

EXCLUSIVE BUS LANE ANALYSIS
N.J. LINCOLN TUNNEL APPROACHES

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N.J. DEPARTMENT OF TRANSPORTATION

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CONCLUSIONS AND RECOMMENDATIONS

Several assumptions must clarify our recommendations and conclusions:

1. That priority along this section of roadway is to be given to the movement of people rather than individual vehicles.
2. Traffic volume counts are assumed to be adequate and any projected reassignment, redistribution or generation of traffic due to any exclusive bus lanes are reasonable estimates.

In order to move the maximum number of people by buses during the peak hours, any exclusive bus lane should begin at the westernmost points of the study section. Although there are numerous proposals, they may be categorized into four major categories:

- (a) Exclusive eastbound bus lane in westbound roadways.
- (b) Exclusive eastbound bus lane in eastbound roadways.
- (c) Exclusive eastbound bus lane in westbound roadway from North Bergen Viaduct to Lincoln Tunnel with new construction west of North Bergen Viaduct and in vicinity of N. J. Turnpike.
- (d) Exclusive eastbound bus lane in eastbound roadway from North Bergen Viaduct to Lincoln Tunnel with same new construction as above.

Each category has certain restrictions in the areas of safety and capacity. The most severe capacity restrictions occur with the exclusive bus lane in the eastbound roadways and the most severe accident potential occurs with the exclusive bus lane in the westbound roadways. Recommendations as to the most feasible operation of an exclusive bus lane in this corridor must be viewed in two separate time frames.

The most promising proposal with the least restrictions to capacity and most adequate safety measures would require additional major construction. If work

were initiated in the immediate future and given top priority, it is anticipated that it could be made operational over the next 1-1/2 to 2 years. The alternate proposals, which have the most critical restrictions to either safety or capacity and would require no major construction, could be tested within the next 6 months if given top priority. It is recommended that the alternates requiring no new major construction be tested by means of a "demonstration" project in order to evaluate in detail certain anticipated problems in the areas of safety and capacity if time is of the essence.

Following are the recommended methods of providing an exclusive bus lane in this corridor. The most desirable method assumes that a 1-1/2 to 2 year time frame is acceptable.

1. It is recommended that ramps similar to ramps X, Y, and Z proposed in the area of Interchange 16, N. J. Turnpike (Fig. 1) be constructed and that a new lane be provided from these ramps paralleling Roadway W to connect with the median lane of the eastbound roadway at the west end of the North Bergen Viaduct. This lane could be constructed so as to be separated from opposing traffic by a physical barrier and made wide enough to allow passage should breakdowns occur. This would also allow for the left-hand lane of Ramp J to be reserved for buses and merge with the buses on the new lane in the vicinity of the west end of the North Bergen Viaduct. The median lane of the Viaduct would be reserved for buses leaving the three remaining lanes for non-bus traffic. In order to provide adequate capacity in the Union City Underpass, ingress to the underpass should be restricted at the Kennedy Boulevard on-ramp and ingress and egress restricted at the Pleasant Avenue ramps. This would require major traffic engineering improvements to be initiated on the eastbound marginal street to handle the additional volumes. Indications are that the eastbound marginal

street can adequately handle this additional traffic. This proposal has the least restrictions in the areas of safety and capacity and consequently the greatest potential for success.

Should new construction not be possible and the 1-1/2 to 2 year time frame not acceptable, the following "demonstration" project should be considered.

2. An exclusive bus lane be tested utilizing the median lane of the westbound roadway from the service road at the New Jersey Turnpike to the Lincoln Tunnel. The exclusive bus lane should be coned off from the opposing westbound movements and proper signing and lane control devices must be utilized. Every possible precaution should be taken to ensure that westbound traffic is made continuously aware of the median lanes use for opposing bus traffic. Constant surveillance of the area is mandatory. Many of the expected problems in the areas of capacity and safety are based on projected redistribution and generation of traffic which may or may not occur. We do not have the benefit of past experience of similar projects on which to base recommendations. For these reasons it is recommended that a "demonstration" project be tested in order to investigate in detail anticipated problems in the areas of safety and capacity. It is felt that between the engineering staffs of the New York Port Authority, New Jersey Department of Transportation, Tri-State Transportation Commission, New Jersey Turnpike, and other involved agencies, that a plan can be tested with due precautions taken to ensure the motorist is provided with the best available safety measures and also with the least restrictions to roadway capacities.

By recommending this alternate over the exclusive bus lane in the eastbound roadway for the same section length, it should not be inferred that we feel we should sacrifice safety for the sake of additional capacity. It only indicates that it is felt that any anticipated unsafe conditions can be held to a minimum by proper engineering and traffic control measures.

FIGURES AND VOLUME DATA

Bus Volumes - Peak hour bus volumes are assumed to be 600.

These are distributed to the major feeder roads as follows:

SB N.J. Turnpike - 180

NB N.J. Turnpike - 190

EB Route 3 - 130

EB Paterson Plank- 70

Park-Ride Lot - 30

Plan of Site and Existing Westbound Volumes - Figure 1 and Table 1.

Existing Traffic Flows - Figure 2 (Port of New York Authority figure).

EXCLUSIVE BUS LANE ANALYSIS
N. J. LINCOLN TUNNEL APPROACHES

Proposals for an exclusive bus lane on the New Jersey approaches to the Lincoln Tunnel between New Jersey Turnpike Interchanges 16 & 17 and the Lincoln Tunnel have been made for almost ten years. The Port of New York Authority over recent years has submitted proposals containing various plans for the establishment of an exclusive bus lane in this corridor. The purpose of this study is to evaluate these proposals from a safety and capacity standpoint and to analyze any anticipated problems in these areas. It is also the purpose of this report to recommend the most feasible method of establishing an exclusive bus lane in this area, assuming of course, that one of the proposals is feasible. Since many of the proposals are similar in that they utilize common sections of roadways for at least a part of the exclusive bus lanes, the proposals will not be discussed separately; however, the anticipated problem areas will be discussed individually. This is done for two reasons: (a) It will avoid repetition, as each problem area will only be discussed once and, (b) An acceptable plan may use the best features of alternate proposals.

ANALYSIS OF ROADWAY SECTIONS

The designation of ramps and roadway sections contained in the following analysis is shown in Figure 1 attached.

1. MERGE OF ROADWAY E AND RAMP V IN VICINITY OF N. J. TURNPIKE

a. Use of left lane on Roadway E and left lane on Ramp V as exclusive bus lanes.

Approximately 180 buses in the left lane of Ramp V would have to cross 600 vehicles in the right lane of Roadway E during the A.M. peak hour to move into the left lane of Roadway E. This could normally be

accommodated if it were not for the backup of traffic on Roadway E from downstream Ramp G. At present, traffic from the northbound and southbound N. J. Turnpike destined for the North Bergen Viaduct backs up from Ramp G through Roadway E upstream of the merge with Ramp V. Hence, the crossing of buses from Ramp V through the right lane of Roadway E would be extremely difficult.

b. Use of right lane of Roadway E and right lane of Ramp V as exclusive bus lane.

The same cross of ramp traffic would take place as in (a) above. Vehicles in the left lane of Ramp V would have to cross 190 buses in the right lane of Roadway E in the same congestion as described above.

2. RAMP G

Approximately 1400 vehicles in the A.M. peak hour merge on Ramp G. This congestion delays traffic and backs it up along Roadway E towards the Turnpike.

a. Use of left lane in Ramp G as exclusive bus lane.

Because Ramp G is presently striped for 1 lane, the merge with Ramp B would have to be redesigned to widen Ramp G in order to accommodate an exclusive bus lane. This redesign would then reduce the acceleration lane of Ramp B giving priority to the Ramp G traffic.

b. Use of right lane as the exclusive bus lane on Ramp G.

The same conditions as exist in (a) above would prevail here.

3. MERGE OF RAMP J AND RAMP G

Ramp J is presently striped for two lanes which are continued across the North Bergen Viaduct and into the Union City Underpass. Ramp G would have to have its striping extended to two lanes at least to the North Bergen Viaduct, again giving it priority over Ramp B traffic.

a. Use of left lane on Ramp J and Ramp G as exclusive bus lanes.

To effectively merge an exclusive bus lane on Ramp G to what would be an exclusive left lane bus lane on Ramp J, approximately 370 buses in the peak hour on Ramp G would have to cross approximately 1700 vehicles in the right lane of Ramp J. The resulting delays to the bus traffic from Ramp G would be very much the same as they are today with no exclusive bus lane. The remaining traffic in the right lanes on Ramps J, G and B would then merge in the remaining three lanes of the North Bergen Viaduct. The existing merging traffic of the North Bergen Viaduct during the A.M. peak hour is approximately 3800 vehicles in the four lanes. With the proposal that the left lane be used as the exclusive bus lane, it is anticipated that over 4000 vehicles (N.Y. Port Authority estimate) in the A.M. peak period would have to merge in three lanes (rather than four) on the North Bergen Viaduct. There could be no estimate of delays for non-bus vehicles except that the delay would be far in excess of the 10 to 20 minutes of delay now experienced.

In addition to the 370 buses in the left lane of Ramp G that must cross the right lane of Ramp J to enter the proposed exclusive bus lane, 70 buses from Paterson Plank Road entering on Ramp B must cross all three lanes of traffic to also enter the exclusive bus lane. The difficulty in the delay experienced by merging buses will add to the delay of Ramps B, G and J traffic.

b. Use of right lane on Ramp J and Ramp G as exclusive bus lanes.

The right lane bus volume from Ramp J of 130 buses must cross 1100 vehicles in the left lane of Ramp G to enter the proposed exclusive right-hand bus lane. The difficulties of this merge are similar to

those expressed in (a) above. However, the bus traffic from Ramp B would enter the proper lane. Local exiting traffic to Kennedy Boulevard of approximately 1100 vehicles coming from Ramp J, Ramp G and Ramp B would also have to enter the right lane prior to the east end of the North Bergen Viaduct. Again, as in (a) above, over 4000 vehicles in the A.M. peak hour would be restricted in their merging maneuvers to three lanes on the North Bergen Viaduct (presently, 3800 vehicles merge in four lanes on the North Bergen Viaduct).

4. UNION CITY UNDERPASS AT THE KENNEDY BOULEVARD EXIT RAMP

a. Use of left lane as an exclusive bus lane.

The anticipated 4000 vehicles in the A.M. peak hour on the North Bergen Viaduct, the 1100 exit vehicles to Kennedy Boulevard, and the constriction of two lanes in the Union City Underpass should result in delays to non-bus traffic far in excess of the 10 to 20 minute delays that are currently experienced. The Union City Underpass is presently carrying approximately 3300 vehicles in the A.M. peak hour in three lanes. Using one of these lanes as an exclusive bus lane would require a two lane roadway to carry 2900 vehicles per hour.

b. Use of the right lane as an exclusive bus lane.

At the eastern end of the North Bergen Viaduct, the 600 buses in the exclusive right lane would have to ^{weave}merge with the 1100 existing vehicles destined to the local street system exiting at Kennedy Boulevard. This ^{weave}merge could not be restricted to this location but would have to extend over the entire length of the Viaduct. East of the Kennedy Boulevard Exit Ramp on the Union City Underpass, the right lane of the three lane roadway would be restricted to buses. The associated merging of Ramps J, G and B traffic in weaving on the three lanes of the North Bergen Viaduct

would result in similar problems as previously discussed.

5. DIVERGE OF RAMP J AND RAMP E (ROUTE 3).

The use of either the left lane or right lane as an exclusive bus lane will back traffic along both Ramp E and Route 3 farther upstream. If the exclusive bus lane were to be the left lane, traffic would be restricted on Route 3 to the two right-hand lanes and the exclusive bus lane on Route 3 could run to the vicinity of the N. J. Turnpike Overpass. There would be no weaving on Route 3 with this proposal. Using the right lane as an exclusive bus lane would create an undesirable weave of the right lane bus traffic with the traffic exiting from eastbound Route 3 to Ramp E.

6. UNION CITY UNDERPASS EXCLUSIVE BUS LANE IN EASTBOUND ROADWAY

Using one lane of the three lanes in the Union City Underpass for an exclusive bus lane would restrict all of the non-bus traffic to the remaining two lanes. The major consideration with this proposal is whether or not traffic should be allowed egress or ingress to the Union City roadway from the eastbound marginal roadway.

Using existing volumes as a guide, there are over 800 vehicles that enter the Union City Underpass from local streets during the A.M. peak hour, most of these from Kennedy Boulevard. There are almost 700 vehicles exiting the Union City Underpass to the eastbound marginal street. This interchanging volume of over 1500 vehicles with the existing tunnel-bound traffic of approximately 2200 vehicles in the Union City Underpass could create additional delays if only two lanes were utilized for moving traffic. If ingress and egress to the Union City Underpass were restricted, improvements to the eastbound marginal street would be an absolute necessity. These improvements would have to accommodate a maximum of approximately 1200 vehicles at the

west end of the eastbound marginal street at Kennedy Boulevard. The eastbound marginal street can accommodate two lanes of moving traffic for its entire length from the Kennedy Boulevard exit ramp to Hudson County Boulevard East.

7. EXCLUSIVE BUS LANE IN ROADWAY W (IN VICINITY OF INTERCHANGE 16 & 17 ON THE N. J. TURNPIKE)

Roadway W is westbound and this particular item refers to using the median lane of the westbound roadway in this section to handle buses traveling eastbound. With the proposal for U-turn roadways on the N. J. Turnpike service road to Paterson Plank Road, Roadway W in the vicinity of the Ramp V overpass would have to accommodate almost 1000 vehicles in the westbound direction during the A.M. peak hour. With the exclusive bus lane as the median lane of this roadway, up to 600 buses per hour would be in this median lane. The exclusive bus lane as the median lane of Roadway W could be extended eastbound to Ramp U. The portion of the roadway between Ramp T and Ramp U is presently four lanes wide and accommodates approximately 1500 vehicles in the westbound direction. This volume could be accommodated in three lanes. To remove the restriction of a two lane roadway (under Ramp V) Roadway W could be widened to three lanes over this approximately 500 foot length under Ramp V thereby allowing two lanes in the westbound direction and the exclusive eastbound bus lane.

8. EXCLUSIVE BUS LANE ADJACENT TO ROADWAY W

Similar to the preceding proposal, that U-turn ramps at the Turnpike service road be provided, a separate service roadway of approximately 18 feet in width could be placed adjacent to Roadway W and Roadway E to accommodate the eastbound buses during the A.M. peak period. Roadway W would have to be

realigned approximately 15 feet to the north of its present alignment to allow this new exclusive bus lane to be accommodated. This naturally would require new construction.

9. EXCLUSIVE BUS LANE ON RAMP F

Ramp F is a two lane roadway between Ramp U and the western end of the North Bergen Viaduct. Under this proposal the median lane would be reserved for the exclusive bus lane in the eastbound direction during the A.M. peak period. There would be approximately 600 buses during the A.M. peak period in the eastbound direction and approximately 1100 vehicles in the westbound direction in the adjoining lane.

10. EXCLUSIVE BUS LANE ADJACENT TO RAMP F

To maintain two lanes in the westbound direction during the A.M. peak period a proposal was made for the construction of a roadway adjacent to and south of Ramp F for the approximately one-quarter mile from Ramp U to the North Bergen Viaduct. This separate roadway will entail the construction of a road between Ramp F and Roadway E for approximately 1000 feet of at-grade roadway and two bridges, one over Ramp J and the other over Route 3 at the eastern end of Ramp F. This separate roadway could be aligned into the median lane of the present westbound roadway of the North Bergen Viaduct or to the left lane of the eastbound roadway.

11. EXCLUSIVE EASTBOUND BUS LANE IN WESTBOUND ROADWAY OF NORTH BERGEN VIADUCT

a. Continuation of exclusive bus lane from Ramp F.

Ramp F would be restricted to one lane in the westbound direction with exclusive bus lane on its roadway. There is a major bifurcation for traffic headed westbound on the North Bergen Viaduct continuing either westbound on Ramp F or exiting to westbound Route 3 (Ramp D). Approximately 3000 vehicles are on the westbound roadway at this point.

Approximately 2000 exiting to Route 3 and 1000 continuing westbound on Ramp F. The restriction of one lane at this exit ramp is potentially dangerous with this volume of exiting and thru traffic. The North Bergen Viaduct being four lanes wide is itself sufficient to carry the westbound A.M. peak hour traffic and would continue to be so even with the loss of the median lane as an exclusive bus lane. At the eastern end of the North Bergen Viaduct, the exclusive bus lane can be aligned directly onto the eastbound roadway as a left lane exclusive bus lane on the eastbound roadway or can continue as the median lane on the westbound roadway.

b. Continuation of exclusive bus lane from the separate roadway adjacent to Ramp F.

A similar condition would exist as above with the new roadway being able to feed into either the median lane of the westbound roadway or the left lane of the eastbound roadway. *no problem at bifurcation.*

12. EXCLUSIVE BUS LANE IN THE EASTBOUND ROADWAY OF THE NORTH BERGEN VIADUCT

a. Continuation of an exclusive bus lane from Ramp F.

To accommodate an exclusive bus lane as the left lane of the eastbound roadway on the North Bergen Viaduct would necessitate constricting Ramp J traffic to a single lane in the merge with Ramp G and Ramp B traffic.

The effects of this constriction of Ramps J, G and B traffic would be to delay all non-bus traffic far in excess of the 10 to 20 minute delays now experienced by all traffic. The resulting storage of these vehicles would extend much further upstream on their feeder routes than is now presently experienced. With the use of the left lane on Ramp J as an exclusive bus lane at this point, this lane could be reserved for the buses from Route 3 which could then merge with the buses from Ramp F.

- b. Continuation of exclusive bus lane from separate roadway adjacent to Ramp F.

The alignment of the exclusive bus lane on a separate roadway adjacent to Ramp F will allow this roadway to be brought directly into the left lane of the eastbound roadway on the North Bergen Viaduct.

13. EASTERN END OF NORTH BERGEN VIADUCT

- a. Exclusive bus lane as left lane of the eastbound roadway.

This proposal suggested no more than the continuation of the left lane from the North Bergen Viaduct into the Union City Underpass as the exclusive bus lane. Inherent problems of using the left lane as an exclusive bus lane through this area were inferred in a previous section of the report covered in the section entitled "Union City Underpass at the Kennedy Boulevard Exit Ramp".

- b. Exclusive bus lane in median lane of westbound roadway crossing over to the left lane of the eastbound roadway at Union City Underpass.

The alignment of the median lane of the westbound roadway is a continuation of the left lane of the eastbound roadway, hence, traffic coming westbound from the Union City Underpass in the left lane should continue in that lane without having to move one lane to the right for the exclusive bus lane. In bringing the exclusive bus lane into the eastbound roadway from the westbound roadway at this point would allow the merge of all non-bus traffic from Ramps J, G and B to extend over the entire length of the Viaduct. However, at the eastern end of the Viaduct the four lanes of traffic would be restricted to two lanes in the Union City Underpass. The right lane of Viaduct traffic may be expected to be mainly exiting traffic to Kennedy Boulevard. The three adjacent lanes would then merge at the eastern end of the Viaduct to the two remaining lanes of the Union City Underpass.

This, in effect, is an additional constriction to the Lincoln Tunnel bound traffic on the eastbound roadway at the Union City Underpass.

14. EXCLUSIVE BUS LANE IN THE MEDIAN LANE OF THE WESTBOUND ROADWAY AT UNION CITY UNDERPASS

a. Operating westbound roadway as two westbound and one eastbound exclusive bus lane.

For the use of the median lane of the westbound roadway as an exclusive bus lane, the Union City Underpass could be restricted to the two lanes in the westbound direction. The capacity of the two lanes for westbound operation is sufficient to handle the flow of approximately 2300 vehicles during the westbound peak hour. There may however be some constriction downstream from this point where the Kennedy Boulevard on-ramp merges approximately 1200 vehicles with the 2300 vehicles from the Union City Underpass.

b. Exclusive bus lane in median of westbound roadway in the helix.

The four-lane helix for westbound traffic could be reduced to one lane for the exclusive bus lane, one buffer lane and two lanes for the westbound traffic. The only disadvantage for using two lanes for the westbound movement on the helix is the fact that the helix is a 4 percent grade of approximately 2000 feet in length. The heavier trucks will impede the flow of the faster moving westbound vehicles, hence, restricting them to one lane. With approximately 1900 vehicles moving westbound on the helix, as many as 1500 may be forced to use the second lane while the 400 remaining vehicles move in the slower right lane. The four lane roadway of the westbound helix terminates near the top of the grade at the exit ramp to Pleasant Avenue. At this point, the buffer lane on the helix would have

to be dropped, in fact, the buffer lane will have to be transitioned between the Hudson Boulevard East exit ramp and the Pleasant Avenue exit ramp. The traffic in the section from the right lane must at this point move to the center lane allowing the right lane to move one lane to the left. To continue through the Union City Underpass, there will be approximately 1600 vehicles in the westbound roadway west of Pleasant Avenue. The slower moving traffic should still be in the right lane at this point, however, 1000 feet downstream approximately 800 vehicles will enter this roadway from the Pleasant Avenue on-ramp. The westbound roadway will now have approximately 2400 vehicles westbound in the Union City Underpass in two lanes. The Union City Underpass should have sufficient capacity to handle this flow.

- c. Operating westbound roadway as one lane westbound, one exclusive bus lane eastbound and one buffer lane.

Again the westbound roadway of the helix would operate as two lanes transiting at the top of the helix from the four lane to the three lane roadway through the Union City Underpass as explained previously. However, the 1600 vehicles in the westbound direction would be restricted to a single lane. This restriction will slow traffic appreciably with the presence of larger trucks. The increase of the 800 vehicles on Pleasant Avenue must be restricted since the Union City Underpass westbound roadway operating as a single lane would become overloaded. The 800 vehicles on Pleasant Avenue would then be required to traverse the westbound marginal street and enter the westbound roadway from the Kennedy Boulevard on-ramp. This flow of 800 vehicles would be supplemented by the normal on-ramp flow of approximately 1200 vehicles. At this point of merge of on-ramp traffic and

westbound roadway traffic, the westbound roadway transitions from a three lane section to a four lane section. Westbound roadway flow of approximately ¹⁶⁰⁰2300 vehicles would have to be striped from the right lane to the center lane over this transition length, in fact, all lanes from the three lane section would be transitioned one lane to the left by use of striping. This would allow the 2000 vehicles to enter from Kennedy Boulevard to continue westbound across the Viaduct in the right lane. However, the westbound roadway traffic from the Lincoln Tunnel should not be allowed access to Route 1&9 Northbound exit at this point. It would be necessary to close off this northbound movement to Route 1&9 because there would be approximately ³⁶⁰⁰3400 vehicles in the two lane westbound roadway and the existence of a weave in this 300 foot length between the Kennedy Boulevard entrance ramp and the northbound Route 1 exit ramp ^{would} could be a major bottleneck.

15. ENFORCEMENT FOR EXCLUSIVE BUS LANE FOR EASTBOUND ROADWAYS

The only positive enforcement to restrict this lane to buses would be to place policemen at strategic points throughout the length of the road, otherwise non-bus traffic could be expected to take full advantage of this exclusive lane considering there will be only 600 buses in it as opposed to 1500 vehicles ^{each of} in the adjoining two lanes in the Union City Underpass. West of the Union City Underpass area, with the considerable volumes of merging and weaving traffic, non-bus vehicles would be making considerable use of this lane also.

16. ENFORCEMENT OF EXCLUSIVE BUS LANE IN WESTBOUND ROADWAY

Because of the physical separation of the exclusive bus lane from other east-bound traffic, non-bus traffic cannot physically enter the lane. If, however,

others prefer entering the lane at its beginning on the N. J. Turnpike service road, they can be picked out of the stream on the Lincoln Tunnel Toll Plaza.

16. VEHICULAR BREAKDOWNS AND THE EFFECT ON TRAFFIC FLOW

Using a three month period in 1965 as the basis for vehicle breakdowns, the Port of New York Authority has supplied the following data from the immediate approaches to the Lincoln Tunnel and the Tunnel itself. This section is assumed to approximate ~~the~~ the 2-1/2 miles of the New Jersey approaches to the Lincoln Tunnel.

<u>Type Veh.</u>	<u>No. Stoppages</u>	<u>Volume</u>	<u>One Stoppage per</u>
Auto	984	6,062,000	6,200
Bus	74	760,000	10,300
Truck	234	638,000	2,800
Trailer Truck	<u>168</u>	<u>323,000</u>	1,900
Totals	1460	7,783,000	

The peak periods have 39 percent of the traffic and 47 percent of the stoppages. The non-bus stoppages during the peak morning period is then in the following ratio:

$$\frac{1386 \times .47}{7,023,000 \times .39} = 1/4200 \text{ vehicles}$$

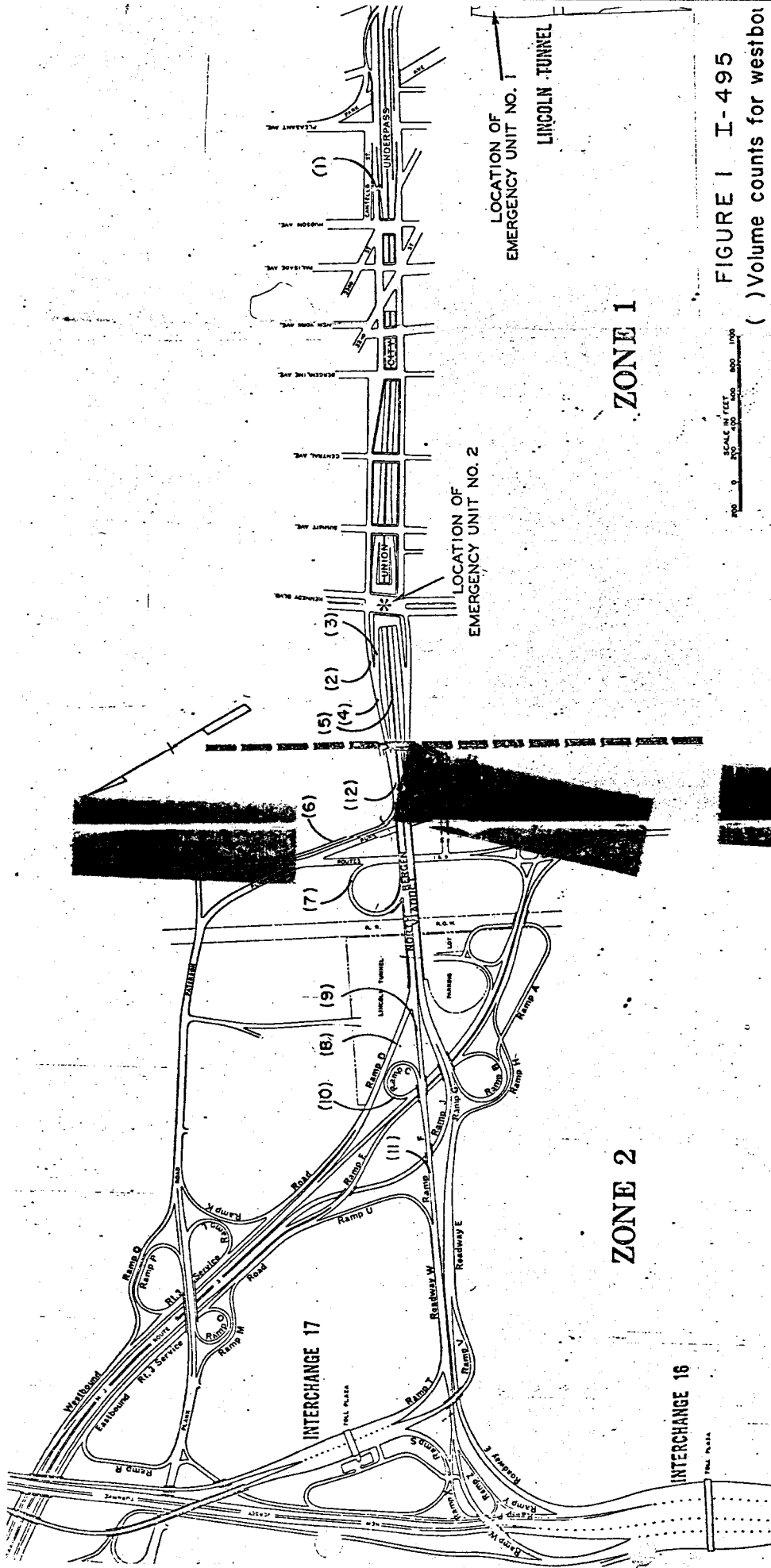
It is to be expected that the ratio is greater for the congested roadways than for the freer flowing roads. The Port of New York Authority's plan for an exclusive bus lane dated January 1967 goes into great detail to show how they would remove disabled vehicles from the various roadways in this corridor. Their data indicates that less than one bus per week would be disabled on these roadways, however, it is to be noted that on the basis of the above information that we can expect as many as one breakdown for every 4200 non-bus vehicles on the same roadway network. This breakdown rate approximates two stoppages

per A.M. peak period. The most critical areas for these stoppages would be on any roadway where the flow is restricted to either one or two lanes. One of the moving two lanes would be used to bring in the emergency vehicle and the other would be stopped because of the disabled vehicle. The most critical section of road where a disablement could occur would then be in the Union City Underpass if one of the eastbound lanes was used as an exclusive bus lane. All non-bus traffic would be restricted to only one moving lane during the time the disabled vehicle was on the road.

18. SAFETY

The previous portion of this report has been concerned mainly with capacity, or the lack of capacity, and the resulting congestion that may occur due to an exclusive bus lane. The safety aspects certainly should not be overlooked. Anytime that traffic moves in opposing directions without a physical barrier separating the opposing movements of traffic there is always a possibility of a head-on or a sideswipe type collision. Reversible lane operations have been utilized on various roadways in the country. Head-on collisions are also a possibility in reversible lanes. It appears that the main objection to the exclusive bus lane is the fact that a barrier is on the right-hand side of the exclusive bus lane where it is in the westbound roadway. It is felt by some that the barrier, normally being on the left-hand side separating opposing traffic, may lead some to believe that the exclusive bus lane is in actuality a lane for moving westbound traffic. This would indeed be possible if proper precautions were not taken to reserve this lane as an exclusive bus lane. Even with proper precautions, there is naturally always the possibility that a vehicle will get into this lane and be involved in an accident. Any use of the median lane of the westbound roadway as an exclusive bus lane for eastbound buses would have to be accompanied by stringent controls as to the use of the

lane through the use of existing hardware such as pop-up cones, lane control signs, and variable message signs to give the motorist advance and continuous warning that the median lane is reserved for opposing traffic. Any proposal that did not consider and utilize adequate safety measures could prove to be disastrous.



ZONE 1

ZONE 2

SCALE IN FEET
0 200 400 600 800 1000

FIGURE 1 I-495
() Volume counts for westbound traffic (see table I).
For eastbound traffic volume see Figure 2

LOCATION OF EMERGENCY UNIT NO. 1
LINCOLN TUNNEL

LOCATION OF EMERGENCY UNIT NO. 2
UNION

TABLE I

Westbound Volumes

<u>Location</u>	<u>Map Code</u>	<u>Day</u>	<u>Date</u>	<u>Time (AM)</u>		
				<u>7-8</u>	<u>8-9</u>	<u>9-10</u>
Pleasant Avenue On-ramp	1	Monday	6/29/70	849	616	403
		Tuesday	6/30/70	925	621	477
Kennedy Blvd. On-ramp (Upper)	2	Monday	6/29/70	490	304	215
		Tuesday	6/30/70	526	306	219
Kennedy Blvd. On-ramp (Middle)	3	Monday	6/29/70	639	402	226
		Tuesday	6/30/70	661	386	247
Kennedy Blvd. On-ramp (Total)	4	Monday	6/29/70	1129	706	441
		Tuesday	6/30/70	1187	692	466
I-495 ^{WB} East of Kennedy Blvd. On-ramp	5	Monday	6/29/70	2337	1962	1557
		Tuesday	6/30/70	2339	2037	1649
Off-ramp to Rt. 1 & 9 NB	6	Wednesday	7/1/70	140	157	109
Off-ramp to Rt. 1 & 9 SB	7	Wednesday	7/1/70	217	208	162
Off-ramp to Rt. 3 WB (ramp D)	8	Wednesday	7/1/70	2087	1507	1151
Off-ramp to Turnpike (ramp F)	9	Wednesday	7/1/70	837	786	808
On-ramp from Rt.3 WB to Ramp F (ramp C)	10	Wednesday	7/1/70	245	208	134
Ramp F west of Ramp C	11	Wednesday	7/1/70	1082	994	942
I-495 west of Kennedy Blvd. On-ramp	12	Monday	6/29/70	3466	2668	1998
		Tuesday	6/30/70	3526	2729	2115
		Wednesday	7/1/70	3281	2658	2230

PORT OF NEW YORK AUTHORITY

EXCLUSIVE BUS LANE PLAN

PRELIMINARY PEAK HOUR VOLUME ASSIGNMENT

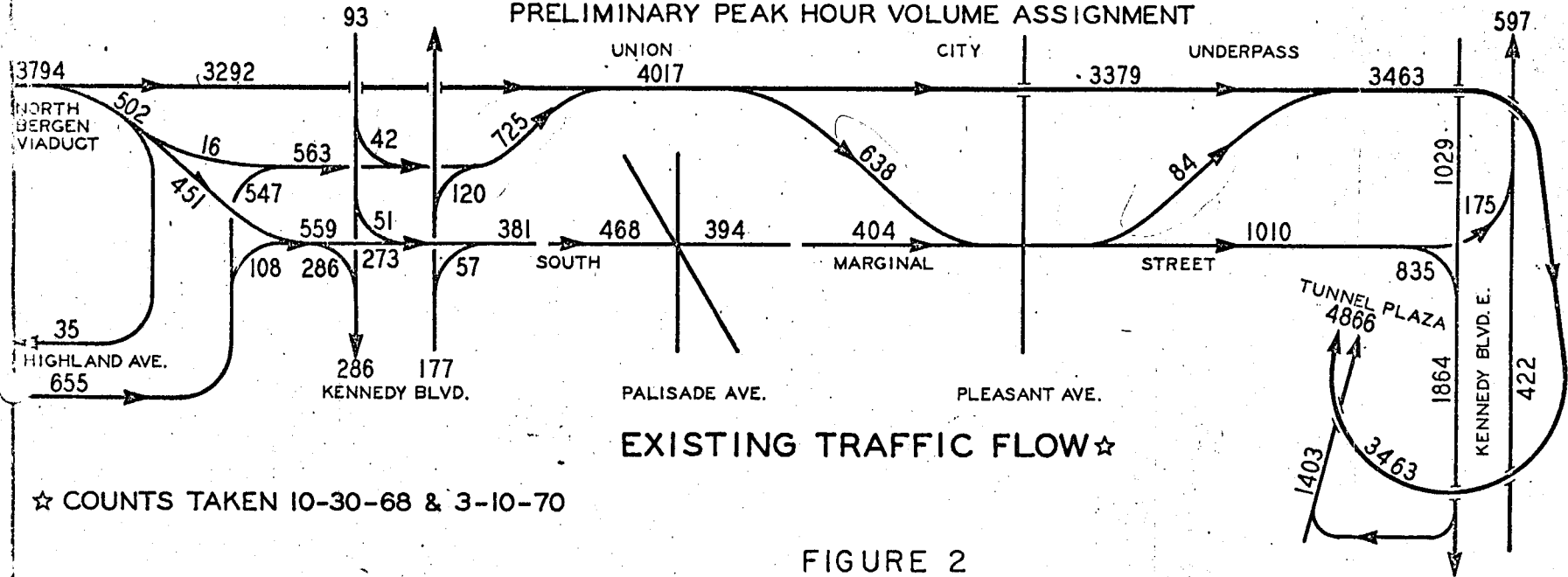


FIGURE 2