In addition to working toward consistency of regulation, the transportation industry should strive, in every way that it can, to insure that permit applications are reviewed by competent personnel. This probably will be reasonably assured when dealing with the States and large metropolitan agencies. There is, however, a possibility that in the smaller units of government the review may be by non-professionals. Here, the problem exists of their not being aware of the consequences of arbitrary decisions. Nor may they have the background necessary for reasonable judgements. What, if any, the appeal process would be remains to be seen. But if an appeal is necessary, it will involve further project delay. This could be particularly significant in the field of industrial site location where the manufacturer to be served by the railroad must get his plant under construction on schedule if it is to be a profitable enterprise.

In summation, as for the impact of flood plain regulation on the railroads, it becomes apparent that these regulations will require longer range planning in order to obtain the necessary permits for construction within a flood plain, and they may result in higher first costs. There will, of course, be compensating benefits; primarily the development of relatively flood-proof construction and the not insignificant benefit of management of the entire flood plain. This may preclude upstream construction by others of large building projects, parking lots or similar features, which, in the past, have caused the railroads serious problems because of resulting increased rates of runoff.

I do not feel that the railroads need to be afraid of flood plain regulation, as it has always been to our advantage to carefully design and construct our facilities in a manner that will minimize the risk of consequent flood damage. This has been done because the railroads have recognized that they are in business to stay and that they must live with whatever they build. Nevertheless, the probability remains that flood plain regulation will increase the time required for the planning of a project and possibly will unnecessarily increase the cost of that project. This will be up to the judgement of the reviewing agency and hence not in the hands of the owner.

IMPACT OF FLOOD INSURANCE PROGRAM ON HIGHWAY TRANSPORTATION Samuel V. Fox, Hydraulic Engineer, Texas Highway Department

Flood plain management and flood plain insurance has had an impact on the transportation community. I can't deny that, but it is not something that started just recently either. It dates back to Executive Order 11296 that the President of the United States, then President Johnson, issued dealing with Federally financed programs in flood plain areas or hazardous areas. This began the move toward individual Federal agency concern, the development of more agency regulations, and more agency involvement in flood plains. Of course, we unlike the railroads, have the Federal Highway Administration, then the Bureau of Public Roads, to take care of us and out of their infinite wisdom, in 1967, they jumped in early and developed certain interpretations from the Executive Order. At first some State highway engineers felt more strain from Federal regulation; however, when the smoke cleared, we found out that we were not really as far apart as we first thought and that we in the transportation field, in many areas of the country, were already being guided by a very sincere concern about our involvement in the flood plain. But in the absence of centrally concerted efforts with respect to building in flood plains we mostly had to steer our own course. This meant the development of design standards on a State to State, county to county, and city to city basis, to reflect various levels of moral, ethical and legal concern with an eye on staying within certain budgetary constraints.

Because of Executive Order 11296 other agencies began to be more involved. Flood plain insurance came upon the scene in 1968, the Corps of Engineers developed their Flood Plain Information Reports, concerns for the 100 year flood event surfaced, and contracts were negotiated for studies by consulting engineers, and so it went.

The Federal Flood Insurance Program has had a subtle impact on the transportation community. Witness the fact it was enacted in 1968 and this is the first serious meeting to discuss its relation to transportation. With its associated criteria there are evolving local ordinances and State ordinances that have or will have a tremendous impact on highway transportation, city transportation facilities, and county transportation facilities. But I think that even though this TRB session is aimed at discussing impact from the Flood Plain Insurance Program, if we are really going to understand the total picture and involve ourselves in the total concept we in the transportation community are going to have to think of ourselves as being involved in the total flood

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plain management concept. This means believing that rivers and streams are vital parts of our total environment and are worthy of being treated as such because of their effect on people. This is a lofty goal, but there is no doubt that flood plain involvement is going to be more of a cooperative effort than before. We will not be working alone as an agency or firm as many of us have in the past. We are going to become involved with people who call themselves flood plain managers and who are interested in managing the flood plains. But, who are the managers? Cities, counties, States, flood control districts, Federal agencies, who will have the last say? And with this I think comes the need for the setting of reasonable criteria because this is where the greatest stress and impact is being realized.

It's difficult now to determine the governing criteria for which we'll judge our highway encroachments on the flood plain being managed by others. Standards vary. These standards for the most part depend on the interpretation of individual State and Federal agency regulations by city and county officials as to what should be done to implement good flood plain management. And I don't know whether the individual agencies realize this or not but from my standpoint, looking out to see where the guidance might come from, we can see considerable duplication and considerable conflict. Because there seems to be no where to go to determine exactly what criteria we should use. We heard speakers a moment ago talk about the one foot of backwater upstream of a bridge. This is the Federal Insurance part of it, but there are States that do not allow any backwater, six inches backwater, or no backwater? Which structures constitute involvement in a flood plain? A twelve inch drain or a crossing of the Mississippi. We spend millions and millions in flood plains every single year and it is important that we pin down criteria that are reasonable if we want to participate in good flood plain management. To what normal water surface do we add the backwater effect that's caused by the structure that we're investigating. Is it the normal water surface of the 100 year flood that would occur with today's 100 year event, or is it the water surface of a future flood for which development and change in the watershed has been considered. The criteria accepted by one Federal agency is not necessarily that which is acceptable to another not to mention the ideas of various State, county, city agencies and entities that we must deal with. So the design and analysis of highway facilities is definitely affected by the lack of uniform and reasonable criteria for managing the flood plains for those of us that are continually involved with them on a day-to-day basis. Which methods of analysis do we use? There is impact on highways felt by the experienced highway engineers in the determination of which method is to be used or which tool will be acceptable. Who will pass on our designs? Will the reviewers accept the same design techniques that we have accepted over the years or is some clerk reviewing our hydraulic engineering plans going to try to pull something on us that fits his own whims and fancies? And what kind of background or backing do we have to keep ourselves out of trouble? How is the 100 year discharge determined? Ed, I'm sorry we don't have gauges on every stream in the State of Texas, and I am sure you are too. The curves that you were showing here this morning were most interesting but they do not apply in every case throughout the entire U.S. What's the best method for determining backwater at a bridge? We've only begun to fight you see, because there are several methods of determining backwater. Who's method is acceptable and which one should we use? Which is the most correct?

There is a great need for better methods of risk evaluation. What happens when methods do not agree and this seems to be the usual case. What are the legal aspects of flood plain management? We're uncertain right now. For instance, what if any right we might have as a long term entity. By that, I mean are drainage patterns established due to the long term existence of a highway or railroad? Let's say we have decided to increase the capacity of an existing two lane highway by simply adding additional parallel lanes, or by widening the structure that is presently there. The existing facility, we'll say, has been there for forty years, a frequent occurrence, but certainly was not originally designed to accommodate the so called 100 year flood within the criteria and standards in effect today. Yet, this bridge and the highway facility have served well over a range of floods; they are structually sound and adequate for many, many more years to come. Has the old structure been there long enough so that its effect on the flood profile of the stream is acceptable, in that the associated drainage patterns or flood behavioral patterns have been sufficiently re-established over 40 years that they are now considered natural? Do we tear the old structure out and build a brand new bridge, thereby losing our existing investment and more than doubling our construction cost at that location?

Now these are just questions that I raise in order to increase the awareness. There has been an impact. It's one I think that can result for good. Most of what I mentioned admittedly have been "rocks in the road" to our total flood plain management. Right now we're banging over some of these rocks and going around others as if they didn't exist. We need to begin to involve ourselves and study the regulations and history of flood plain management so that we can understand flood plain management within its proper context. And that's where I think some of us are getting into trouble. We think this is another Federal regulation and it is, but, it should lead to something better for people whose lives are affected by what happens in this country's flood plains. We must begin to want to work with all possible entities, cities, counties, flood control districts, State and Federal agencies, whatever, to let them know what criteria we believe are fair and reasonable. After all, we do have some expertise in the transportation community, since we've been involved in flood plains for several decades now, and also have a contribution to make to mankind through continued development of usable transportation facilities.

Many mistakes have been made but we've learned a few things. Besides, we spend many millions of dollars there so we have a right not to just criticize what's being done, but to tell people through diplomatic disagreement, if you will, and with facts, what it is that we think is reasonable and just. We must support research to develop better tools and information. Both hydrologic and hydraulic methodology is important.

Much of the impact which involves criteria and methodology that is being expericnced by highway engineers today can be resolved through the interdisciplinary actions of concerned entities and individuals, who, when considering the seriousness of the impact on transportation, will help develop uniform criteria and methodology while providing a service of keeping the transportation engineer well informed about rules, regulations, city ordinances, etc., so that he can perform his task in concert with those who strive for good flood plain management. I believe we are all playing the same game so I suggest that we get into the same ballpark.

FLOOD CONTROL IN ILLINOIS William C. Ackermann, Chief, Illinois State Water Survey

The State of Illinois has recently completed a two-year study of its flood problems and issued a report entitled "Flood Control in Illinois, a Statement of Program and Policy," dated May 1975. The significance attached to this study may be judged by the fact that it was carried out by The Governor's Task Force on Flood Control. The material which follows is adopted from that report.

Although the Illinois report cannot be assumed to represent the views of any other State, it may be indicative of the position in other States which have taken a recent, hard look at their flood experience and management system.

Illinois suffers flood damages in excess of \$100 million annually. We must invest our flood control dollars, both state and federal, in the most efficient program possible. Until now, we have not. For example:

1. Our state investment has been inadequate: in the nine years between 1964 and 1973 only \$11 million was spent on urban flood control projects, \$4 million less than our budgeting for FY 76 alone.

2. Our state dollar investment has been inefficient, without regard for the most severe problem areas and without analysis of cost-benefit ratios.

3. State projects have consisted primarily of piecemeal channelization which often causes environmental damage, increases flooding downstream and is only a temporary solution.

4. The U. S. Army Corps of Engineers has pursued its own flood control objectives without coordination with state priorities.

5. Urban flood control problems in Illinois have been ignored by the Corps - less than \$2 million a year is allocated for urban flood control projects.

6. No level of government has seriously attempted to discourage homes and businesses from being built on the flood plains.

7. Flood control planning procedures are so cumbersome that they cannot respond quickly to small, obvious problems.

8. Too many flood victims have heard from State Government in the past, "That's not our problem."

9. The State, too, in the past, has not been flexible or responsive enough to provide real help in emergency flooding situations.

10. The only major effect on agricultural flooding, the Soil Conservation Service's small watershed program (PL 566), has been paralyzed by lack of federal funds.

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