correctional facilities, and workers' dormitories. ACS group quarters population for the block group is then proportionally allocated based on the percentage of group quarter address points located within the buffer area. Minority and households in poverty are determined by allocating ACS block group level percentage data to the resulting population estimate.

By summing all residences in each route buffer, the characteristics of the population, including the number of people belonging to minorities and the number of low-income households, are estimated for the entire route.

The same process is followed in computing the District populations; in this case, the computational area is the entire area within the District boundary.

### STEP 2: ANALYZING IMPACTS FROM ROUTE ALIGNMENT CHANGES

Route alignment changes are analyzed by comparing the population characteristics within the impacted routes' buffers before and after the proposed change. The resulting impact on minority population and households in poverty are calculated by comparing their percentage impacted against the LTD average.

For example, analysis on planned 2017 service changes following the introduction of West Eugene EmX found that 1.08% of the district's minority population benefitted from the resulting route realignments, compared to 0.78% of the district's non-minority population. Therefore, there is no disparate impact, since minorities are receiving more than 80% of the level of benefit being received by non-minorities. A disparate impact would have been determined if less than 0.62% ( $=0.78\% \times 80\%$ ) of the district's minority population had benefitted from the realignments.

### **STEP 3: ANALYZING IMPACTS FROM SERVICE QUANTITY CHANGES**

Changes in service quantity (e.g. more or less frequency, longer or shorter hours, fewer or more trips on a given route) are analyzed by looking at the difference in revenue hours due to proposed route changes. Routes with service increases and routes with service decreases are considered separately to ensure that both benefits and adverse effects are borne equitably. The resulting impacts on minority populations and households in poverty are calculated by route and their percentage impact is analyzed in aggregate of the total service change.

For example, analysis found that 45.7% of the District's households living in poverty benefitted from the 2017 service changes, compared to 33.1% of non-poor households. As a result, no disproportionate burden was determined. A disproportionate burden would have been determined if less than 26.5% ( $=33.1\% \times 80\%$ ) of households in poverty had benefitted.

## **III - People-Trips Title VI Methodology**

JWA's preferred way conducting this type of analysis is the 'people-trips' methodology. The 'people-trips' service equity analysis method develops provides a measure of the distribution of service provided by the transit network, relative to the number of people who are likely to benefit from the service.

'People-trips' are the *number of trips provided by a transit service* within a given window of time, multiplied by the *number of people within walking distance* of that service.

For example, if a transit route provided 100 trips per week to a population of 500 people, it would provide 50,000 weekly people-trips (100 trips x 500 people). If that route's design were adjusted so that it reached only 400 people, the number of weekly people-trips would drop to 40,000. Or, if the routing did not change, but the number of weekly trips was cut to 80, the number of weekly people-trips would also drop to 40,000.

The number of people-trips is thus impacted both by the quantity of service (number of trips) and the demographic makeup of the served area. Census data on income, race and ethnicity is used to determine total, minority and low-income people-trips, in order to assess whether changes to routes or transit networks impact those populations at rates exceeding that of the general, non-minority and non-low-income populations.

### **STEP 1: ESTABLISHING IMPACTED POPULATIONS (MINORITY, LOW-INCOME, NON-MINORITY, AND NON-LOW-INCOME)**

This method has been implemented in the transit planning software package Remix. In the Remix people-trips method, the socio-economic characteristics of routes are determined by the area within a set distance from a route's stops. This set distance, or buffer, is an aerial distance (as the 'crow flies') and ignores pedestrian network computations.

In Remix, all buffers are considered to be ¼ mile radius from a route's stop. This ¼ mile distance is used for both 'local' service routes and Bus Rapid Transit (BRT)<sup>1</sup>. Population is estimated using area-based interpolation of ACS block group population statistics. The percentage of the block group within the buffered area is used to allocate the ACS block group population within the service area. Minority and low-income populations are determined by allocating ACS block group level percentage data to the resulting population estimate<sup>2</sup>.

By summing all residences in each route's stops buffer, the characteristics of the population and the number of minorities and low-income populations are estimated for the entire route. The same process is followed in computing the District populations; in this case, the computational area is the entire area within the District boundary.

## STEP 2: ANALYZING IMPACTS FROM A SERVICE CHANGE

People-trips provide a single metric to judge change in service to impacted populations. The same measure can be used for either a route alignment change or a service quantity change.

Typically, people trips are calculated on an annualized basis. This makes it possible to look at the total aggregate change in service, including weekday, weekend and holiday service, and at all times of day. Total annual trips are calculated for each route and then multiplied against the impacted populations.

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$$\text{Impacted Population} * \text{Annual Trips Available} = \text{People-Trips}$$

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By focusing on the total available trips for each route, as opposed to the total revenue hours spent, this allows the agency to report a single metric, people-trips, that captures how a service change will impact all current and potential riders.

In contrast, LTD's current methodology requires separate two-step analysis of how route realignment and service quantity changes will impact minority and low-income communities. This process can over- or under-value the impact of a route realignment due to its separation from service quantity. For example, eliminating an infrequent route may appear more impactful than reducing service on a frequent route. People-trips give a comparable metric to assess the relative impact of those two changes.

Using Remix allows for the rapid comparison of service equity impacts of different transit alternatives as they are developed. However, the same people-trips method can be implemented with the datasets currently in use by LTD in GIS applications.

## IV - Baseline Title VI Calculation

The following section shows baseline measurement of LTD's current transit network. Any proposed network changes can be compared to this baseline to determine if disparate impacts or a disproportionate burden will be placed on minority or low-income populations, in accordance with LTD's Title VI policy. The baseline uses GTFS feed data from March 2018, and American Community Survey 2012-2016 5-year estimates for demographic data.

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<sup>1</sup> Note that this is a characteristic of the Remix implementation, not of the people-trips method as a whole. One could design an R or GIS methodology to extend the BRT buffer to a 1/2- mile.

<sup>2</sup> Note also that the Remix calculation does not break down population by address, nor does it take group housing into account, beyond the inclusion of people housed in group quarters in the overall ACS block group population statistic. Again, this could be adjusted in an R- or GIS-based implementation.

### SOCIO-ECONOMIC CHARACTERISTICS OF LTD'S SERVICE AREA

Table 1 shows the number and percentage of low income and minority populations within LTD's service area. It also shows the same figures for other populations in situations of social disadvantage, including the elderly, people with limited English proficiency, and people living in zero-vehicle households.

*Table 1: Service Area Socio-Economic Characteristics*

Lane Transit District Service Area		
Service Area Population		333,066
Low Income	Percent	19.9%
	Total	109,431
Minority	Percent	17.6%
	Total	96,714
Elderly (65+ years old)	Percent	16.2%
	Total	51,618
Zero Vehicle Household	Percent	8.5%
	Total	27,316
Limited English Proficiency (LEP)	Percent	2.8%
	Total	9,832
Annual System Trips		548,700
Data Source: ACS '12-'16 (5-yr est); GTFS March 2018		

### LTD EXISTING SERVICE CHARACTERISTICS

Table 2 shows LTD route miles, revenue hours by day, and route coverage by population and jobs. This information helps to determine if any individual route changes meet the Major Service Change threshold established by LTD, as well as providing an overview of the current network by route.

Table 2: Route Service Table

Route				Revenue Hours				Coverage		
	Name	LTD Class	Miles	Weekday	Saturday	Sunday	Weekly	Population	Minority	Low Income
01	Campbell Center	connector	2.1	5.7	5.7	3.3	14.7	2,833	669	1,201
11	Thurston	urban	12.9	65.5	49.6	44.5	159.6	14,962	2,828	3,262
12	Gateway	urban	12.0	28.0	22.5	17.3	67.7	9,441	2,700	2,238
13	Centennial	urban	12.0	26.7	19.5	10.2	56.4	12,973	3,451	4,476
17	5th St/Hayden Bridge	connector	5.8	10.1	5.2	4.2	19.5	6,981	1,340	1,738
18	Mohawk / Fairview	connector	5.7	11.7	6.3	4.7	22.7	6,555	1,429	1,750
24	Donald	urban	8.3	21.7	15.6	8.8	46.1	13,172	2,608	4,913
27	Fairmount	connector	10.1	10.5	0.0	0.0	10.5	14,520	3,572	7,928
28	Hilyard	urban	9.5	26.5	12.6	10.3	49.4	16,473	3,937	8,797
33	Jefferson	connector	9.1	14.0	8.1	0.0	22.1	11,646	1,665	2,807
36	West 18th Avenue	urban	10.6	16.8	20.1	11.1	48.0	13,530	2,801	4,181
40	Echo Hollow	urban	13.5	36.3	16.6	13.2	66.1	12,190	3,084	3,791
41	Barger / W 11th	urban	22.9	55.0	36.7	15.2	106.9	20,528	4,824	5,029
51	Santa Clara	urban	14.0	36.4	23.6	12.4	72.4	14,837	2,819	3,413
52	Irving	urban	15.7	26.6	11.0	8.0	45.6	15,164	2,730	3,518
55	North Park	connector	18.9	13.6	0.0	0.0	13.6	15,320	2,895	4,382
66	VRC / Coburg Rd.	urban	12.5	45.1	24.0	11.9	81.1	11,036	1,920	2,593
67	Coburg Rd. / VRC	urban	12.3	42.1	21.6	9.7	73.4	11,341	1,962	2,767
73	UO / Willamette	college commuter	10.0	15.0	0.0	0.0	15.0	14,052	3,288	6,534
78	UO / Oak Patch	college commuter	12.5	25.1	0.0	0.0	25.1	20,362	4,867	8,186
79x	UO / Kinsrow	college commuter	6.5	19.1	3.8	0.0	23.0	5,003	1,786	3,067
81	LCC / Harris	college commuter	9.4	17.8	7.6	0.0	25.5	14,792	3,668	9,023
82	LCC / Pearl	college commuter	10.2	30.4	0.0	0.0	30.4	9,938	2,137	5,227
85	LCC / Springfield	college commuter	8.4	9.8	0.0	0.0	9.8	1,608	381	474
91	McKenzie Bridge	rural	112.1	11.3	5.5	5.5	22.3	10,968	2,512	3,981
92	Lowell / LCC	rural	45.8	5.7	0.0	0.0	5.7	10,190	2,181	5,258
93	Veneta	rural	26.1	9.3	2.7	0.0	12.1	3,294	777	830
95	Junction City	rural	34.4	11.4	5.3	2.6	19.3	9,789	2,251	2,976
96	Coburg	rural	19.6	6.5	0.0	0.0	6.5	9,723	1,682	2,149
98	Cottage Grove	rural	50.5	16.9	4.9	3.2	25.0	14,783	3,474	7,244
	EmX	EmX	18.1	181.5	120.6	96.8	398.8	21,453	5,041	7,981
System Totals			571.4	851.9	449.3	293.0	1594.2	-	-	-

Data Source: 2017 LTD Route Profile Summaries; GTFS (10/17)

## LTD PEOPLE-TRIPS BASELINE

Table 3 reports the People-Trips Baseline for LTD's current network. People-trips are reported by route, with the network total at the bottom. The 'Existing System' columns show the People-Trips, Minority Trips, and Low-Income Trips provided today. The blank 'Alternative' columns on the right is where proposed network changes would be reported.

Table 3: People-Trips Baseline

Route	Existing System			Alternative		
	People Trips	Minority Trips	Low-Income Trips	People Trips	Minority Trips	Low-Income Trips
01 Campbell Center	31,102,095	7,326,695	13,230,665	-	-	-
11 Thurston	653,670,890	133,071,845	153,902,338	-	-	-
12 Gateway	184,357,500	35,376,220	46,798,838	-	-	-
13 Centennial	265,757,135	70,167,920	90,956,559	-	-	-
17 5th St/Hayden Bridge	107,234,500	20,711,010	26,397,932	-	-	-
18 Mohawk / Fairview	95,551,560	20,402,640	25,428,425	-	-	-
24 Donald	251,015,550	47,649,525	87,125,195	-	-	-
27 Fairmount	94,792,425	23,702,250	54,060,645	-	-	-
28 Hilyard	322,589,295	76,761,395	169,910,195	-	-	-
33 Jefferson	146,980,350	21,188,750	35,769,050	-	-	-
36 West 18th Avenue	284,730,465	58,313,725	85,665,074	-	-	-
40 Echo Hollow	240,370,870	60,928,110	74,754,605	-	-	-
41 Barger / W 11th	470,368,295	109,132,455	116,868,141	-	-	-
51 Santa Clara	287,917,080	54,858,495	71,015,819	-	-	-
52 Irving	199,563,860	36,431,285	50,123,174	-	-	-
55 North Park	95,085,675	17,817,105	26,874,639	-	-	-
66 VRC / Coburg Rd.	257,983,025	48,052,765	62,587,932	-	-	-
67 Coburg Rd. / VRC	248,427,690	46,167,290	63,440,740	-	-	-
73 UO / Willamette	139,351,890	32,694,570	61,449,691	-	-	-
78 UO / Oak Patch	217,529,025	52,530,765	87,487,704	-	-	-
79x UO / Kinsrow	105,484,390	37,318,200	64,707,413	-	-	-
81 LCC / Harris	182,121,185	46,844,900	113,111,640	-	-	-
82 LCC / Pearl	244,991,760	52,489,200	126,628,682	-	-	-
85 LCC / Springfield	18,455,625	4,277,625	5,315,130	-	-	-
91 McKenzie Bridge	16,154,590	3,458,230	5,050,003	-	-	-
92 Lowell / LCC	17,525,385	3,724,275	8,857,322	-	-	-
93 Veneta	12,645,370	2,981,250	3,104,823	-	-	-
95 Junction City	42,630,900	10,442,275	13,251,725	-	-	-
96 Coburg	43,373,205	7,467,930	9,315,330	-	-	-
98 Cottage Grove	53,754,020	12,959,575	27,637,532	-	-	-
EmX	1,222,159,460	295,877,710	479,951,220	-	-	-
Total	6,553,675,065	1,451,125,985	2,260,778,181	-	-	-

Data Source: GTPS March 2018

#### FUTURE ANALYSIS: CHANGE IN PEOPLE-TRIPS (TITLE VI IMPACTS)

The following table shows how the reported change to People-Trips can be reported. By reporting the total and percent change by individual route, any network level design changes can be better captured. Change Borne reports the percentage impact each change has on individual route and the system as a whole. This is where disparate impact and disproportionate burden thresholds are applied, with a route triggering this threshold requiring future analysis and mitigation or network corrections.



**Table 4: People-Trips Change and Change Borne on Title VI Populations**

Route	Total Change			Percent Change			Change Borne	
	Person Trips	Minority Trips	Low-Income	Person Trips	Minority Trips	Low-Income	Minority	Low-Income
01 Campbell Center	-	-	-	-	-	-	-	-
11 Thurston	-	-	-	-	-	-	-	-
12 Gateway	-	-	-	-	-	-	-	-
13 Centennial	-	-	-	-	-	-	-	-
17 5th St/Hayden Bridge	-	-	-	-	-	-	-	-
18 Mohawk / Fairview	-	-	-	-	-	-	-	-
24 Donald	-	-	-	-	-	-	-	-
27 Fairmount	-	-	-	-	-	-	-	-
28 Hilyard	-	-	-	-	-	-	-	-
33 Jefferson	-	-	-	-	-	-	-	-
36 West 18th Avenue	-	-	-	-	-	-	-	-
40 Echo Hollow	-	-	-	-	-	-	-	-
41 Barger / W 11th	-	-	-	-	-	-	-	-
51 Santa Clara	-	-	-	-	-	-	-	-
52 Irving	-	-	-	-	-	-	-	-
55 North Park	-	-	-	-	-	-	-	-
66 VRC / Coburg Rd.	-	-	-	-	-	-	-	-
67 Coburg Rd. / VRC	-	-	-	-	-	-	-	-
73 UO / Willamette	-	-	-	-	-	-	-	-
78 UO / Oak Patch	-	-	-	-	-	-	-	-
79x UO / Kinsrow	-	-	-	-	-	-	-	-
81 LCC / Harris	-	-	-	-	-	-	-	-
82 LCC / Pearl	-	-	-	-	-	-	-	-
85 LCC / Springfield	-	-	-	-	-	-	-	-
91 McKenzie Bridge	-	-	-	-	-	-	-	-
92 Lowell / LCC	-	-	-	-	-	-	-	-
93 Veneta	-	-	-	-	-	-	-	-
95 Junction City	-	-	-	-	-	-	-	-
96 Coburg	-	-	-	-	-	-	-	-
98 Cottage Grove	-	-	-	-	-	-	-	-
EmX	-	-	-	-	-	-	-	-
Total	-	-	-	-	-	-	-	-

Data Source: GTFS March 2018

**KEY FINDING: BASELINE SERVICE (MARCH 2018) EQUITABLE TO TITLE VI POPULATIONS**

The following table shows the percentage of people-trips in the baseline that serve the two target Title VI populations: minorities and people with low incomes. These figures clearly show that minority and low-income people trips are higher than the minority and low-income share of the population.

This suggests that, at base, LTD's service meets the spirit of Title VI legislation and policies, which is an important finding in itself. However, this does not mitigate LTD's obligation to meet its Title VI policy in evaluating future service changes.

Table 5: Title VI Populations vs. Baseline People-Trips in the LTD System

LTD Service Area	
Minority Population	17.6%
Low Income Population	19.9%
LTD System People Trips	
Minority People Trips	22.1%
Low Income People Trips	34.5%

## Access-Based Title VI

Many transit agencies are turning to measures of access to evaluate the impacts of different changes to the service. Generally speaking, access measures seek to gauge how effectively transit services connect people to jobs or major destinations.

Access measures are focused on the distributional *outcomes* of transit service, contrasting with measures like changes in revenue hours or people-trips that are focused on the distributional *quantity* of service.

For example, two different designs for a route might be compared on the basis of how many jobs people can access in 45 minutes from each stop along the route. Access measures can be used to evaluate how proposed changes to the transit network impact minority or low-income people, compared to the impacts on the non-minority and non-low-income population.

Conventional Title VI methodologies, like those described earlier in this memo, measure the change in the distribution of a transit agency's operational resources among different groups. Access methods offer the potential to complement this with an understanding of the distribution of *utility*: the degree to which proposed major changes positively or negatively benefit minority and low-income people differently than the rest of the population.

Access-driven service equity analysis develops measures that are designed to make the distribution of transit benefits very simple for the public and decisionmakers to understand. For example, changes to the transit network might be analyzed to determine the % of regional jobs accessible in 45 minutes for the total, minority, non-minority, low-income, and non-low-income populations. A policymaking process would obviously be required to set suitable disparate impact and disproportionate burden thresholds for action to be taken on any such measures.

### Access-Based Methodology

A methodology evaluating access in this way might proceed as follows:

1. A GTFS schedule of the network to be implemented. This will be compared to the GTFS schedule representing the current service pattern.
2. These GTFS files are used to deploy an instance of OpenTripPlanner (OTP), the open-source routing engine that underlies many agencies' online trip planning applications. Alternatively, any other transit-capable routing engine could be used to perform this type of analysis.

3. A set of analysis points covering the entire service area is developed, which will be used as origins to measures access from. These points could be something as simple as the centroids of census blocks or block groups, or a grid of evenly spaced points generated based upon the limits of the service area. Points falling into water bodies or other inaccessible areas should be discarded.
4. Routing requests returning the area within a given travel time are made to OTP for each point, for samples across a time period (such as every 1, 2, or 5 minutes while transit is in service, or during the peak period and midday).
5. For each point's access areas, the number of people, jobs, and major destinations within the accessible area (isochrone) is calculated.
6. The point access numbers are aggregated to census or TAZ geographies for which demographic data is available. For example, the access values for a single census block group could be the average number of people and jobs accessible from points within that block group.
7. Service-area access numbers are then computed for each segment of the population, by calculating the average access numbers across all block groups, weighted by total, minority and low-income population.