# A TRAFFIC CONTROL PLAN FOR EAST LANSING, MICHIGAN

Thesis for the Degree of B. S.

MICHIGAN STATE COLLEGE
John Mulholland

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THESIS

# A Traffic Control Plan
# for
# East Lansing, Michigan

A Thesis Submitted to
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By
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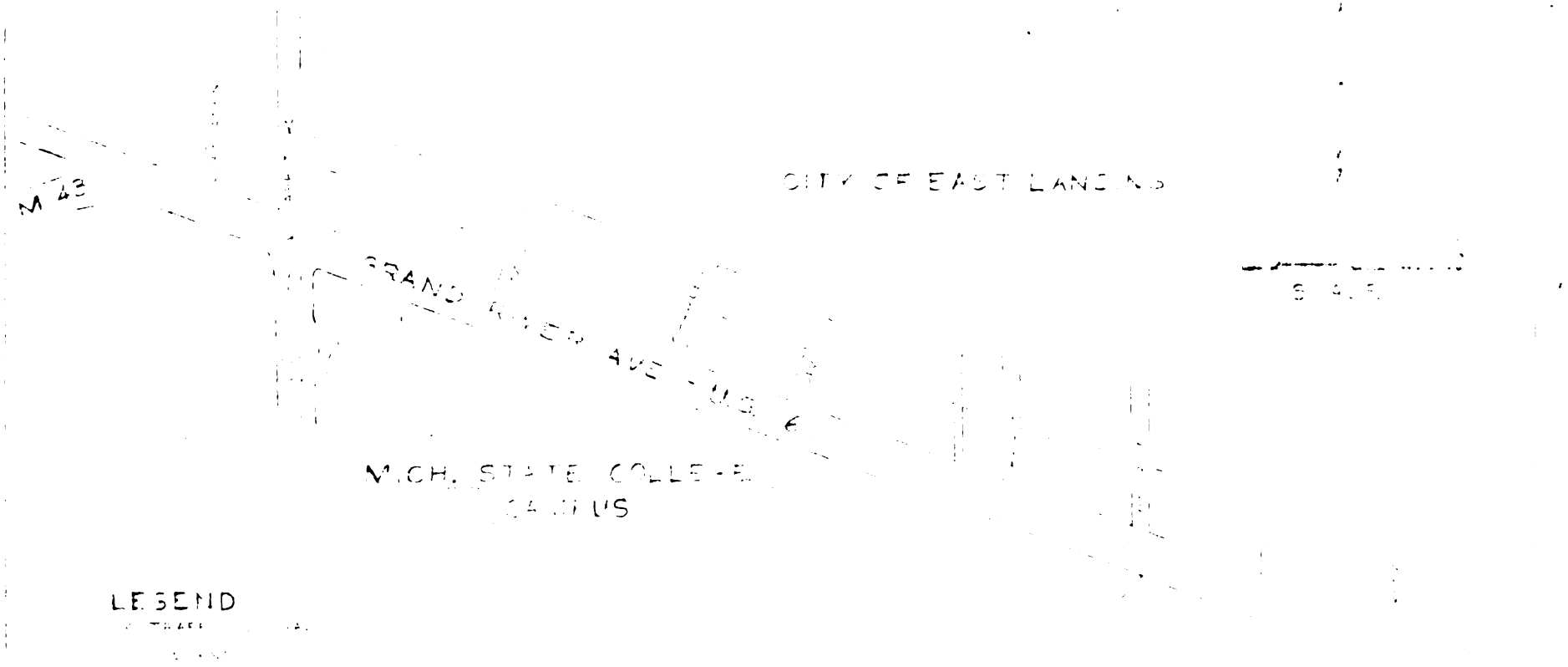

M 43
CITY OF EAST LANSING
GRAND RIVER AVE
MICH. STATE COLLEGE
CAMPUS
LEGEND

FIG. 1

# CHAPTER I

East Lansing is not a particularly large city and were it not for exceptional circumstances there would be no traffic problem to speak of.

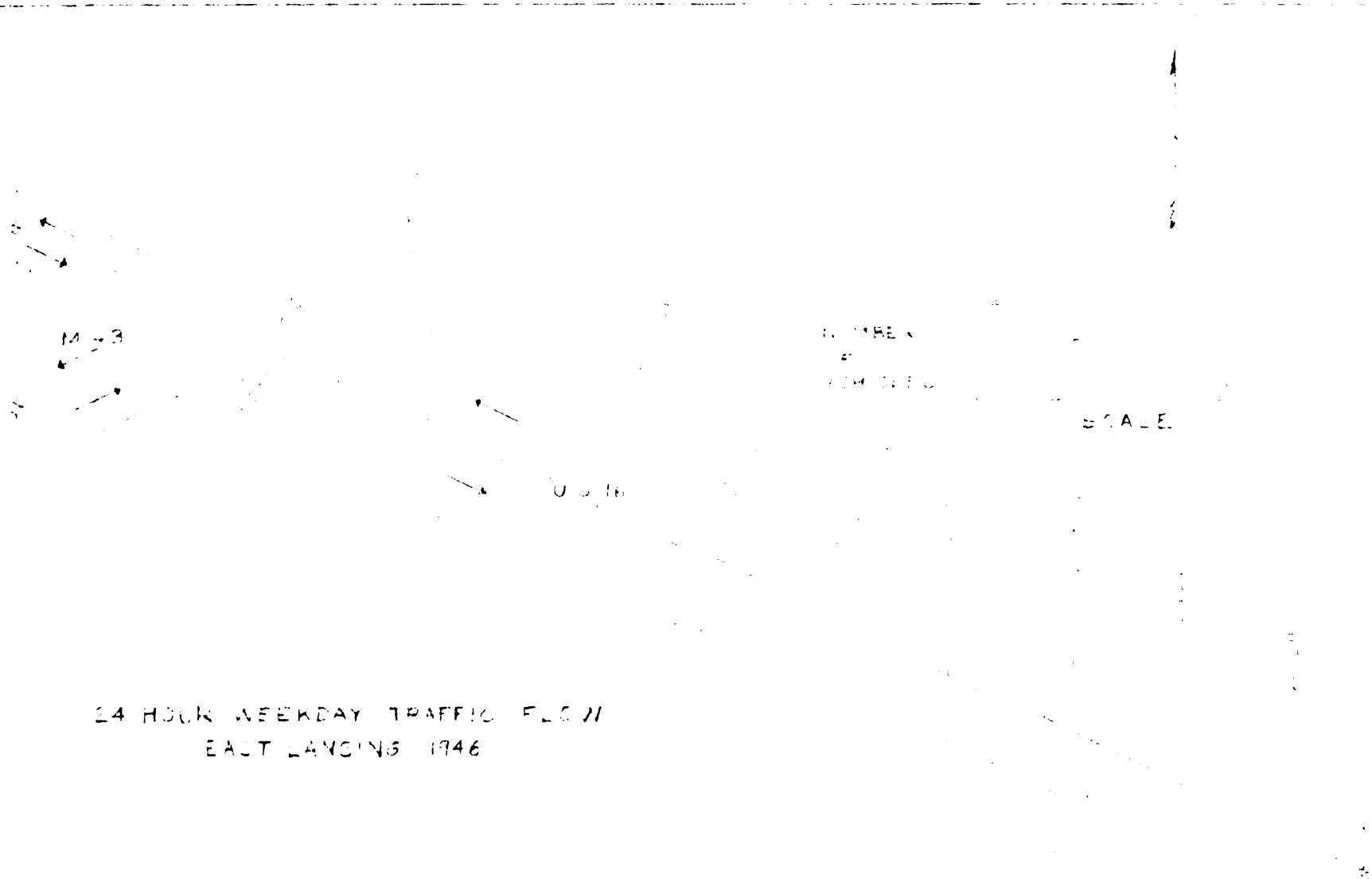
Originally, the fact that U. S. 16 (Grand River Avenue) passed through the center of the city, in addition to a limited local traffic, was all that needed to be provided for. However, the city and its environs have undergone, and are still undergoing, an abnormally rapid increase in population which, naturally, means an increase in both vehicular and pedestrian traffic. This increase brings with it a most undesirable traffic situation and it emphasizes the failures which the present highway system represents.

East Lansing, therefore, finds itself in the position of most American cities, namely, an overcrowded condition due to the inadequacies of facilities which in turn are due to a most regrettable lack of foresight on the part of the city planners in the past. The tremendous postwar boom brought the situation to a head much sooner than expected but this was merely an acceleration of normal growth and no significant recession is expected. A problem does exist at the present and, to all indications, will continue to get worse.

During much of the day in general there is a very bad traffic snarl in the business district further complicated by a woeful lack of parking space and hordes of impatient pedestrians.

The population of East Lansing is just under 6,000 and Michigan State College contributed approximately 16,000 students and faculty. The skyrocketing attendance at the college is still soaring and, it is generally believed, has not reached its postwar peak yet. In addition the formerly vacant areas just outside of the city limits have become residential districts and their population may, for our purposes, be included with that of the city proper. These population requirements plus the through traffic on U. S. 16 present a formidable problem indeed.

In general, the proposed solution is not designed to favor either vehicles or pedestrians but to provide the greatest margin of safety, convenience, and efficiency for all concerned with special emphasis on future needs. The proposed plan, I believe, is thoroughly practical and applicable and represents a common sense solution to this city's traffic problem.



24 HOUR WEEKDAY TRAFFIC FLOW
EAST LANSING 1946

FIG 2

## CHAPTER II

A clear and comprehensive picture of the present traffic flow may be obtained by referring to figure 2. This carefully constructed flow diagram represents the 24 hour volume of traffic in the city during an ordinary week day. I wish to thank the Michigan State Highway Department for permission to reproduce the diagram in this thesis.

This chart gives visible proof of the large volume of vehicles which may be expected during an ordinary day. At present, not included in the flow diagram, there is a considerable amount of detoured traffic from a highway in the vicinity undergoing repairs. This traffic is not permanent, to be sure, but it does give a preview of what conditions will be like when the normal volume reaches this total through the medium of anticipated future growth.

The figures show that approximately 40% of the traffic which enters the city also leaves, this will be referred to as through traffic and the remainder will be called local traffic.

The requirements of through traffic are simple and may be summed up by the phrase "swift, uninterrupted passage." Unfortunately, even such simple needs cannot normally be realized at the present time.

Parking facilities are the most urgent need of local traffic. Parking is too important a part of merchandising and of the convenience and pleasure of shopping and recreation

to be left to chance. Present facilities are limited to parallel parking along the outside lanes on both sides of Grand River Avenue and similar parking along adjacent and intersecting side streets. It is a well-known fact that parallel parking is the most uneconomical means of using available space besides presenting a dangerous situation to crossing pedestrians. The American Automobile Association states that 45.9% of pedestrians were struck stepping from a spot where the motorist's view was obstructed by a parked car. In addition, it is very difficult for inexperienced drivers to park their vehicles within a reasonable length of time; all of which leads to delays, obstructions, and worn nerves. Even the elimination of cruising cars looking for a space would be a great step forward. Drivers of such cars are notoriously slow, which impedes traffic, and their preoccupied nature is a defiant menace to motorist and pedestrians alike.

Aside from consideration of the problem from the motorist's viewpoint it must be remembered that all motorists at some time become pedestrians, besides those people who are always on foot. The authorities of the college recently enacted a measure prohibiting motor vehicles to be operated by students. This, of course, was done to alleviate the strain on their campus parking facilities. I must envy the simplicity of such a solution, if only it were universally adaptable! However, it also serves to throw an additional burden on those attempting to provide safety for the pedestrian and an additional increase of responsibility on the

city. It can readily be seen, then, that pedestrians traffic is so intense as to warrant more than superficial attention.

Existing conditions may therefore be described simply as a great overcrowding of present facilities.

Many other cities, as stated previously, are in the same predicament as East Lansing, however, their problem usually resolves itself into how to provide nearly exclusive routes for the largest contributors to traffic and how to keep them away from the business sections. It is fortunate in one respect and unfortunate in an other that such is not the case in East Lansing.

There is not a manufacturing concern worthy of note, much less worthy of particular attention, within the city limits. It is fortunate that this is true considering present road capacity but unfortunate in the respect that traffic is more difficult to account for and also more difficult to dispose of. We must therefore assume that every house is a source and destination and plan according. This must be borne in mind and tends to complicate the design of an adequate system.

The city of Lansing, however, is host of many manufacturing establishments whose shipments by motor freight use this route and constitute a factor to be reckoned with. The business of State Government is also a provider of considerable traffic both for pleasure and necessity. These, in addition to tourists and those who live beyond East Lansing and drive through each day, make up the bulk of the normal through traffic.

New subdivisions are being developed east of this city and it may be assumed that a goodly portion of Lansing's

increase in population will reside there. Motor freight is being used more and more each year as it becomes more efficient and less expensive so an increase in the volume of trucks may reasonably be expected for the future. We then see that, with the exception of State Government, each factor contributing to through traffic has increased and will continue to do so. This development is precisely what has happened in the past to add to the causes that precipitated this condition today.

In the past years, East Lansing has come to provide a residential district for Lansing business men besides providing homes for the faculty of the college. In such a community one would expect to find a high car per capita ratio and this is precisely the case. The greater staff of faculty members also increases the number of cars coming from the college. There is no necessity for differentiating between college and city traffic, for my purposes, so in the future I shall refer to them as a whole.

The present system of traffic manipulation is also a chief cause of trouble. It has previously been pointed out how the parking system contributes to the general confusion and the same thing is true of the remainder of the present plan. Despite its wide right of way (nearly 100 feet) it is simply not designed to handle the volume of traffic it does.

The stop and go type of intersections were quite adequate for the horse and buggy days but the need for a new system is well illustrated in this case. No doubt, when

the present road was built the incorporation of islands in the plan was thought to be the last word in beauty and efficiency. However, when they are used in their present capacity they are of little or no value in increasing efficiency, rather they tend to increase confusion by not confining cars to special lanes.

Unfortunately this old system will be very difficult to dispose of because it is so firmly ingrained in the mind but for those who have the faculty for vision without prejudice the inadequacies of the old system are not hard to point out and the superiority of the new system will be easy to see. Notice the development of the automobile. In a relatively short space of time it has changed from a thing of inefficiency and ridiculous appearance to a machine of beauty, comfort, and phenomenal preformance. These improvements certainly are not ended although nobody can accurately predict what a car will look like ten years from now. In contrast, let us look at the development of road systems; it is amazing how something can remain so unchanged through the years. The fact remains; there has been no corresponding increase in efficiency in roadways to match the development of the automobile.

Let us incorporate the vitues of the superhighway as much as possible into the control of city traffic and this will be the first step forward.

## CHAPTER IV

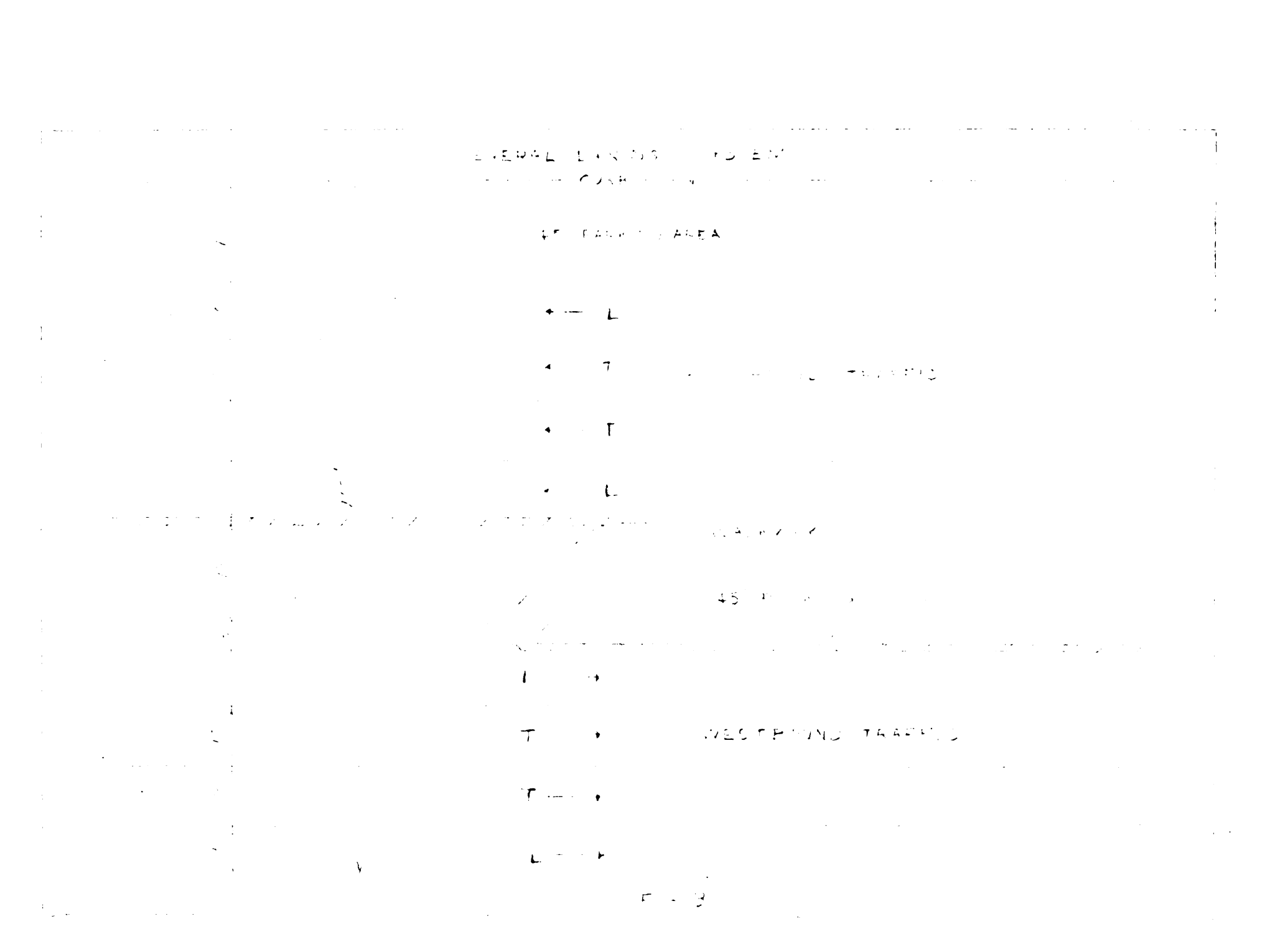
In the previous chapters I have discussed the problem, its causes, and the necessity for a solution. In this chapter I will offer a solution in accordance with the needs I have previously expressed. This is not the only solution nor perhaps the best but it does present an answer to the problem while attempting to please everybody concerned.

The problem resolves itself into three separate phases, two distinct and one perhaps not so evident. The first is to design the road for the benefit, safety, and convenience of the motorist. This will undoubtedly prove to be the most expensive and it displays the most radical features.

As explained before, the motorists will be divided into two classes, the through and local traffic, each with very different requirements.

Through traffic is often disposed of by means of a special route by-passing the center of town. This procedure is inadvisable in this case for the following reasons. The total length of the portion of road under consideration and the fact that the present site is the shortest route do not warrant the construction of a by-pass. In addition the businessmen and merchants always feel that they are losing revenue when that is done.

These factors coupled with the tremendous cost of such an undertaking led me to design a system whereby both local and through traffic would be incorporated on the same plan. In such a case, however, the demands of



safety require complete separation but this is the ideal and unfortunately cannot be accomplished under existing conditions. The next best thing is to supply two lanes going each way for through traffic with the understanding that precautions be taken to keep them reasonably clear and unobstructed. The problem of keeping the lanes clear will be taken up later. Figure 3 represents the general laning technique which will be used in this plan, the L refers to local lanes and the T denotes through lanes.

It is necessary to provide two lanes for through traffic even though it constitutes only 40% of the total volume, because the road must be clear enough for a car to make an oblique crossing from one local lane to the other within a reasonable distance. Under these circumstances volume should be about the same in both local and through lanes.

Parking facilities will be increased by employing present parking space more economically and by constructing bays in the islands. A large portion of the south side of Grand River will contain bays for 45 degree parking following the general scheme illustrated in figure 3. Forty-five degree parking is used because it is the happy medium between accessibility and economy and has proved to be the most successful type in modern cities.

It would indeed be far better to have parking space away from the street altogether but once again the ideal must be sacrificed for the practical. The lack of suitable planning in the past is responsible for this necessity, of

course, but the city is fortunate in the fact that the south side is not built up, except in a few cases of college buildings fairly close to the pavement but not close enough to interfere.

It would appear to be a drawback for motorists who have parked their cars to be forced to cross the street in order to shop, but why should motorists be better off than pedestrians in this respect. Walkways are provided so that they may safely walk to a point recommended for pedestrian crossing.

Another feature which must be included in any design for convenience is the temporary stopping zone which need only be constructed on the north side, once again because of the unusual layout of the city. This lane is to be used only for the loading and unloading of trucks and for quick stops to pick up pedestrians. It must be emphasized that this lane is proveded for the convenience of commercial vehicles particularly and must not be used for parking under any circumstances. The city is also equipped with numerous alleys behind the business establishments which, if properly supervised, may serve the same purpose.

It will be noted that the proposed system is not incongruous with the present layout although it will be necessary to reduce the island width by nine feet and widening strips must be taken from each side. Several combinations are possible and the most economical one must be chosen.

A detailed analysis of the two worst intersections in the city will now be presented and I shall attempt to point out how the system works and why it will be advantageous.

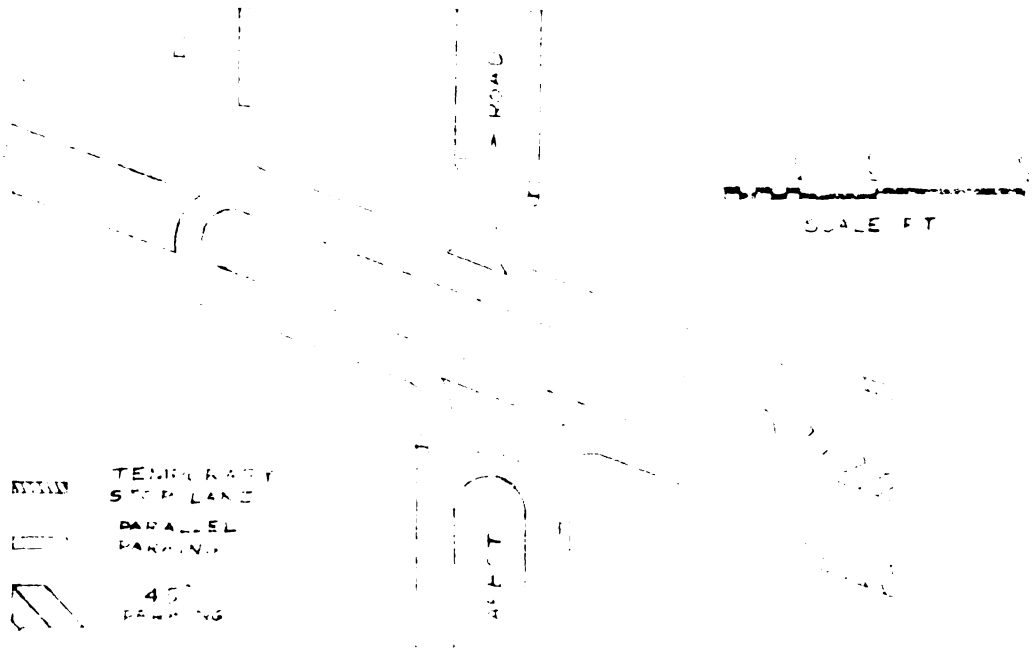

ROAD
SCALE FT
TEMPORARY
STOP LANE
PARALLEL
PARKING
45°
PARKING
EXIT

FIG. 4

FIG. 5

A detailed drawing of the island and its approaches at the intersection of Grand River and Abbot Toad is shown in figure 4. This oblong type of island is the correct way of handling traffic which favors vehicles along one of the streets, as is indicated in this case. It will be noted that the island at this point is of greater width than any of those to the east. This is so for several reasons. The ten foot turning radius employed on the other islands cannot be considered ideal because many vehicles require more room and only two can be out of the moving lanes at one time. A twenty foot radius, however, will accommodate any size vehicle and will shelter four from the moving lanes. It is therefore desirable to have the larger radius at much traveled intersections.

By enlarging the island the two inside lanes are eliminated, this, coupled with the fact that the small triangular islands on Abbot Road occupy the two outside lanes, limits the roadway to twenty feet or enough for two cars. This is necessary in view of the rule that cars approaching from the side street should not have to cross any more lanes of traffic moving in one way than the total number of lanes discharging on to the main thoroughfare from the side street.

The length of the island is also well over the minimum distance required for successful completion of the oblique crossing. As a matter of general interest the rule of thumb governing this will also be stated here. Roughly, the distance between centers of turning radii on the side street and the center island should not be

less than three times the width of street that must be crossed, which is twenty feet at this point. A larger distance was used here to compensate for the inexperience of drivers in accomplishing this sort of turn.

The shape of both the large and the triangular islands illustrates the attempt to automatically control the direction of the car. This, it is hoped, will guide motorists into doing things correctly and will eliminate, insofar as humanly possible, committing such blunders as turning in the wrong direction and finding himself facing traffic. It is doubtful if motorists can be totally restrained from executing such maneuvers as this but they can be made very difficult to accomplish.

Constricting flow at intersections not only automatically forces cars into the desired lanes but it provides a brake for the inevitable speeders, eliminates lagging local lanes at a crucial time, and provides a different set of circumstances which tends to alert drivers. The value of this type of intersection to the pedestrian will be described later in the chapter.

Figure 5 graphically illustrates how the oblique crossing is accomplished. The white cars represent the thoroughfare traffic while the black ones are crossing on Abbot Road. If a driver fails to make his turn at the proper place he will have an other opportunity a short distance away and will merely sacrifice a small amount of time for his lack of driving ability.

Exact dimensions are purposely avoided in this

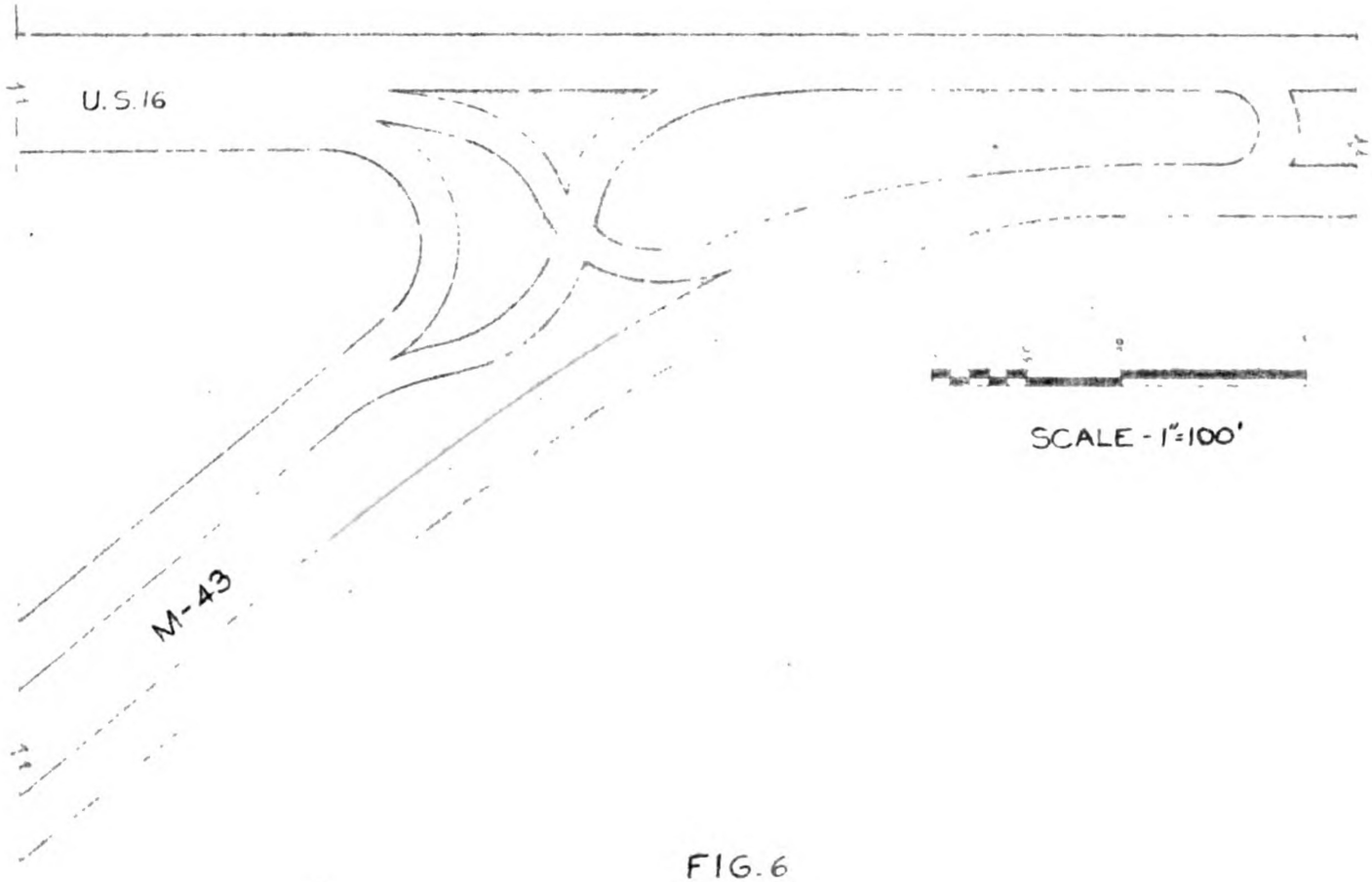



FIG. 6

analysis to eliminate a great deal of superfluous detail and in order that the main principles and issues remain clear. However, basic minimum dimensions which can not be violated will be given for completeness, as I have done in the past. Turning roadways should have a minimum width of twelve feet for one lane, of twenty-two feet for two lanes and an outside curve based on a radius of at least thirty feet.

By favoring this intersection with a special island system I am deliberately attempting to force more traffic to use Abbot Road, thereby relieving the more inadequate streets of much of the present traffic. In this way control need be established only on Grand River and Abbot Road but actually these two will, in effect, control the whole city.

The only other intersection which need be given special attention is the joining of U. S. 16 and M-43. An enlargement may be seen by referring to figure 6 and the importance of control here may be seen by once again referring to the flow diagram. On the basis of these figures preference must be given to cars on one street, in this case traffic bearing left going toward Lansing. It might be said that the only control present at this intersection now is one stop sign which, needless to say, is ridiculously inadequate. A relatively sharp turn is used to enter the merging traffic lane to effect a braking device on vehicles and to prevent "road hog" tactics. It is also seen that a proper place is provided for making all conceivable turns without the danger of encountering somebody coming the other way.

The flow principle is the same as that described earlier, oblique crossing and merging traffic, it is merely present under different circumstances. The same minimum design requirements are used and all the principles still hold, they are merely applied to a different shape. This illustrates one of the primary advantages of this system, its adaptability under such varied circumstances.

It is fortunate from the standpoint of this thesis that East Lansing presents so many different problems. It does indeed put this plan to the acid test and gives ample opportunity to demonstrate its versatility.

The second phase which I shall now take into consideration concerns protection of the pedestrian.

The Abbot Road crossing will, no doubt, have the greatest volume of pedestrian traffic. In spite of this, however, I will provide no specific protection because the construction for vehicular control, as previously set forth, allows a considerable margin of pedestrian safety. It is quite true that detours are in order to cross safely but the benefits far outnumber the inconveniences. By referring to the legend in figure 7 the reader may see the approved crossing routes. Note that in the process of "island hopping" it will not be necessary to cross more than two lanes of moving traffic at one time and at no time will it be necessary to watch for cars from two directions. The proper place to cross should be prominently designated and replacement of the curbs with ramps at these places will insure the rapid passage of baby carriages and the like.

At M.A.C., however, the situation is more complicated and many dangers confront a pedestrian attempting to cross on the surface. It need not be said that the only way of absolutely insuring safe passage for a pedestrian would be to have some plan whereby all contact between persons and cars is avoided. I, therefore, advise the construction of an underpass at this point, with entrances and exits on each side of M.A.C., on the island, and on the south side of Grand River.

Underpasses at intersections to the east of M.A.C. may or may not be necessary. Economically speaking, no additional underpasses should be constructed until it is evident that there exists a real need. At frequent intervals places of clear view should be provided, however, to accommodate the occasional pedestrian.

These provisions, including recommended bus stop sites, were omitted from previous drawings for clarity but their locations may be seen on figure 7.

Structural details of the underpasses will not be undertaken here but general requirements will be described. If at all possible, underpasses should be enterable by ramps rather than stairways but special attention should be given to keeping the ramps free from ice during the winter. Emphasis must be placed on a well-lighted interior, waterproof construction, ventilation, spaciousness, and accessability. To make the underpass unpleasant to use, for one reason or another, would defeat its purpose, so care in design and construction is essential.

An interesting fact which should encourage the use

of pedestrian-vehicle separation is that 95% of the pedestrian fatalities were people unlicensed to drive. It is evident that non-drivers do not realize the limitations of automobiles. Would it not be better in that case to eliminate all contact entirely?

Figures also show that 75% of all pedestrian accidents occur between the hours of 5 and 12 P.M., the periods of dusk and dark. This indicates a grave necessity for adequate street lighting at night, something which is non-existant in East Lansing at the present time. This does not mean that huge glaring lights should be dangling all over, there are many systems of lighting which are pleasant, efficient, and contribute to beauty as well as safety.

There are several more items I would like to mention at this time pertaining to the proper application of this plan.

A lane marking device of a type easily seen and difficult to unconsciously violate should be employed. Possibly a slightly elevated row of reflectors or well protected lights could be used. If painted markings cannot be avoided, however, they should be very wide, very bright, and very conspicuous. It is equally important that they are seen as easily at night as in the day. Special consideration must once again be given to the formation of ice or snow which will obliterate markings. Perhaps the best solution would be rapid and effective removal. The slight elevations previously proposed should not create a skidding hazard under these conditions because the in-

creased height will not be that noticable and if lights are used they will probably create enough heat to prevent ice from forming.

The temporary stopping and parking areas should be conspicuously designated and elevated, by means of a slight grade, to about three or four inches above the adjacent lane. This will discourage drivers from entering too fast and also prevent weaving in and out of the bays.

Special direction signals will be necessary to guide cars into the correct places because of the novelty of a system such as this. Illuminated arrows and large print signs with the emphasis on quick and easy readability should be used. A long winded message on a direction sign is of negative value because it detracts attention from the road and says nothing. Terse, clear, understandable directions are the rule, printed on signs suspended from overhead.

The Los Angeles Regional Planning Commission conducted tests to determine the speed at which the greatest number of cars would pass a given point, taking into consideration that the interval between cars increases as speed increases. Their results show that a speed of 23.5 M.P.H. at an interval of 33 feet produced the best results. On the basis of their findings I will require a speed limit of 25 M.P.H. with rigid control exercised.

This, I think, takes care of the larger elements of design and control, the rest of that which is necessary for successful operation of this plan is up to the indiv-

idual driver and pedestrian, which brings me to the third and final phase of the discussion.

A motorist or pedestrian need only go to the nearest busy corner to see why I consider a reeducation necessary for the people before they participate in this plan. In my opinion, the lack of courtesy, insistance upon right of way, and general selfish attitude of driver is mainly attributable to the evils of the stop and go system. As long as a person is in a car he is dependent on a traffic light, who wouldn't develop a limited vision when it is necessary to keep his eyes glued to a certain spot, under penalty of the law. The motorist will have to develop a more relaxed position at the wheel, constantly relating himself to surrounding vehicles, and making a note of the requirements of his fellow drivers.

Be developing the drivers sense of sportsmanship, fair play, and regard for the natural laws of traffic he shall be taught to show consideration for pedestrians and fellow motorists. The "fear of penalty" device which is now used to control people is an insufficient means to get cooperation. An intelligent appeal to the experimental nature of humans should be made. Give the person the feeling of being a part of a vast noble experiment but, by all means, do not antagonize him with threats and warnings or he will instinctively balk. Some propaganda in the newspapers, distribution of pamphlets and general ballyhoo will give rise to an expectant, eager attitude which together with the manual means of control already explained, should make the whole thing successful.

Traffic schools should be organized for incapable drivers under the police departments helpful guidance and not bullying tactics. One day a week should be set aside for the police to apprehend wrong-doing pedestrians and explain quietly and sensibly why they are doing wrong and why it is dangerous. A plan such as this was initiated in South Carolina and pedestrian accidents were reduced 85% in the first month. Let is be the goal of every policeman to be known and welcomed to everybody and peoples cooperation will then be obtained through the spirit of service to a friend rather than punishment by a bully.

This concludes the presentation of this three phase plan for improvement, the next chapter will be devoted to a brief recapitulation.

## CHAPTER V

In conclusion I will briefly enumerate the features and expected improvements of the plan.

Through traffic is provided with rapid, effortless, unobstructed transit through the city while shopping traffic has protection and better parking facilities. It might be stated at this point that, at the time this is being written, parking meters for parallel parking are being installed and two more traffic lights are being considered for the city. This shows the firm entrenchment of the present system of traffic control and rather than improve the situation it will eventually further substantiate the necessity for something radically different. A change could be accomplished easily now but as the city sinks further and further into the depths of convention and the inadequacies become more and more apparent, the transition will become more difficult. I expect that this plan, if installed now, would increase traffic efficiency by 200% and would increase available parking space by at least 100%.

In addition, accidents should be reduced at least 90%, keeping in mind that the future will hold a great many more hazards as conjestion gets worse.

It goes without saying that the use of this plan in East Lansing alone would not correct the nations traffic ills but it would be a beginning, and the full effect would not be felt until it is a part of a complete network. This type of system has found many friends and

wide uses in the eastern part of the country and has proven very successful, it is not, therefore, unknown and untried.

The larger cities such as New York feel the need of better traffic control more and more as the pinch of traffic gets worse. Cities in the Mid-West are growing rapidly and they too will find revisions necessary in the near future. East Lansing may have the distinction of being the first city in this section of the country to be truly "The Community for the Motor Age."

# GRAND RIVER AVENUE
# EAST LANSING, MICHIGAN

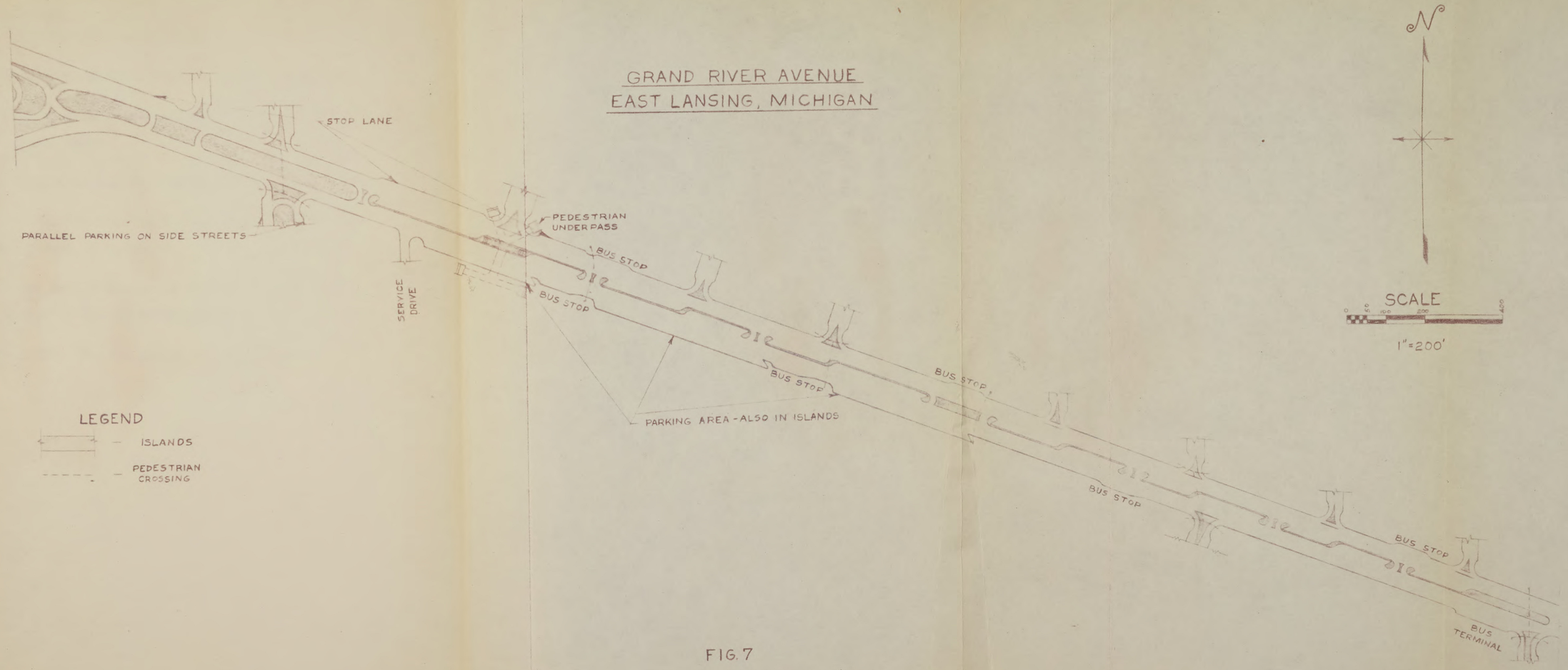



FIG. 7

# BIBLIOGRAPHY


Pedestrian Protection - American Automobile Association

Story of Highway Traffic Control - William P. Eno

A Comprehensive City Plan for Flint Michigan - Flint City Planning Board

Traffic Accidents and Conjestion - Maxwell N. Halsey

Manual on Uniform Traffic Control Devices - Minnesota Department of Highways

Islands and Medial Strips in Traffic Control - Oregon University Bureau of Municipal Research and Service

The Steadyflow Traffic System - Fritz Malcher

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