Freeway Impact on Agriculture Areas

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INTRODUCTION

Advances in highway transportation, especially during the past three decades, have resulted in the movement of more goods and people by motor vehicles than ever before. Motor transportation is now the most pervasive, and for many purposes the most economical, means of connectivity for a large part of the world. The recent and rapid increase in the use of motor vehicles has created a need for highways designed to carry large volumes of traffic safely and quickly. This has led to the development of limited-access highways. Because of their improved alignment, flatter grades, large-radius curves, limited access, planned interchanges, separated roadways, and other modern features, these superhighways permit uniform and reasonably high-speed travel with remarkable safety.

The modern freeway, with its new requirements for land, grade, entrances, and exits, has introduced a multitude of influences that affect human activities and land use in areas through which the freeway passes. The literature is replete with citations attesting to the benefits of limited-access highways to the general public. Largely ignored are the numerous conflicts and problems which result from freeway construction in rural areas. Little research has been done at any level in an attempt to identify and quantify these problems.

Furthermore, the impact of limited-access highways on agricul-

*The author wishes to thank Professor Richard M. Highsmith, Department of Geography, Oregon State University, who originally suggested this topic.

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1. Limited-access highways are defined for purposes of this study as highways to which owners of abutting property have no right or easement of access, or only limited or restricted access. The terms freeway and superhighway are used interchangeably with limited-access highways in this paper.

2. Two testimonial examples representing different approaches to the subject are to be found in C. TUNNARD & B. PUSHKAREV, MAN-MADE AMERICA: CHAOS OR CONTROL?, Part Three: The Paved Ribbon (1963), and Are Freeways Doing Their Job?, MOTORLAND 22-24 (Calif. State Automobile Assoc., Sept. 1967).

3. Most of the information presented in this study was gained from interviews, personal observations, and appraisal reports for freeway right-of-way, most of which were obtained from the district offices of the California Highway Department. In compliance with requests of highway departments, these reports, not readily available to the public, are referred to in general statements or excluded from the bibliography.
tural land is important because an estimated 80 percent of the 42,500 miles of national interstate freeway system runs or will run through rural land.\textsuperscript{4} The construction of modern, limited-access highways requires strips of land 250 to 300 feet wide. Interchanges that speed vehicles to and from the highway may occupy 40 acres of land and are generally two to seven miles apart in rural areas. Thus, the total freeway right-of-way consumes 30 to 45 acres of land per mile in rural areas.\textsuperscript{5} In addition, a disproportionately large amount of the land taken for freeway right-of-way is of excellent quality and intensively farmed. In California, for example, approximately half of the rural land required for freeways was used previously for intensive agriculture. Almost one-fourth of the land taken for rural freeways in California is classified in the highest quality category, “Grade 1.”\textsuperscript{6} This alienation of land for freeway right-of-way and for the associated urban developments that congregate along these corridors, especially around the interchanges, represents a sizable loss to the nation’s agricultural base.

Additional freeway impact on agricultural areas extends beyond the land actually converted to non-agricultural uses. Agricultural land that remains in production is often severed by freeway construction, and the proximity of a superhighway has other effects on the operation of a farm or ranch. It is the intention of this paper to bring to the attention of planners and policy makers in particular the extensive temporal and permanent disruption to a renewable resource that can be created by right-of-way taking in rural areas. Since many of the decisions made today, such as freeway location and magnitude, are not reversible, it is important that adequate consideration be given to possible future consequences.\textsuperscript{7}

\textsuperscript{4} S. GOLDSTEIN & F. THIEL, HIGHWAYS AND ECONOMIC AND SOCIAL CHANGES 123 (1964) (U.S. Department of Commerce, Economics and Requirements Division).
\textsuperscript{5} Studies undertaken by the author based upon regional samples indicate that approximately 36 acres per mile is the average quantity of land taken for freeway right-of-way. The right-of-way for four lanes is generally 31 acres per mile, for six lanes it is approximately 38 acres per mile, and eight lanes average about 44 acres per mile. Interchanges, over- and underpasses, drainage control-ways, cut and fill areas, roadside rests, maintenance areas, and access roads account for additional acreage per mile.
\textsuperscript{6} The proportion and quality of land taken for freeway right-of-way was calculated by mosaicing the California Division of Highways' map entitled "California Freeway and Expressway System" over the R. STORIE & W. WEIR, GENERALIZED SOIL MAP OF CALIFORNIA (1963) (U. Cal. Agricultural Extension Service, Manual 6).
\textsuperscript{7} An assessment of what is "adequate compensation" for land taken and damages caused by freeway construction is not considered here. Nor does this paper deal with problems associated with the disposal of compensation payments. However, problems do arise concerning the payment received for property taken for freeway right-of-way that are seldom realized by property owners until after transactions are completed. The payment
PARCELLING AND CONNECTIVITY OF AGRICULTURAL LAND

Right-of-way taking not only removes productive agricultural land from use and encourages additional alienation through urbanization, but it also cuts and divides farms in a variety of ways. The resulting condition affects the operation and overall plan of the farm. Often the entire organization and unity of a farm or ranch are upset, and hence, its efficiency and economy are reduced.

Most farms and ranches in the United States are established on a grid system. As a consequence, most primary and secondary roads follow boundary lines between properties. The emphasis upon connecting urban centers with the shortest route possible often results in freeways crossing property lines at various angles.

The alignment of a freeway right-of-way along other than a property line presumably disrupts fewer farm headquarters, reduces the number of buildings that must be moved or replaced, and results in less interference with established travel patterns. It may appear that construction of freeways on or adjacent to primary or secondary roads would require less farmland and fewer farm headquarters to be disrupted than if the highway were built on other than boundary lines, but when limited-access highways traverse properties in rural

received from the settlement must be reinvested by the property owner; otherwise, it is subject to the capital gains tax. Many rural areas are “land poor.” That is, property in farms, ranches, timber tracts, and developed recreation sites is generally of a size, arrangement, and organization to operate efficiently and economically. Most compensation payments are far below that needed to purchase an entire replacement farm, ranch, timber tract, etc. It becomes virtually impossible to buy part of another land unit since it is unrealistic, economically, for another property owner to reduce the size of his operating unit below that from which he can obtain a feasible income.

The capital gains tax provides a particularly difficult situation for older property owners who have arranged their unit of operation for convenience and ease of operation, and who have become too old to reinvest and initiate another project. Based on I.R.S. Publication 549, Condemnation of Private Property for Public Use (1979), after July 26, 1978, persons who are age 55 or older are eligible to exclude from capital gains up to $100,000 of the gain from the condemnation of their personal residence or from its disposition under threat or imminence of condemnation. However, the exclusion only applies to that portion of their property directly connected with their personal residence. Older citizens are not eligible to exclude a gain from the condemnation of property used for business unless they reinvest in similar or related in service property within two years. See I.R.C. §1033. It is not only the capital gains tax which causes problems of this nature, but also the loss of property. With less land, the total productivity of the property is reduced and so is the income. These situations may hasten or prolong the time before retirement and result in generally inefficient land use.

8. After 1787, more than two million square miles of public domain were divided into 36-square-mile townships and these, in turn, were subdivided into 36 sections of one square mile each. For additional information of the land divisions in the United States, see F. Marschner, Land Use and Its Patterns in the U.S., Agricultural Handbook No. 153 (1959) (U.S. Dept. of Agriculture) and N. Thrower, Original Survey and Land Subdivision: A Comparative Study of the Form and Effect of Contrasting Cadastral Surveys (1966) (Monograph No. 4, Assoc. of Am. Geographers).
areas on the diagonal or through their centers, service roads usually are not constructed.\textsuperscript{9} When a freeway is built on an existing road or street, service roads frequently are necessary to maintain access for abutting property owners to the system of public roads. Thus, the amount of land that must be acquired for limited-access highways constructed on primary or secondary roads may be as great as or greater than that required for highways built along other alignments.

The alignment of rights-of-way at almost any angle to section lines, however, usually results in more segmentation of farm and ranch units and creates greater problems in operating a farm or ranch efficiently. Also, when freeways are constructed on half-section lines, severance of property may result more than 75 percent of the time. When freeways follow section lines, severance may result on only one out of five farms or ranches.\textsuperscript{10}

Access to parcelled fields can vary from a negligible distance to six miles each way, depending upon the location of the underpasses in relation to the farm headquarters. The distance may be greater in areas of rough terrain or desert. An increase in access distance of approximately one mile each way is the average for severed properties in rural California. This increased access distance requires a considerable amount of additional time, money, and inconvenience to shuttle farm machinery, equipment, and livestock back and forth, to inspect crop and field conditions, and to perform various other tasks demanded of the farm operator. The economic advantages of sharing labor and utilizing jointly owned machinery often are hampered. The movement of machinery which is not mounted on rubber tires or machinery that is too large to go through an underpass generally creates the greatest problem of connectivity.

In California, a large portion of the farm machinery is metal track-laying equipment that cannot use paved crossings. When it is not feasible for the highway department to acquire parcelled fields, it has two alternatives: (1) hire someone to move the equipment, or (2) purchase a trailer and truck for the farmer to move the machinery to the severed fields. Costs determine which method will be employed.

Underpasses for livestock, machinery, and drainage have been constructed in some areas to provide access to severed fields. This arrangement has proven satisfactory in most instances, but several examples were found where poorly drained underpasses become use-


\textsuperscript{10} Data based upon a case study of California State Highway Route 126 Freeway, Wells Road Interchange to Foothill Road Interchange.
less during periods of rain or snow. The usefulness of underpasses is also restricted by the reluctance of livestock, especially cattle, to enter dark, tunnel-like structures under the wide roadbeds of freeways.\textsuperscript{11} Salt, feed, and water are used by some ranchers to lure livestock through underpasses. The placement of animals accustomed to going through underpasses is another method used by ranchers to condition their livestock to use the passageways. Some ranchers report that it is easier to truck their livestock than to coax them through an underpass.

Agriculture in the western United States is very dependent upon irrigation. In California, about two-thirds of the cropland is irrigated.\textsuperscript{12} As a result, freeways sever a number of irrigation systems. Irrigation systems that are severed by a right-of-way usually are burdened with additional service roads, boxes, and special operating procedures (Figs. 1 & 2). The result is an increase in routine operational costs. For example, in the before condition, if a ditch or box became clogged, the ditch-tender could walk or drive across the field to inspect and correct the problem. After a freeway has been constructed, access to parcelled fields is restricted to interchanges, underpasses, or overpasses, requiring additional time and travel costs. Also, open ditches are simple to maintain and easy to repair, whereas freeway construction often leaves the farmer with long concrete boxes and trash grates which require almost constant maintenance and have a tendency to fill with silt.\textsuperscript{13}

**THE IMPACT ON FIELDS**

In addition to causing the problems discussed above, freeways change the number, size and shape of fields and alter cropping and rotational practices. Right-of-way taking parcels and trims fields in a variety of ways (Figs. 1 & 2).

\textsuperscript{11} This problem was first brought to the author's attention by Dr. Richard F. Logan, Professor of Geography, University of California, Los Angeles. The same problem was also cited by Otto F. Krueger, former Area Manager, U.S. Department of Interior, Bureau of Land Management, Redding District Office, Redding, California.

\textsuperscript{12} B. BURLINGAME, E. THOR & H. SENEY, CALIFORNIA AGRICULTURE 1 (1967) (U. Cal., Agricultural Extension Service).

\textsuperscript{13} When a farm is severed by freeway right-of-way, California determines the final situation by the cost to the state analyzed on the basis of: (1) purchasing the parcelled area as excess land and reselling it to adjoining ownership or (2) paying cost-to-cure damages and/or incurable damages. The problems of severance and connectivity are aggravated by the federal government's opposition to recognition of permanent damages. In California, many of the highway districts do not recognize permanent damages resulting from severance while other districts accept it as a standard consideration. In areas where farming dominates both the economy and politics, damages are paid for severance.
The right-of-way taking for Interstate 5 in Fresno County will require considerable alteration to this irrigated farm. Map indicates severance to irrigation system before correction.
This Kern County farm illustrates the problems of triangle-shaped fields (shaded area) brought about by freeway construction. In addition to the land lost to right-of-way and field triangulation, a 12 foot unsurfaced farm service road is required on both sides of the freeway. Therefore, the land taken from production would be 8 to 12 acres per mile additional to the right-of-way taking.
Highway appraisal reports, citing information obtained from interviews with farm operators and agricultural advisors in California's Central Valley, indicate that row lengths of 1,320 feet are considered ideal, and that for row crop practices, regularly-shaped fields containing approximately 50 acres are of the minimum size acceptable for efficient operation. Large fields and long row lengths permit more efficient use of farm machinery, irrigation equipment, and labor. Increasing the row length beyond the normal 1,320 feet generally is not feasible. The increased area becomes too difficult to grade and prepare properly. In addition, evaporation increases and water flow cannot be controlled effectively.

Fields that are reduced in size or left in undesirable shapes by right-of-way taking are more expensive to operate. Some smaller farms may be reduced in size sufficiently to make them uneconomic units. The increased expense of farming small, irregularly shaped fields is, in part, the result of nonproductive time required for move-in costs and for turning equipment in small fields.

In the San Joaquin Valley of California, tractors are usually in the field about ten times each year for land preparation, seeding, cultivating, and harvesting. Land preparation is ordinarily done by track-laying equipment, and the other operations are usually accomplished by wheeled vehicles. If a field has, for example, 325-foot rows rather than 1,320-foot rows, the nonproductive time required for turning increases fourfold, because four times as many turns are necessary to work a given unit of ground. Therefore, when row lengths are shortened, nonproductive time and labor costs increase.

Additional operating costs are incurred with increased consumption of oil and gas and additional wear on tires, brakes, and equipment. When turn-around movements are increased, the most vulnerable parts of the equipment are taxed heavily. For example, when implements are lifted out of the ground, increased wear occurs to the hydraulic system, and when track-laying equipment is turned, wear on brake bands and spider gears increases. If tractors are in the field ten times a year, it is not difficult to imagine that the cost of field operations will be substantially increased.

Small fields also impair the efficiency of crop-spraying operations. Chemicals that are sprayed on trees and on other types of crops are wasted when spraying equipment is turned, because half of the spray falls on nonproductive land as row turns are made. Thus, the fewer turns necessary, the greater the efficiency and economy.

14. F. Smith, Appraisal Report, 15-Kern County, 4-5 (1964) (California Highway Department, District 6, Fresno, Cal.).
Inefficiency resulting from shortened rows is exemplified by the operation of a 5.6-acre pear orchard near Eureka, California.\textsuperscript{15} Before part of the orchard was taken for a freeway, the farmer was required to make 26 turns, or approximately 4.6 turns per acre, when using a tractor or other equipment. After the acquisition of 2.2 acres for freeway right-of-way, the farmer still made 26 turns but cultivated only 3.4 acres—an average of approximately 7.8 turns per acre. Unit costs for dusting, spraying, cultivating, and any other activity requiring the use of wheeled equipment increased accordingly. The increased operating cost resulting from shortened rows was appraised at approximately $53 per acre in 1964 (or a loss of $53 net income per acre).

In the Fresno area of California, a 360-acre triangle-shaped field was left after right-of-way taking.\textsuperscript{16} Row lengths varied from 1,320 feet to a negligible distance. The increased cost of operating the odd-shaped and smaller field was appraised at $50 per acre. Another appraiser in California’s Central Valley calculated the increased operational cost to farm odd-shaped fields by multiplying the land area having row lengths less than 1,320 feet by 25 percent.\textsuperscript{17} The 25 percent estimate is believed to be a reasonable measurement of reduction in net income based upon the appraiser’s interviews with farmers and county farm agents.

The cost of farming odd-shaped fields is difficult to determine. If an operator has the equipment, it is economically sound for him to use it to farm the land even if it is odd-shaped. To confuse the situation further, highway appraisal agents state that odd-shaped fields often sell for about the same price as rectangular, square, and circular fields.

A considerable loss of productive land can result if the freeway right-of-way crosses fields on the diagonal, because it is impossible for farm machinery to operate in the narrow confines of the tip of triangular fields (Fig. 2). Also, the tip of triangle-shaped land which is fenced can create problems with livestock. Farm animals tend to follow fences. In doing so, livestock (especially sheep and goats, which have an aversion to backing up) may become “trapped” in the wedge-shaped portion of the tip. This creates more demands on the rancher.

\textsuperscript{15} T. Hewitt, Supplemental Appraisal Report No. 1, Kelseyville Area, 9 (1964) (California Highway Department, District I, Eureka, Cal.).
\textsuperscript{16} F. Howell, Appraisal Report, Project Limits King County Line to Merced County Line, 621 (1964) (California Highway Department, District VI, Fresno, Cal.).
\textsuperscript{17} H. Hamm, Appraisal Report (1959) (California Highway Department, District VI, Fresno, Cal.).
Odd-shaped fields disrupt irrigation and canal facilities. When furrows are of different lengths, irrigation becomes more difficult and costly since proper water distribution often is impossible. Short rows require the irrigator to meter the flow of water to avoid washouts and overflows. When longer ditch lengths result, water requirements per unit area are increased due to greater evaporation. The porosity of the soil may also make proper water distribution impossible with long row lengths. Night irrigation becomes very difficult because the irrigator cannot see areas where a washout can occur. As a result, the only feasible method of irrigating odd-shaped fields is with sprinklers. Even though less water is used when irrigated land is taken for highway right-of-way, pumping costs often are increased on a per acre basis (i.e., the pumping costs remain the same, but serve fewer acres). Also, a certain amount of head is required to maintain water flow regardless of how many acres are irrigated.

Other expenses to rehabilitate irrigated land affected by right-of-way taking are costs to combine and regrade fields, relocate drainage facilities, and provide interior roads with ditch crossings. It is possible that the construction of a freeway may require the entire drainage system for irrigated fields to be redesigned to function properly with the freeway drainage system (Figs. 1 & 2). Also, problems of poor drainage may be encountered, especially during highway construction.

When a parcel of land is isolated from the original field by freeway right-of-way, its water supply may be lost. Electrical power for well pumps, buildings, and possible expansion of the operation may be lost in the same way. Private electrical and water lines cannot cross over or beneath freeways due to construction and safety requirements. As a result, it may be impractical or uneconomical to obtain water and electrical power on the isolated remainder parcel.

MISCELLANEOUS IMPACTS ON AGRICULTURE

The miscellaneous impacts of freeways on agricultural areas often are overlooked in the light of the more obvious influences such as reduction of farm land and farm unity. Yet these other influences, alone or in combination, can be very important in determining the efficiency and economy with which a farm or ranch may be operated. Miscellaneous problems attributable to freeway construction are summarized in the following paragraphs.

19. "Head" refers to the height of water above any point of reference (elevation or pressure head).
(1) Impairment of air drainage. When a freeway, with its elevated roadbed which provides all-weather use, crosses foothills parallel to mountain crests, frost damage can result on the upslope side due to the reduction of air drainage and consequent ponding of cold air.⁹ Canal banks and elevated railroad beds also create problems of impaired air drainage. As a result, certain fall vegetable crops adjacent to and on the uphill side of a freeway embankment are damaged by frost. Similarly, tree crops which are susceptible to spring frost experience damage with the ponding of cold air. When elevated freeways are constructed in river valleys, the ponding of air can affect an extensive area. For example, a 15-foot-high freeway roadbed constructed on a 15-degree slope perpendicular to the dip increases the ponding of air over an area of at least 7 acres per mile of highway.

Increased frost damage can be expensive for orchard operators; not only may valuable trees and their crops be lost, but the impairment of air drainage requires additional use of wind machines and/or orchard heaters. Initially, many trips will be required for the farmer to determine how cold it is in the “pond.” Eventually the operator will learn the temperature difference between his home place and the area dammed by the roadbed so that he knows when it is necessary to use his wind machine and/or orchard heaters.

(2) Impairment of surface and subsurface drainage. The problem of water drainage, like that of impaired air drainage, is worse generally when freeways cross foothill areas and disrupt the downslope movement of water. Ponding of water can sour soils, concentrate mineral salts, kill vegetation, flood buildings and shelters, and increase the incidence of hoof rot, associated fungi, and other diseases affecting livestock. The concentration of runoff water diverted away from the roadbed also causes drainage problems. Occasionally, an improved drainage system will result when a freeway is constructed, although during an exceptionally heavy rain, drainageways may become clogged with debris and rendered inoperative, resulting in a worse condition than before.

Where salt is used on road surfaces to prevent motor vehicles from slipping on ice or snow, melt waters containing salt can drain into irrigation water and be applied to crops, thus reducing productivity and shortening the life of distribution equipment. The California Highway Department reports that they rarely use any material other than sand to reduce slippage.

(3) Reduced effectiveness of windbreaks. Freeways can function

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⁹ “Ponding” refers to the settling or collecting of cold, denser air in topographical depressions.
as manmade wind gaps and disrupt the original purpose of windbreaks to check the flow of air. This is important particularly in the coastal valleys of California, where a problem of diurnal land and sea breezes exists. Windbreaks in these areas are arranged perpendicular to mountain crests to reduce exposure (in order to keep fruits, buds, and leaves on the trees) and to reduce the drying effect of offshore winds. This arrangement of windbreaks also affords some protection from the hot, dry, föhn-type Santa Ana winds, which blow from the northeast and result in mechanical as well as physiological damage to crops. Freeways which make their way through coastal valleys can create 400-foot-wide-holes in windbreaks, thus reducing their effectiveness.

(4) Disruption of the overall farm or ranch operation. Freeways create a variety of disruptive effects aside from the more obvious problems of field access and loss of productive land. Farm operators whose farms are left parcelled may no longer be able to observe their property on the far side of an elevated roadbed from the headquarters. Special trips are required to the parcelled field on the opposite side of the highway to check livestock, fencing, crop and field conditions, trespassers, etc. The general plan of the entire farm becomes disrupted by right-of-way taking. Houses, utility buildings, barns, farm roads, and irrigation lines may be removed. Modification of the original farm plan not only reduces the operating efficiency and farm income, but may reduce the value of the property.

(5) Increased weed danger. The possibility of encroachment on cultivated land by undesirable vegetation from the right-of-way area is increased. Although all farmers are plagued by weeds, the problem is important especially in areas where crops are grown for seed. Most highway departments spray along the right-of-way, but the spraying intervals are usually variable and weed eradication is not sufficiently thorough. Complete eradication of noxious weeds frequently requires additional effort by the farm operator.

(6) Air pollution damage. It is estimated that smog and other forms of airborne pollutants cost California agriculture considerably more than $100 million each year. This damage is severe particularly along major traffic routes and near certain unchecked industries. Also, crops can be damaged mechanically by winds created by fast-moving traffic. This kind of harm especially affects tree and

21. Föhn-type winds are those warmed and dried by descent, generally occurring on the lee side of mountains.
flower crops. Although it is difficult to determine which plays the greatest role—wind turbulence caused by traffic, air pollutants, or heat from the pavement—orchards adjacent to surface freeways do show damage along the first four to six rows from the right-of-way. Some benefits to crops grown along highways may be derived by traffic-induced air turbulence that reduces frost hazard during radiation freezes.

(7) Mobility. The advanced safety and engineering standards incorporated into limited-access highways have a much different impact on rural land than previous highway improvements had. In the past, highways were applauded as facilities to provide access to promising underdeveloped areas and to provide a greater interchange of urban and rural attributes. Roads enabled the urban dweller to enjoy the country and other attractions at a distance from the city; they also reduced transportation costs to obtain food products and building materials. Rural areas benefitted primarily from wider opportunities for social, educational, recreational, and religious activities, and from enhanced possibilities for part-time farming and ranching, off-farm employment, and use of migrant labor.

Today, the system of primary and secondary roads that existed before the construction of limited-access highways continues to provide access to most rural residences except in areas near interchanges. Therefore, travel distances remain unchanged or may even increase. In rural areas, crossings and interchanges are widely spaced and many previous routes are discontinued. This has made it necessary to alter the travel pattern to marketing and trade centers and has resulted in increased travel time and cost. The economic and social advantages of jointly owned machinery, exchange of labor, and routine social calls are often hampered. Visiting a neighbor only a short distance away may involve considerable circumvolution to reach the opposite side of a freeway. Travel on foot or horseback for visiting may be out of the question.

The major advantage of freeways to today’s rural populace is the use of a better highway. Less time is spent for travel beyond the local area. In areas where freeways replace surface routes as the major transportation artery, noise and traffic may be reduced.

(8) Rural living. The activities and amenities of rural living are modified by the presence of freeways. Often the result is a deterioration of the social and personal environment. Limited-access highways

23. S. Goldstein & F. Thiel, supra note 4, at 131.
degrade scenic and esthetic values by introducing traffic noise and movement, unattractive cut and fill areas, and obtrusive highway structures. Rural dwellers may find that freeways defeat the purposes for which they built in the first place. A scenic vista may be exchanged for a view of a sterile strip of fill and pavement; a service road may lead to a dead end abutting the freeway. Traffic noise may become an unbearable presence and a hazard to mental health.

Freedom to hunt on one's own property is also reduced, since a hunter must be very careful not to discharge firearms in the direction of the freeway. Limited-access highways can cause changes in school districts by reducing or increasing travel time and limiting access in such a way that school district boundaries are altered. The result may be educational and social problems for families with school-age children.

Having to contend with emergency demands of stalled motorists is a common complaint voiced by rural dwellers, especially in areas without 24-hour automobile service stations. In addition to trespassing by motorists with mechanical and fuel problems, malicious damage to rural property is more likely to occur. This threat, coupled with the additional risk of livestock-automobile accidents on the freeway, increases the cost of liability insurance.

The presence of freeways can limit the freedom of business endeavors. Federal and state legislation prohibits the establishment of unsightly land uses such as junkyards and outdoor advertising on lands near limited-access highways. Attempts to curb unsightly enterprises may be for the general good, but the fact still remains that individual property owners adjacent to freeways are denied certain uses of land which they have occupied and paid taxes on for years. This situation may be more difficult for rural people to understand, as they are not as conditioned to the numerous governmental restrictions that are regularly imposed upon the urban dweller.

(9) Urban encroachment. The most common problems associated with farms and ranches on the rural-urban fringe are increased taxes, trespassing and malicious damage, and restrictions due to nuisances. The construction of freeways generally encourages urban encroachment on rural lands. Freeways, by virtue of their limited access, result in commercial service facilities, speculative land holdings, and industrial and residential developments initially congregating around interchange areas. The land between the interchange developments is left to its previous rural functions.

The impact of urban pressures on rural areas is often devastating. When subdivisions encroach on rural lands, the market value of the land rises beyond the reach of farmers and ranchers. The increased
market value can produce a "trend," and the assessor values the property in a higher bracket. Taxes then reflect speculative land values that may never be realized. Even if the assessed valuation of the land remains the same, special assessments for schools, sewers, drainage facilities, water supply, and other improvements demanded by the residents of a subdivision usually must be met by all taxable property in a given district, and all must share these costs. In effect, the farmer must pay for these facilities for someone else, while he continues using improvements he installed and paid for himself. The development costs are shifted to rural lands. Tax pressure may force premature subdivision of prime agricultural land, or it may end in tax foreclosure.25

As suburbia follows the freeways and commercial services cluster around interchanges, the odors, burning, spraying, and noise that are commonplace to agricultural operations may prove to be incompatible with these new uses, even in areas far removed from urban centers. The presence of freeways and residential-commercial areas can hamper the spraying of fertilizers, herbicides, fungicides, and insecticides on fields since the residue can endanger nearby inhabitants and the safety of motorists. Spraying by aircraft may become impossible.

On the positive side, the rural populace generally welcomes the establishment of commercial facilities such as restaurants and motor vehicle service stations. In addition, the availability of three-phase electricity and increased maintenance of access roads are other benefits prompted by the establishment of commercial facilities.

CONCLUSION

The structure of our landscape is essentially dynamic and susceptible to incessant change. In the past two decades, few things have shaped our living areas more than freeways. There are many perplexing and unique problems introduced by the construction of limited-access highways in agricultural areas, and impact studies of freeways on rural areas are almost non-existent.26 The purpose of this study is to identify and bring into proper perspective the conflicts, problems, and benefits that occur in rural areas traversed by limited-access highways. While superhighways are useful and are often responsible

for less expensive vehicular transportation than surface roads, benefits to farmers and ranchers are generally minor in comparison with the detrimental effects brought about by freeway construction. The foregoing is not an attempt to revive physiocracy, but it should be recognized that freeways are permanent structures with permanent consequences. Thus, there is a definite need for better overall planning, and adequate consideration must be given to all values that are involved when freeways are constructed in agricultural areas.