# Highway Severance Damage Studies—Some General Findings

GEORGE V. BRODERICK and FLOYD I. THIEL
Office of Research and Development, U. S. Bureau of Public Roads

•A MAJOR job facing builders of modern highways today is the equitable and timely acquisition of right-of-way. For several reasons, this task may be growing even more complex than it has been in the past (1). Controlled access features of modern highways place more limits on abutters' rights than was formerly the case with free-access roads. Increasing competition for space causes more questions to be raised now when space is taken for highway right-of-way, and this problem is intensified by modern highway facilities needing wider rights-of-way.

Whether or not the task of right-of-way acquisition for highways is growing more difficult, there can be no doubt about the magnitude of this task. For the Interstate System alone, 1.5 million acres costing approximately $6.5 billion will be required. Right-of-way acquisition in which the Federal Government participates is currently costing about $750 million/yr (proposed State right-of-way programs for 1963, $685 million; for 1964, $757 million; for 1965, $870 million—for federally participating right-of-way only, excluding the secondary system, except in Indiana). It is the aim of highway officials charged with spending such sums to assure that the money is being spent wisely.

## Severance Damage Study Efforts

To assist in the job of right-of-way acquisition, severance damage studies (sometimes referred to as land economic studies) have been receiving increasing attention and use. Severance damage studies are case study analyses of the experience of properties taken in part for highway right-of-way. Beginning in a few States only a few years ago, systematic severance damage studies have now been completed or are under way in 46 States (Fig. 1). The States have supplied more than 1,200 case studies for a central file or of cases established about 2 yr ago in the U. S. Bureau of Public Roads. In addition to these case studies, reported to the Bureau on standard form PR-1030 and/or IBM punch cards, the States have issued more than 1,500 individual case study reports.

## Uses of Severance Damage Studies

Severance damage studies are intended to provide the information which will permit equitable payments to be made for property taken. By recording and analyzing experience with property partially taken for right-of-way in the past, severance damage studies make it possible to know what the experience may be for properties partially taken now or in the future. As more is learned about what happens to properties taken in part for right-of-way, and especially about those factors or characteristics that affect value, considerable savings in right-of-way costs can be realized. But severance damage studies are obviously not intended simply to reduce costs of right-of-way acquisition. Inadequate payments for right-of-way are every bit as disquieting to conscientious highway builders as excessive payments.

Many of the benefits to be derived from severance damage studies are already being realized in those States where individual case studies of severed properties have been

Paper sponsored by Committee on Land Acquisition and Control of Highway Access and Adjacent Areas.

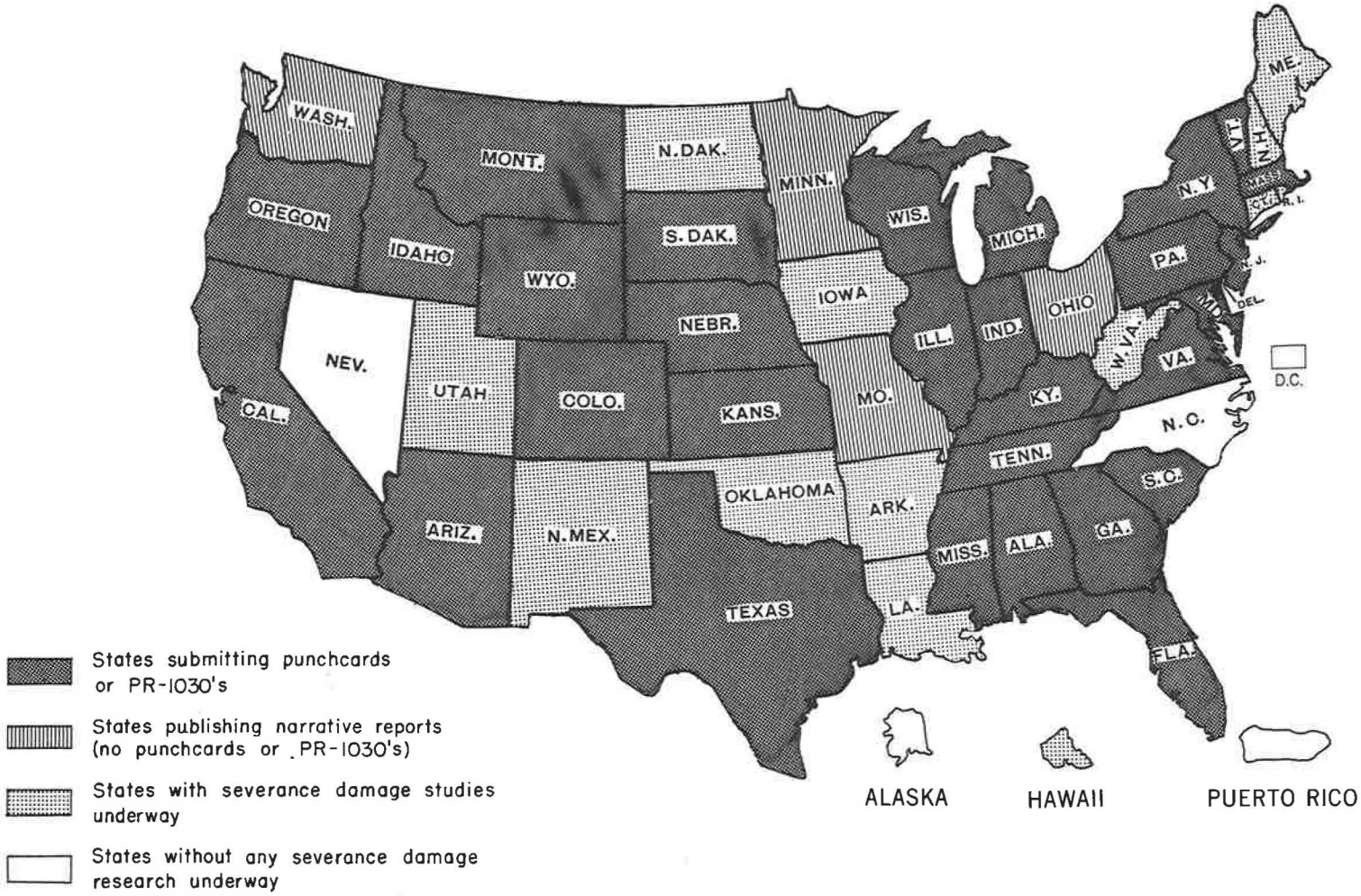


Figure 1. States conducting severance damage studies.

completed or are under way. As suggested previously, severance damage studies can help assure the proper spending of tax money for right-of-way purposes by making available to the people involved information relevant to their deliberations. In determining what compensation is proper for right-of-way property, experience in similar situations is obviously of direct relevance.

## Case Studies

Analysis to supply experience in similar situations, the purpose of individual severance studies, is the traditional approach employing comparables used so successfully by appraisers. Ordinarily, the best sources for comparables in highway-taking situations are studies completed within the State; for these takings, most States rely on cases within their own borders. For unusual cases (e.g., takings involving special purpose properties), the Bureau's bank can be searched for comparable takings (Appendix, 2, p93).

The usefulness of severance damage data to appraisers is obvious. Severance damage studies provide the facts which appraisers need to make their knowledge of highway-affected land comparable to what they already know about the value of property unaffected by the highway. An appraiser with a thorough knowledge of what has happened in a number of cases similar to that under consideration is obviously in a better position to make an appraisal of a highway-severed parcel which will be fair to both the State and the affected owner.

Adequate severance damage data can have the same general usefulness for negotiators as for appraisers—to provide enough factual information about highway effects so that expectations of highway experience can be based on a body of facts. A negotiator armed with facts will be in a more favorable negotiating position than he would be without a good knowledge of actual experience with highway-severed parcels.

A fairly common result of severance damage investigations is to show (a) that highway-severed land parcels are affected frequently less adversely than is feared, or (b) that the remainder parcel receives a significant benefit. Thus, these studies have obvious usefulness for public relations. Several States have shown that easy-to-understand accounts of experience with highway-severed parcels of land can be useful for keeping affected individuals and the general public informed.

Cases in which highway right-of-way property is acquired by amicable negotiation constitute the bulk of all highway-taking cases. However, for those cases which do result in court proceedings, economic or severance damage studies can be helpful in reaching equitable decisions. Highway attorneys in 15 of the 36 States responding report that they have used economic studies in right-of-way litigation. Although the use of economic studies as direct evidence of value has been very limited, three States have done so. Five States have used such studies on cross-examination (3). Severance damage studies have also been useful as a source of information to the State attorney for cross-examination and to test opposing witnesses on their knowledge of market value. In general, court acceptance of severance damage and land economic study findings is increasing, but slowly (4).

## Usefulness of Collection of Cases

A collection of severance damage cases, as the Bureau's bank of cases, not only provides a possible source for comparables but also offers opportunities for analyzing these cases. Obviously the experience reflected in the Bureau's bank of cases cannot be considered typical of all highway takings, primarily because most States have investigated and recorded only a portion, and not necessarily a representative portion, of their total number of partial-taking cases. But the data that can be assembled permit some interesting and perhaps valuable insights. For example, the 647 cases in the Bureau's bank in which the entire remainder has sold provide a good indication of the extent to which the owner was "made whole" or, in a very general way, whether just compensation was provided "Making the owner whole" can be equated to "just compensation" only when both general and special benefits can be used to offset the cost of the taking and any damage to the remainder. Where the law does not permit such offsets, "just compensation" may very well exceed what would be needed to "make the owner

whole" (2, pp. 79-85). The extent to which the owner was "made whole" can, of course, be reckoned by simply comparing the before value of the entire tract with the total amount received by the owner (from payment for property taken plus any payment for damages plus the sales price of the entire remainder).

While there is general agreement about the purpose of severance damage studies—to learn from past experience how to provide equitable payments for right-of-way in the future—there are variations in the way which study findings are presented. Thus, in addition to information showing whether just compensation has been provided, it is sometimes expedient to compare the per acre (or square foot) value at the time of the highway taking with the per acre value of the remainder (or a part of the remainder) which sells. This comparison ordinarily leaves out of consideration any payment that may have been for damages. It is simply the per acre selling price divided by the per acre value at the time of the taking and is commonly termed a "recovery rate." For this type of analysis, nearly all 1,250 cases in the Bureau's bank of partial-taking cases can be used.

A third type of analysis, multiple regression, permits the measurement of the association between the recovery rate of remainder parcels and several of the variables influencing the recovery rate. For example, for certain types of cases, slightly more than 70 percent of the variation in the recovery rate seems to be explained by the combined effect of the eleven characteristics which have so far been tested.

## RECOVERY RATE EXPERIENCE

The recovery rate is a useful concept. A remainder parcel experiencing no change in value would have a recovery rate of 100 percent. A recovery rate greater than 100 percent means that the remainder has increased in value. The recovery rate can be determined when any part of a remainder sells.

Although there are now about 1,250 cases in the bank, cases are not usable for analysis until they are edited and checked. The number of usable cases for different comparisons varies; for the recovery rate analysis, the number of cases is 938. There are perhaps an additional 1,000 case studies (500 in Ohio) which were conducted before working out a systematic and uniform method for conducting and reporting severance damage studies. Because these studies varied considerably in concept and form, they could not be used for the present study.

### Limitations of Concept

There are obviously some limitations or shortcomings in using recovery rates for comparison. The recovery rate, for example, leaves out of consideration any payment made for damages; thus, a recovery rate of less than 100 percent provides no indication of whether or not the owner has been made whole or whether just compensation has been paid.

Another problem with using the recovery rate is that the term may carry a negative meaning—the unjustified suggestion that there is some undesirable thing or event to be recovered from. Experience reflected by the Bureau's bank, in which recovery rates typically exceed 100 percent, suggests that it may be more reasonable to expect a benefit than a damage. Notwithstanding these problems, there has been considerable use of the recovery rate concept by right-of-way and appraisal groups, and findings from the Bureau's bank are, therefore, presented here using this term.

### Recovery Rates and Total Experience

The results of the preliminary analysis so far are somewhat inconclusive and perplexing. The recovery rates do not seem to vary consistently with some of the characteristics used for comparison (e.g., size of nearest urban place or type of highway system). This may result partly from the fact that these rates have not been adjusted for any payment made by the highway department. When this is done, the pattern sometimes becomes more consistent. For example, the recovery rate for landlocked remainder parcels is likely to be less than 100 percent nearly half the time and more

than 100 percent the rest of the time. But when damage payments are included, only about 17 percent of the owners of landlocked parcels are found to have received less money than they had in property before the highway taking. Therefore, although it is difficult to tell in advance whether the recovery rate for landlocked remainders will be more or less than 100 percent, there can be more certainty in predicting that the total value accruing to the owner of a landlocked remainder will equal or exceed the value the owner had in property before the acquisition took place.

## Medians

Because of the extremely high recovery rates experienced by some remainder parcels, simple arithmetic averages may not be a satisfactory measure of the typical recovery rate for severed parcels in the Bureau's bank at the present time. Median values provide a way of summarizing the over-all recovery rate experience in which remainder parcels with extremely high recovery rates will not have such a noticeable effect as on average values.

The median recovery rate for cases in the bank at the present time is 138 percent. This may seem high in view of the fact that it does not include any damage payments whatsoever; it should be remembered that these recovery rates are on a per acre basis and that, in many cases, only a portion of the remainder has been sold. The most valuable portion of a remainder may be sold first (e.g., for a service station at the corner of a parcel adjacent to an interchange) and this would tend to pull a recovery rate upward. Obviously all of the remainder will not have a recovery rate as high as the very valuable portion that has been sold. Conversely, remainders that are odd-shaped, too small, or otherwise uneconomic may have a lower recovery rate than would be true for other, more valuable portions of the remainder which have not been put on the market.

## Over-All Experience

Figure 2 shows that in the over-all recovery experience, approximately three-fourths of all cases in the Bureau's bank had a recovery rate greater than 100 percent. Approximately 7 percent of the cases had a recovery rate of more than 1,000 percent, and one-fourth of the cases show a recovery rate of less than 100 percent.

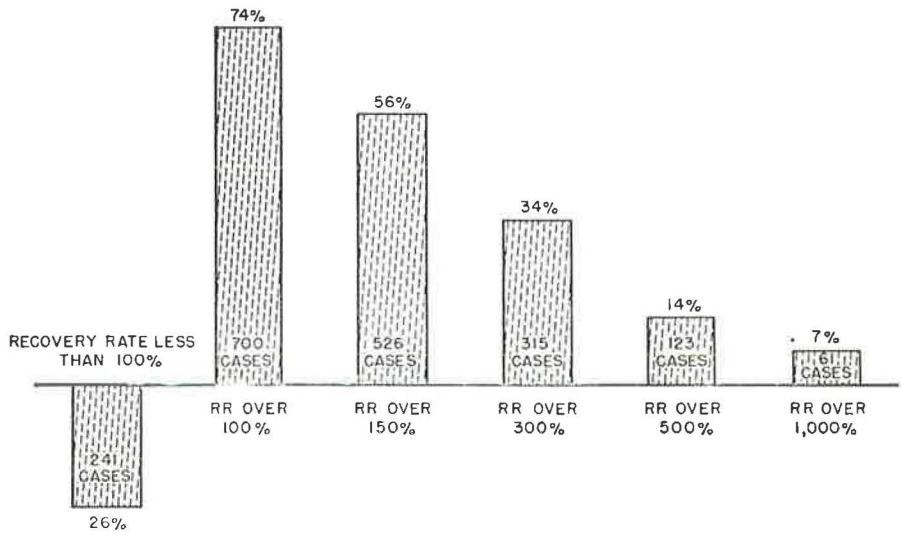


Figure 2. Land value recovery rates (over-all), by number and percent of cases.

In addition to considering recovery rates for all cases in the Bureau's bank, it seems worthwhile to consider recovery rates by categories of cases. The object of this is, of course, to separate and classify known information, with the hope that this experience can be extended and applied to cases in the future. For this purpose, cases in the Bureau's bank have been considered according to such characteristics as (a) time of sale, (b) land use before taking, (c) type of remainder parcel, (d) type of highway involved, (e) visibility from remainder, (f) distance to the new highway, (g) population of the nearest urban place, and (h) location of the parcel with respect to an interchange.

## Time of Sale

The effect of time at which a remainder parcel sells on the recovery rate is of interest because it affects the validity of the comparison of before and after values. (If a sale occurs soon enough after the highway taking, there may be little or no need for adjustments for general changes in land values—the before value can be compared directly with the value shown by the sale.) The highway effect is revealed by simply comparing the before value with the value shown by the sale.

The effect that time has had on recovery rates of cases in the Bureau's bank is quite noticeable. Whereas there is no noticeable difference between the recovery rates of parcels that sold immediately after the highway taking or within a few months, those that sold a year or more after the time of the taking tend to have a higher recovery rate. As can be seen from Figure 3, parcels that sold within a year's time had a lower rate of recovery than was true for all cases. One third of the parcels that sold within the first year had a recovery rate of less than 100 percent. Only 12 percent of the parcels selling more than 3 yr after highway taking had a recovery rate less than 100 percent. The effect of time is also clear when the high recovery rates are examined. Nearly 60 percent of the land parcels that sold more than 3 yr after the highway taking had a recovery rate greater than 200 percent, and about 15 percent had a recovery rate of 1,000 percent or greater. In contrast, only about 25 percent of the land parcels that sold within the year of the taking had a recovery rate of greater than 200 percent; 4 percent had a recovery rate of 1,000 percent or greater.

There are several probable reasons why the recovery rate should be higher for parcels selling some time after the highway taking than for parcels selling soon after the taking. One reason is that sellers who dispose of their land some time after the highway taking are more likely to have received the price that they expected to receive; that is, they waited until they were offered a price that satisfied them. Perhaps an even

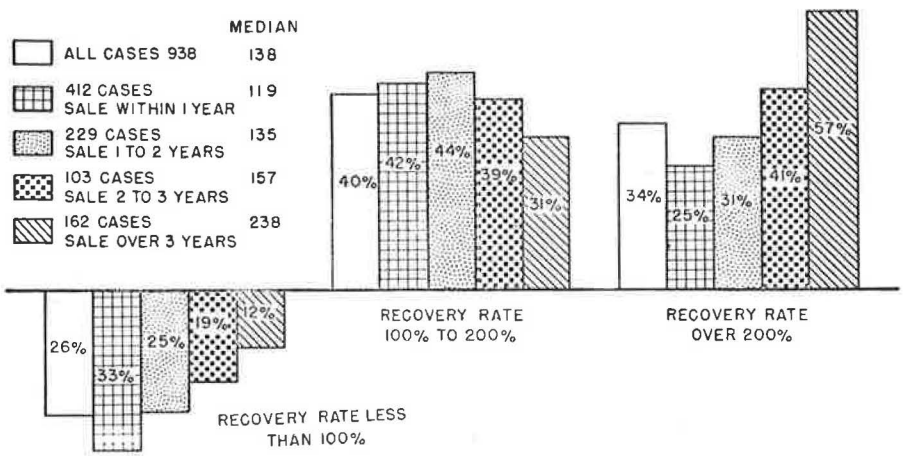


Figure 3. Land value recovery rates, by time from acquisition to sale, unadjusted for general land value changes.

more important reason is the increase in land values occurring generally. Just how much of the increase in the recovery rate is due to general land value increases and how much is due to highway influence cannot be known from the information available in the severance damage bank. It appears that part of the high recovery rates associated with property selling some time after the taking is a highway benefit which is realized by the owners who kept their property long enough for the increase to have been effective. In other words, some of those property owners who sold their property within one year of the highway taking and did not realize the high recovery rates missed part of the highway benefits that those who retained their property longer were able to capitalize on.

An examination of the median recovery rates for parcels selling at varying lengths of time after the highway taking tends to emphasize this time effect. The median recovery rate for property selling within 1 yr was 119 percent; for property selling between 1 and 2 yr after the taking, 135 percent; for property selling between 2 and 3 yr from the time of the taking, 157 percent; and for property selling more than 3 yr after the date of acquisition, 238 percent (Fig. 3).

Whereas the recovery rates given here are based on current values of land, it is fairly obvious that general land value increases can account for only a portion of these increases. Thus, if the median recovery rates of 119, 135, 157 and 238 percent for parcels selling at varying lengths of time after the taking were adjusted using a composite increase of, for example, 7 percent a year, the recovery rates would still be quite spectacular. As can be seen from Table 1, they would be 115, 121, 129 and 155 percent respectively.

TABLE 1

RECOVERY RATE EXPERIENCE WITH THE PASSAGE OF TIME[1]

| Time (yr) | Recovery Rate | |
|---|---|---|
| | Unadjusted | Adjusted[2] |
| < 1 | 119 | 115 |
| 1 - 2 | 135 | 121 |
| 2 - 3 | 157 | 129 |
| > 1 | 238 | 155 |

[1] Time between taking and sale of remainder.
[2] Average annual increase of 7 percent based on: (a) U.S. Department of Agriculture's index of farm real estate values showing an average annual increase of slightly over 5 percent in recent years (5); (b) average 8 percent increase each year in site value of new and used residences with financing insured by Federal Housing Administration (6); (c) Consumers Price Index change of approximately 1.5 percent per year (7); (d) average annual rate of 2.8 percent in the land value increase for period 1922 to 1956 (8).

## Land Use

Another characteristic that appears to affect the recovery rate is the use of the land at the time of the highway taking (Fig. 4). The median recovery rate for residential property, for example, is now about 126 percent, compared with a median recovery rate for all cases of 138 percent. The other land uses—vacant, agricultural, and a combination of services, trade, manufacturing, and government—had recovery rates of 143, 149, and 145 percent, respectively. Recovery rates for residential property are relatively poorer. Only 27 percent of the residentia

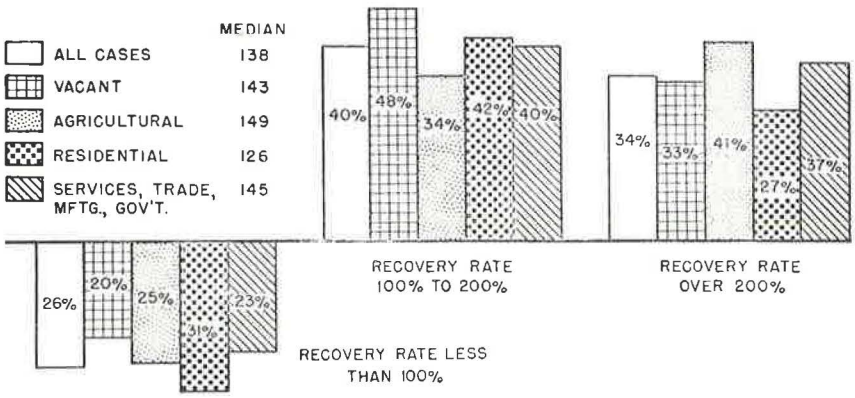


Figure 4. Land value recovery rates, by land use at time of acquisition.

property remainders had a recovery rate 200 percent or more, and 31 percent had a recovery rate less than 100 percent. In considering recovery rates, especially those less than 100 percent, it should be remembered that the recovery rate does not include any highway payment for damages.

## Type of Remainder

The recovery rates for different types of remainder parcels (i.e., separated, isolated, or landlocked) also show some interesting and perhaps significant variations. The three main types of remainders (Fig. 5) are defined as follows:

1. A separated parcel is the remainder containing the improvements. Separated parcels may result when a highway taking leaves two remainders or when only one parcel remains—a situation sometimes referred to as "severed."
2. An isolated parcel is an unimproved remainder which generally can be reached only by an adjacent public road.
3. A parcel is landlocked when no access to the parcel exists by use of public facilities or adjacent land of the same owner.

The differing recovery rates experienced by the three main types of remainders are shown in Figure 6. As can be seen, the experience of separated parcels has been better than that for other types of remainders. Only 18 percent of the separated parcels failed to achieve a per acre value at least as great as before the highway taking. For isolated parcels, 35 percent had a recovery rate of less than 100 percent; and for landlocked parcels, 54 percent had a recovery rate of less than 100 percent. At the other extreme, 38 percent of the separated parcels had a recovery rate of over 200 percent, compared with 24 percent of the isolated parcels and 14 percent of the landlocked parcels. All of these findings are tentative, because there are still only a few landlocked cases in the Bureau's bank.

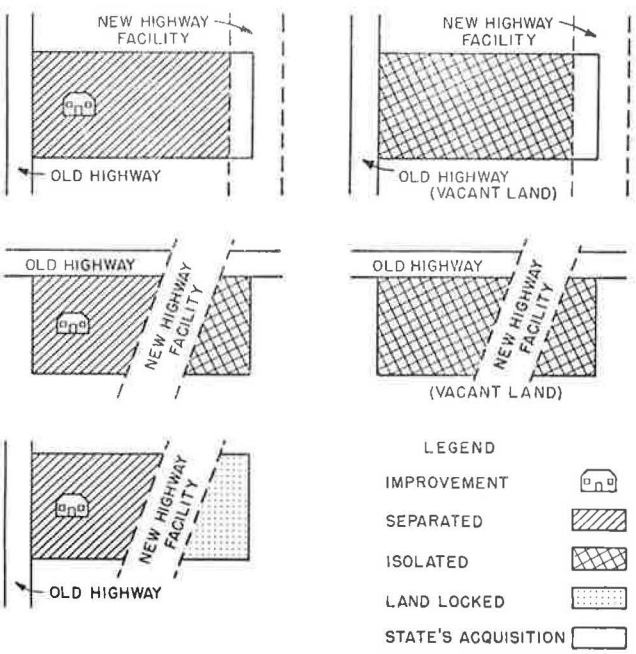


Figure 5. Separated, isolated and landlocked remainders (from 2, p. 38).

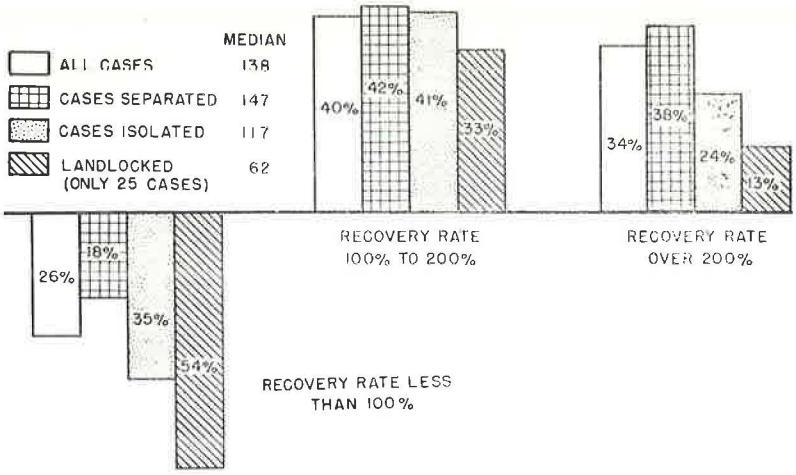


Figure 6. Land value recovery rates, by type of remainder.

## Type of Highway System

Some differences appear attributable to whether the remainder parcel was located on an Interstate System, a Federal-aid primary highway, or a Federal-aid secondary road. The median recovery rate for remainder parcels along Interstate routes has so far been found to be about 140 percent, slightly higher than the median recovery rate for all cases in the Bureau's bank. Along Federal-aid primary highways, the recovery rate is about 132 percent and along Federal-aid secondary roads about 135 percent.

In addition to having higher median recovery rates, remainder parcels along the Interstate System have so far experience more large gains and more losses than has been true along other highway systems. Figure 7 shows about 35 percent of the remainder parcels located along Interstate Highway Systems have had recovery rates greater than 200 percent. This is a slightly larger percentage than that for parcels located along Federal-aid primary and secondary systems. At the same time, about 30 percent of the remainder parcels located along the Interstate System have had recovery rates of less than 100 percent, compared with about 24 and 26 percent of the remainders along Federal-aid primary and secondary systems, respectively, with recovery rates of less than 100 percent. Whether this experience along Interstate routes

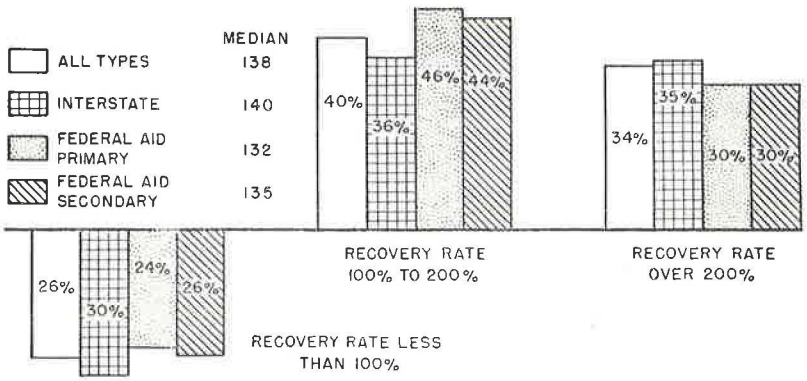


Figure 7. Land value recovery rates, by type of highway system.

will continue when more cases are available to analyze is not clear. Perhaps the overall experience of recovery for remainder parcels along Interstate routes will be more spectacular than for remainder parcels located along other types of highway systems. The higher-than-normal recovery rates along Interstate routes is, or course, quite in line with what many people would expect. And it may be than recovery rates for many parcels located along the Interstate route can be expected to be lower than for parcels located on other types of highway systems because of the lack of direct access to the Interstate System. It should be noted, however, that the contrast between Interstate and non-Interstate experience is sharper at the upper range of recovery rates than it is at the lower end. Thus, the recovery rates along the Interstate System are distinquished from the experience along other highways primarily by the high recovery rates; the low recovery rates along the Interstate System are only slightly different from those found along other types of roads.

## Visibility from Remainder

The States sending severance damage cases to the Bureau's bank are providing information as to whether or not the highway is visible from the remainder parcel. (In most cases full visibility of the highway from the remainder also means full visibility of the property from the highway.) Tentative analysis of the recovery rates by visibility is showing some interesting variations, though it is not possible to tell at this point just how significant these differences are. The median recovery rate for parcels from which the highway is fully visible, for example, has been found to be 145 percent, compared with a recovery rate of 133 percent for parcels from which the highway was partially visible and 117 percent for parcels from which the highway could not be seen (Fig. 8). Figure 8 shows that 37 percent of those remainder parcels from which the highway could be seen fully had a recovery rate of over 200 percent, compared with only about 21 percent of the remainder parcels from which the highway could not be seen.

It is interesting to compare this early experience with some of the claims that are often made about the undesirable appearance of modern highway improvements. Apparently the market does not discount property from which the highway can be seen. On the contrary, property from which the highway is not visible appears to fare worse in the market place than property from which the highway can be seen.

## Travel Distance to New Highway

Like visibility, the travel distance from the remainder to the new highway appears to have some bearing on the recovery rate of the remainder parcel. Whereas the remainder is ordinarily at or very near the highway for which the taking occurred some travel may be necessary to reach the highway; for example, access may be restricted.

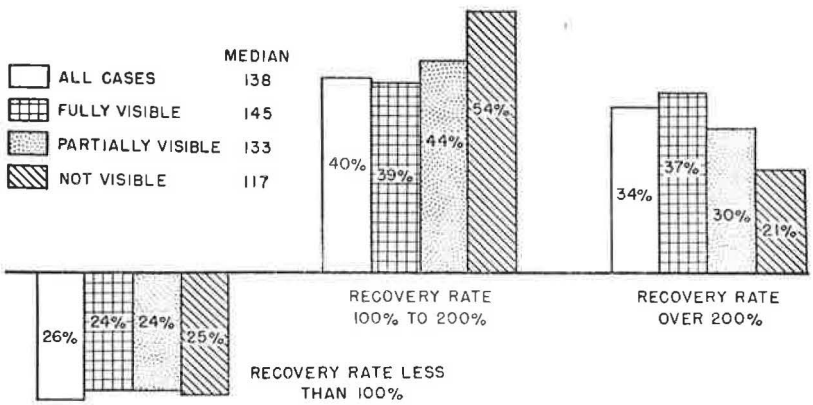


Figure 8. Land value recovery rates, by visibility of highway from remainder.

As might be expected, the bulk of cases in the Bureau's bank involves remainders from which the new highway can be reached by traveling ½ mi or less. These parcels have so far experienced a median recovery rate of 148 percent, compared with only 106 percent for remainder parcels more than ½ mi away in travel distance (Fig. 9). This apparently differing experience is also shown by comparing the parcels having high rates of recovery and those with low rates. For example, about 37 percent of the remainder parcels within ½-mi travel distance of the highway had a recovery rate greater than 200 percent, compared with about 25 percent of those parcels with longer travel distances. Only 21 percent of the remainder parcels within ½ mi of the main highway had recovery rates of less than 100 percent; for remainder parcels more than ½ mi in travel distance from the highway, about 42 percent had recovery rates of less than 100 percent.

## Size of Urban Place

Proximity of a remainder parcel to a growing center of population is often thought to have an important bearing on the demand for the parcel and, therefore, on the selling price. The experience reflected in the Bureau's bank gives only weak support to this expectation. So far, properties near smaller urban places (i.e., those with less than 10,000 people) show a median recovery rate of 119 percent, somewhat less than the

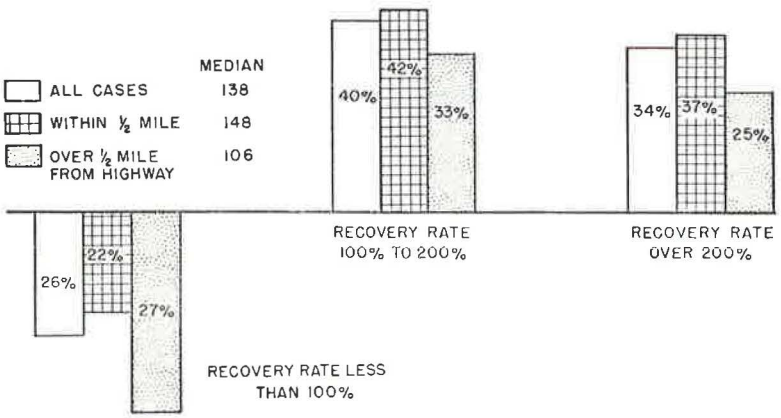


Figure 9. Land value recovery rates, by travel distance to new highway.

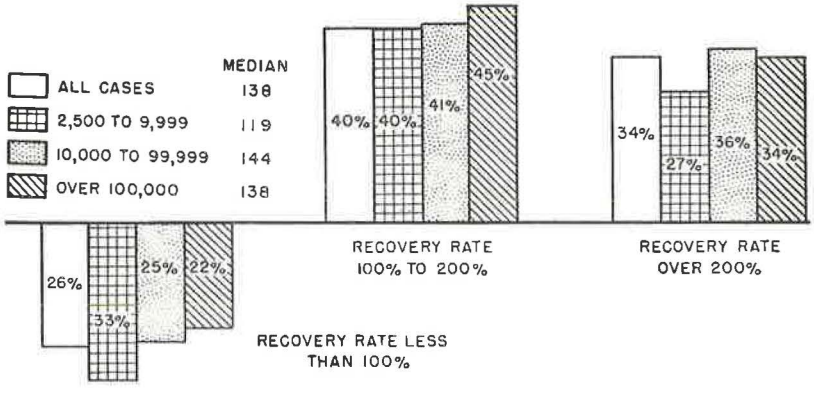


Figure 10. Land value recovery rates, by size of nearest urban place.

138 percent for all cases. Parcels near population centers of 10,000 to 100,000 show a median recovery rate of 144 percent. However, parcels near larger urban places have shown a recovery rate of only 138 percent. As can be seen in Figure 10, differences in recovery rates are small, except that only about 22 percent of the remainder parcels near large urban places had recovery rates of less than 100 percent, contrasted with about 33 percent of the remainder parcels near small urban places. This comparison involves parcels near urban places of varying size; it does not distinguish between parcels at different distances from these urban places. Studies have been made of this latter effect (9, 10).

## Interchange Effects

Approximately one-fourth of the more than 900 cases used in this analysis were located within ½ mi of an interchange, a distance often used to distinguish between interchange and noninterchange areas. As might be expected, the recovery rate of parcels located within ½ mi of an interchange is generally better than the recovery rate for parcels located farther away (Fig. 11). For example, the median recovery rate for parcels located near interchanges is about 164 percent, compared with 131 percent for parcels located away from the interchange. Also, more of the interchange properties had high recovery rates and fewer of the interchange parcels had low recovery rates than was true for parcels located away from the interchange. As can be seen, nearly half of the parcels located within ½ mi of an interchange have had recovery rates greater than 200 percent.

## Whether Bureau Cases Are Typical

Because many States supplying information about remainder parcels do not record and analyze the experience for all of the remainder parcels in the State, there may be some question as to whether the cases in the Bureau's bank are typical of general partial-taking experience. There appears to be no definitive test for this question. One check that can be made is to compare the findings from the Bureau's bank as a whole with the experience of a State supplying information about all remainder parcels which have sold. Experience for all cases in the Bureau's bank has been compared with information available about California cases which are included in the bank of cases. It should be remembered that the more than 400 cases which California has reported to the Bureau constitute a substantial portion of the approximately 900 cases so far recorded and analyzed in the Bureau's bank.

The findings to date for all the cases in the Bureau's bank compare fairly closely with the findings based solely on cases from California. The median recovery rate for the California cases in the Bureau's bank is about 142 percent, compared with a median recovery rate for all cases of 138 percent. (The comparison was made between California

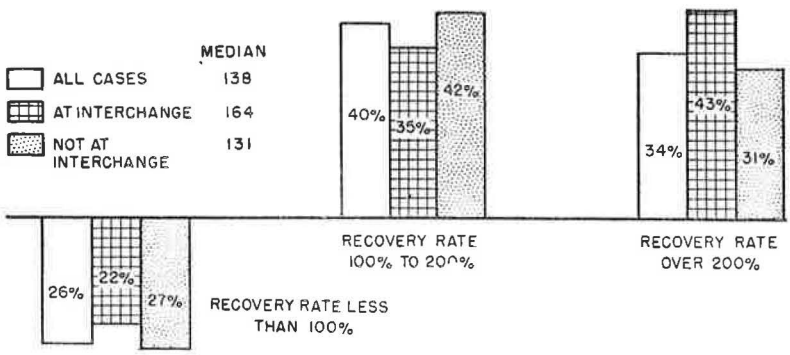


Figure 11. Land value recovery rates, by nearness to interchange (over-all).

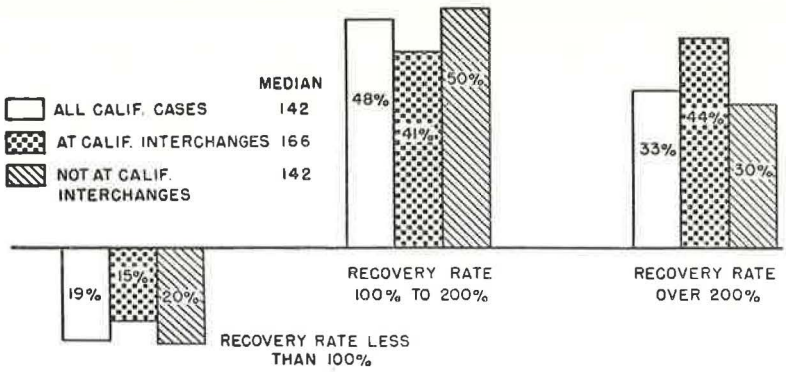


Figure 12. Land value recovery rates, by nearness to interchange (California).

cases and all cases, rather than between California cases and all non-California cases, primarily for convenience. It seems fairly obvious that the variations between California cases and non-California cases would be slightly greater than those between California cases and all cases.) When the California experience with respect to property located near or away from an interchange is compared with that of the Bureau's bank as a whole, there is also fairly close agreement. As can be seen in Figure 12, properties located within ½ mi of the interchange had a median recovery rate in California of 166 percent, compared with the median recovery rate for all interchange cases of 164 percent. For cases located away from an interchange, California cases had a recovery rate of 142 percent, compared with a recovery rate for all cases of 131 percent. It is also interesting to note that the percentage of cases reported by California which were within ½ mi of an interchange (about 25 percent) agrees generally with the percentage of cases near an interchange for all cases in the Bureau's bank (about 29 percent). Thus, it appears that there are similarities in the experience reflected by the California cases and that shown for all cases in the Bureau's bank, except that the recovery rates in California are slightly higher than the recovery rates in other States.

## Multiple Regression

Previous studies of the recovery rates of highway-severed remainders have relied on an examination of the influence of several factors taken one at a time. In the present investigation, a start has been made to determine the simultaneous effect of several factors acting in combination and to measure the relative strength of each of the factors. The principal technique used in the analysis presented here is multiple regression. A program developed for the IBM Model 1401 computer was used to compute regression coefficients, their standard errors, and partial correlation coefficients.

As was explained previously, it cannot be known with any certainty that severance damage cases reported to the U. S. Bureau of Public Roads constitute a representative sample of all partial-taking cases. To the extent that the sample of cases reported differs from a simple random sample, therefore, the estimates of sampling errors of regression coefficients are underestimates of the true sampling errors. To compensate somewhat for this, only those regression coefficients equal to or greater than 3 times their standard errors were regarded as significant at the 95 percent level of confidence. (A 95 percent confidence level means that, on a mathematical probability basis, a coefficient of such magnitude relative to its standard error could occur only five times in a hundred.) Because in an analysis based on a simple random sample, a coefficient need be only twice as large as its standard error to be significant at the 95 percent confidence level, the use of three standard errors in the present analysis is a much more demanding requirement for statistical significance. Coefficients with values between 2 and 3 times their standard errors were regarded as marginal, and coefficients with values less than 2 times their standard errors were rejected as not significant at the 95 percent confidence level (11).

Of the independent variables used in the regression analysis, only two were quantitative measures whose actual values could be used directly in the computations—area of the entire tract of land before the taking and area of land sold after the taking—both measured in tenths of acres. All other independent variables were scaled mainly by judgment. A partial list of ranges of values assigned to these dummy variables is given in Table 2.

Analysis. —An equation of the following form was used:

$$RR = a + b_1\,THS + b_2\,INT + b_3\,TR + b_4\,CLU + b_5\,LU + b_6\,TIM + b_7\,SA + b_8\,TA + b_9\,DIST_1 + b_{10}\,DIST_2 + POP + u \qquad (1)$$

in which the dependent variable is the recovery rate. This equation in intented to sum the separate effects of all the variables involved and show the combined effect on the recovery rate.

The results of the calculations are given in Table 3. The time from date of acquisition to date of sale, TIM, and change in land use, CLU, were very significant, with regression coefficients more than 8 times their standard errors. Travel distance to the new highway, $DIST_2$, had a negative effect, as expected, and was very significant, with a regression coefficient more than 7 times its standard error. Type of remainder, TR, was also significant, with a coefficient 5 times its standard error.

The most influential of these four variables was TIM, the addition of which explained 23 percent of that part of the variation in the recovery rate left unexplained by all the other variables in combination. The least influential was TR, the addition of which explained 10 percent of the previously unexplained variation in the recovery rate.

TABLE 2

DEFINITION OF VARIABLES FOR REGRESSION ANALYSIS[a]

| Variable | Symbol | Range of Values |
|---|---|---|
| Recovery rate | RR | Actual computed value |
| Type of highway system | THS | 1 Interstate urban |
| | | 2 Federal aid rural |
| | | : |
| | | 7 Interstate rural |
| Interchange-noninterchange | INT | 0 Not at or near interchange |
| | | 1 At or near interchange |
| Type of remainder | TR | 1 Landlocked |
| | | 2 Separated and landlocked |
| | | : |
| | | 4 Separated |
| Change in land use | CLU | 0 Vacant to vacant |
| | | 1 Vacant to agriculture |
| | | 2 Vacant to residential |
| | | : |
| | | 7 Vacant to services |
| | | : |
| Land use before | LU | 0 Vacant |
| | | 1 Agriculture |
| | | 2 Residential |
| | | : |
| | | 7 Services |
| Time from acquisition to sale | TIM | 1 0 - 90 days |
| | | 2 91 - 182 days |
| | | : |
| | | 16 > 3 yr |
| Area of land sold | SA | Actual acreage reported |
| Area of entire tract | TA | Actual acreage reported |
| Distance to nearest urban place | $DIST_1$ | 0 0 mi |
| | | 5 0.1 - 0.5 mi |
| | | : |
| Travel distance to new highway | $DIST_2$ | 0 0.0 mi |
| | | 0 0.1 mi |
| | | : |
| | | 40 3.6 - 4.0 mi |
| | | : |
| Population of nearest urban place | POP | 5 2,500 - 4,999 |
| | | 10 5,000 - 9,999 |
| | | : |

[a]Dots in range of values column indicate that some values were omitted from table.

TABLE 3

ESTIMATES OF MULTIPLE REGRESSION EQUATION[a]

| Item | Constant | THS | INT | TR | CLU | LU | TIM | SA | TA | $DIST_1$ | $DIST_2$ | POP |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Net regression coefficient | 85.95 | — | - 5.432 | 5.642 | 4.862 | — | 1.179 | — | — | 0.080 | - 0.469 | — |
| Standard error | — | — | 1.820 | 1.110 | 0.600 | — | 0.139 | — | — | 0.031 | 0.066 | — |
| Partial correlation coefficient | — | — | - 0.189 | 0.311 | 0.463 | — | 0.479 | — | — | 0.163 | - 0.417 | — |

[a]Symbols are defined as: THS, type of highway system; INT, interchange-noninterchange; TR, type of remainder; CLU, change in land use; LU, land use before taking; TIM, time from acquisition to sale; SA, area of land sold; TA, area of entire tract; $DIST_1$, distance to nearest urban place; $DIST_2$, travel distance to new highway; and POP, population of nearest urban place.

The interchange-noninterchange, INT, and distance to nearest urban place, $DIST_1$, variables were marginally significant, and the coefficients may have resulted from chance fluctuations. The remaining variables (type of highway system, THS, land use before taking, LU, area of land sold, SA, area of entire tract, TA, and population of nearest urban place, POP, were not significant at the 95 percent confidence level.

The multiple correlation coefficient for the combination of variables was 0.72. This is a measure of the combined importance of the several independent factors as a means of explaining the differences in the recovery rate. However, a more conservative measure is the square of the coefficient as an indication of the proportion of the variation in the recovery rate, accounted for mathematically. In this analysis, the proportion explained is 52 percent.

Further experiments were carried out in an effort to explain a higher proportion of the variation in the recovery rate. The selected cases were grouped by TIM, and the several groups were analyzed separately. The best result obtained was for remainders which sold between 1 and 2 yr after the partial taking occurred. For this group, using all the independent variables given in Table 3 except TIM, a multiple correlation coefficient of 0.86 was obtained, indicating that 73 percent (the square of 0.86) of the variation in the recovery rate was explained by the combined effect of the variables used. Four of the variables (TR, $DIST_2$, CLU, and INT) were significant factors at the 95 percent confidence level. Each of the coefficients was more than 4 times its standard error. The addition of each variable explained between 28 and 33 percent of the variation in the recovery rate left unexplained by the other nine variables.

An effort was made to apply this technique to the entire bank of cases, but with very disappointing results. It was apparent that a linear regression equation could not be expected to describe the relationship of the several independent variables to the recovery rate if the total group of study cases, including those experiencing very large or very small recovery rates, were retained in the analysis. The analysis would, therefore, have to be restricted to those cases falling within a relatively narrow range of the "typical" case.

## EXTENT TO WHICH THE OWNER IS "MADE WHOLE"

The extent to which the owner is "made whole" can be determined by comparing "before and after" values. When a State takes part of an owner's property for highway right-of-way, and then after a time the owner sells the entire remainder, it may be said that all the results are in for that owner and for that property. It is than possible to determine the extent of damage or benefit to the remainder.

A before and after examination of the 647 cases where the entire remainder sold reveals the extent to which owners of property partially taken for highway right-of-way were made whole—that is, whether affected property owners were placed in as good a financial position as they would have been had their property not been taken. To measure the effects of the partial taking, the value of the entire property (including improvements) before the taking was compared with the total amount the owner received from the property—i.e., for the property taken, for damages to the remainder, and from the sale of the entire remainder.

### Damages—Estimated and Actual

Damage payments were made only to the owners of 60 percent of the properties examined. Examination of the experience of these owners revealed that half of the recipients actually sustained no damage at all, whereas one-fourth of the recipients of damage payments suffered less actual damage than they were paid for. Twenty-two percent of all recipients of damage payments received less in damage payments than they actually sustained.

Of the owners who received no damage payments, 82 percent experienced no actual damage. A comparison of the experience of owners receiving damage payments with those not receiving them shows that for both groups about one owner in five suffered a loss due to an underpayment of damages or to the nonpayment of damages. State highway departments are, of course, just as concerned about property owners receiving in-

adequate compensation as they are about apparent over payment of damages because the goal is to make the owner whole.

It is interesting to compare the experience of owners of property located at interchanges with that of other affected property owners. Separate tabulations were made for the experience of owners of properties located within ½ mi of interchanges and more than ½ mi from interchanges. This comparison revealed that a higher proportion of affected owners in interchange areas (69 percent) were paid damages than in non-

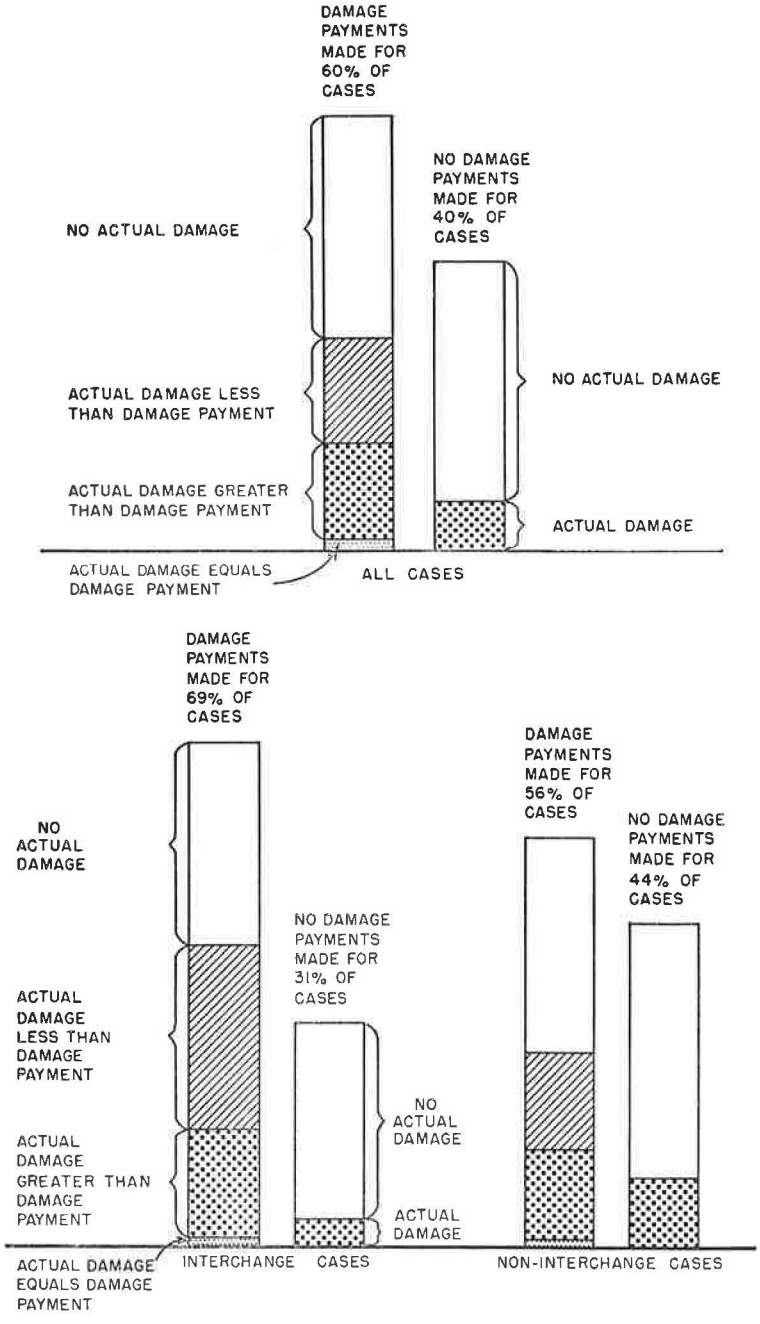


Figure 13. Damage payments vs actual damages.

TABLE 4

PROPORTION OF AFFECTED PROPERTY OWNERS RECEIVING DAMAGE PAYMENTS

| Damages | Interchange | | Non-interchange | | Total | |
|---|---|---|---|---|---|---|
| | No. | % | No. | % | No. | % |
| Cases | 196 | 100 | 451 | 100 | 647 | 100 |
| Paid: | 135 | 69 | 254 | 56 | 389 | 60 |
| No actual | 55 | 28 | 134 | 30 | 189 | 30 |
| Less than paid | 49 | 25 | 56 | 12 | 105 | 16 |
| More than paid | 28 | 14 | 58 | 13 | 86 | 13 |
| Equal to paid | 3 | 2 | 6 | 1 | 9 | 1 |
| None paid: | 61 | 31 | 197 | 44 | 258 | 40 |
| No actual | 54 | 28 | 158 | 35 | 212 | 33 |
| Actual | 7 | 3 | 39 | 9 | 46 | 7 |

interchange areas (56 percent). This difference results at least in part from the differing ratios of controlled-access to free-access highways; remainders at interchange points ordinarily result from a taking for a controlled-access facility, whereas remainders in noninterchange areas may be found along any type of highway. These and other more detailed findings concerning overpayments and underpayments of damage are given in Table 4. Visual comparisons of these findings are also shown in Figure 13.

## Damage Payments as Percent of Total Payments

It is of interest to compare the proportion of total State payments accounted for by damage payments for selected categories of partial-taking cases with that for all cases combined. Using aggregate payment figures for all cases combined, damage payments accounted for 28 percent of total payments made by the States for right-of-way acquisition. The supporting data for this finding are given in Table 5. When these cases were grouped by land use before the taking, the most outstanding finding was that for vacant land 49 percent of the cost of acquisition was accounted for by damage payments. Although this comparison by land use was made on an aggregate basis, the result seems to be consistent with the experience of owners of vacant land as described in a latter section. In that discussion it is shown that owners of vacant land fared noticeably better than owners of land in other uses in terms of total value received compared with the before appraised value of their property. Specifically, owners of vacant land had receipts averaging 129 percent of the before value of their property, whereas owners of land in other uses at the time of acquisition by the State had receipts ranging from 107 percent (residential) to 115 percent ("all other" uses) of the before value of their properties. At least a partial explanation of the more favorable after-taking experience of owners of vacant land is given by a comparison of the uses of remainder parcels at the time they sold with their uses at the time of the taking, which revealed that 29 percent of parcels vacant at the taking had shifted to higher uses by the time the parcels sold. By

TABLE 5

DAMAGE PAYMENTS AS PERCENT OF TOTAL STATE PAYMENTS

| Cases | Payment ($100) | | | Damages as Percent of Total State Payments |
|---|---|---|---|---|
| | For Taking | For Damages | Total | |
| All cases: | 40,116 | 15,636 | 55,752 | 28 |
| Interchange | 10,710 | 3,483 | 14,193 | 25 |
| Noninterchange | 29,406 | 12,153 | 41,559 | 29 |
| Land use before: | | | | |
| Vacant | 5,059 | 4,784 | 9,843 | 49 |
| Agriculture | 11,259 | 2,055 | 13,314 | 15 |
| Residential | 14,297 | 6,183 | 20,480 | 30 |
| Other | 9,501 | 2,614 | 12,115 | 22 |
| Type of remainder: | | | | |
| Separated | 26,503 | 10,474 | 36,977 | 28 |
| Isolated | 7,389 | 722 | 8,111 | 9 |
| Landlocked | 1,337 | 371 | 1,708 | 22 |
| Other | 4,887 | 4,069 | 8,956 | 45 |
| Type of highway system: | | | | |
| Interstate rural | 5,448 | 2,628 | 8,116 | 32 |
| Interstate urban | 15,638 | 6,587 | 22,225 | 30 |
| FAP rural | 4,202 | 808 | 5,010 | 16 |
| FAP urban | 4,821 | 4,030 | 8,851 | 46 |
| FAS, local, and other State | 2,140 | 330 | 2,470 | 13 |
| Other | 7,827 | 1,253 | 9,080 | 14 |

contrast, only 9 percent of residential parcels had shifted to higher uses by the time they sold.

In view of the very favorable after-taking experience owners of vacant land and considering the high proportion of State payments accounted for by damage payments, it appears that the acquisition of vacant land offers a good chance for improvements in the pursuit of the goal of making the owner whole.

## Value Received as Percent of Before Value

A basic comparison is that between the value before the acquisition and the value realized by the affected owner after the taking (Table 6). The total amount received by the owner may be expressed by the following equation:

$$A = P + SD + SP \quad (2)$$

in which

A = total amount received by the owner for his property,
P = payment by the State for the property taken,
SD = payment by the State for damage to the remainder, and
SP = sale price of the entire remainder.

As can be seen in Table 6, four out of five property owners (80 percent) received either adequate compensation or more. The remaining property owners had less money after the highway than they had in property before the highway improvement. However, a closer examination of the cases where the value realized by owners was less than the value of property that these owners held at the time of the taking helps to put this finding in perspective. In more than 98 percent of these cases, the value received was 50 percent or more of the before value; in 86 percent of the cases, was 75 percent or more; in 76 percent, 80 percent or more; and in half of the cases, the amounts received were 90 percent or more of the appraised value of the entire property before the taking. Thus, most owners losing value did not lose heavily. As can be seen in Table 6, the same sort of "crowding" toward the 100 percent break-even point is evident for property owners receiving adequate compensation or better, although the crowding is less marked. Of the total of 647 owners, 80 percent received 100 percent or more of what their property was worth before acquisition. Twelve percent of the affected owners received double the before value of their property or more.

TABLE 6

VALUE RECEIVED AS PERCENT OF BEFORE VALUE[a]

| Value Received (%) | Cases | |
|---|---|---|
| | No. | % |
| < 100 | 132 | 20 |
| > 100 | 515 | 80 |
| > 150 | 136 | 22 |
| > 200 | 74 | 12 |
| > 500 | 16 | 3 |

[a]Entire bank.

## Experience of "Typical Case"

Another measure of the extent to which the owner is made whole is the experience of the "typical case." As was explained in the section on recovery rate, the median value received as a percent of before value is a more satisfactory single measure of the experience of the typical case than a simple arithmetic average because a median is not noticeably affected by cases with extremely high increases in value. The median value which the entire group of 647 property owners received was 112 percent of the before value of their property.

TABLE 7

VALUE RECEIVED AS PERCENT OF BEFORE VALUE[a]

| Distance (mi) | Cases | |
|---|---|---|
| | No. | Median (%) |
| 0 | 151 | 126 |
| 0 - 1 | 321 | 110 |
| 1 - 2 | 41 | 103 |
| > 2 | 34 | 106 |

[a]Experience by travel distance to new highway.

## Travel Distance to New Highway

When individual case studies are grouped by travel distance from the subject parcel to the new highway, some interesting variations in the median values for the groups are revealed. Table 7 indicates that the gain in dollar value was greatest for owners of property with immediate access to the new highway,

with the gain falling off as travel distance to the new highway increased up to 2 mi. Beyond 2 mi, the median value rose slightly. The observed decline seems reasonable; the market can logically be expected to recognize the greater convenience and desirability of close access to the new highway. The slight upturn in value received beyond 2 mi must be regarded as tentative and may not be maintained as the Bureau's bank increases in size. At present, the bank contains only 34 cases where the entire remainder sold and where travel distance to the new highway exceeds 2 mi.

## Type of Highway System

An examination of median values for groups of cases classified by type of highway system for which the parcels under study were acquired shows rather mixed results (Table 8). Owners of property located along Interstate highways show a higher median return as a percent of before value in rural than in urban areas. However, owners of urban property along Federal-Aid Primary (FAP) systems fared better than those with rural property.

## Type of Remainder

Owners of property partially taken for highway right-of-way with the exception of owners of landlocked parcels, fare equally well regardless of the type of remainder. Table 9 indicates that the States, in pursuing the goal of making the owner whole, have approached that ideal about equally well for the different types of remainders. The median value received of 106 percent of before value for owners of landlocked remainders must be regarded as tentative, there being only 24 landlocked cases in which the entire remainder is sold in the Bureau's bank.

It might be well to emphasize at this point that the median values being discussed are not recovery rates as that term is coming to be understood. The medians presented in this part of the paper represent summary measures, for large groups of cases, of the relationship between payments received by affected property owners (including payments for damages) and the appraised value of the entire property before the highway improvement.

TABLE 8

VALUE RECEIVED AS PERCENT OF BEFORE VALUE[a]

| Type | Cases | |
|---|---|---|
| | No. | Median (%) |
| Interstate: | | |
| Rural | 115 | 115 |
| Urban | 224 | 108 |
| FAP: | | |
| Rural | 98 | 107 |
| Urban | 72 | 117 |
| FAS, local and other State | 77 | 116 |
| All other and combinations[b] | 61 | 128 |

[a] Experience by type of highway system.

[b] Includes nonclassified Federal and combinations of Interstate rural with FAP rural, other State, nonclassified Federal, or two other systems, Interstate urban with FAP or FAS urban, and any two or more systems not elsewhere classified.

TABLE 9

VALUE RECEIVED AS PERCENT OF BEFORE VALUE[a]

| Type | Cases | |
|---|---|---|
| | No. | Median (%) |
| Separated | 479 | 113 |
| Isolated | 76 | 112 |
| Landlocked | 24 | 106 |
| Other[b] | 68 | 113 |

[a] Experience by type of remainder.

[b] Includes on dead end, separated and isolated, separated and landlocked, separated and on dead end, isolated and landlocked, other combinations not listed, and not reported.

## Access to New Highway

It is generally believed that the degree of access to a public road that is available to the owner of property abutting the road has an influence on the value of the property. To gain some measure of this effect for owners of property partially taken for a new highway improvement, remainder parcels selling in their entirety were grouped by the degree of access to the new highway enjoyed by the owners. In this context, property was classified as having no access to the new highway, even though there may be access to another public road leading to the new facility. Access was classified as unrestricted if the property owner could enter the new highway at any point that his property abutted the highway. If an owner was permitted access to the new facility at a single designated point, his access was classified as restricted to a designated point; similarly, remainders from which access was permitted at two or more designated points were classified as having access restricted to designated points. One additional classification was used—restricted to frontage road—where the owner had direct access to such a road leading to the new facility.

With the exception of owners of parcels having unrestricted access to the new highway facility, all other owners of property classified by various degress of access to the new facility fared about equally well on the average. As can be seen in Table 10, owners with unrestricted access to the new highway had a median value received as a percent of before value of 124 percent. None of the other group medians differed from the over-all median of 112 by more than 3 percent.

The difference in the extent to which the goal to make the owner whole was achieved (as between owners having unrestricted access to the new facility and all other owners) can also be seen by comparing the percentage distributions of these cases (Table 11). The percentage of owners of unrestricted access parcels losing value was 15 percent as compared to 21 percent for owners of restricted access remainders (including no access). Moreover, a smaller percentage of owners of parcels with unrestricted access experienced small increases in value (100 to 124 percent), and a larger percentage of owners of unrestricted access remainders had larger increases (125 to 149 percent and 150 to 199 percent) than was true for owners of remainders with restricted access. However, approximately the same proportion of owners of restricted and unrestricted access remainders experienced returns of 200 percent or more of before value. These comparisons are illustrated in Figure 14.

TABLE 10

VALUE RECEIVED AS PERCENT OF BEFORE VALUE[a]

| Degree | Cases | |
|---|---|---|
| | No. | Median (%) |
| No access | 366 | 112 |
| Unrestricted | 46 | 124 |
| Restricted to: | | |
| Designated point | 54 | 109 |
| Designated points | 40 | 115 |
| Frontage road | 141 | 111 |

[a]Experience by degree of access to new highway.

TABLE 11

VALUE RECEIVED AS PERCENT OF BEFORE VALUE[a]

| Value (%) | Unrestricted (%) | Restricted (%) |
|---|---|---|
| < 100 | 15 | 21 |
| 100-124 | 35 | 46 |
| 125-149 | 24 | 13 |
| 150-199 | 13 | 9 |
| 200-299 | 5 | 5 |
| 300-499 | 4 | 4 |
| > 500 | 4 | 2 |

[a]Experience by degree of access to new highway.

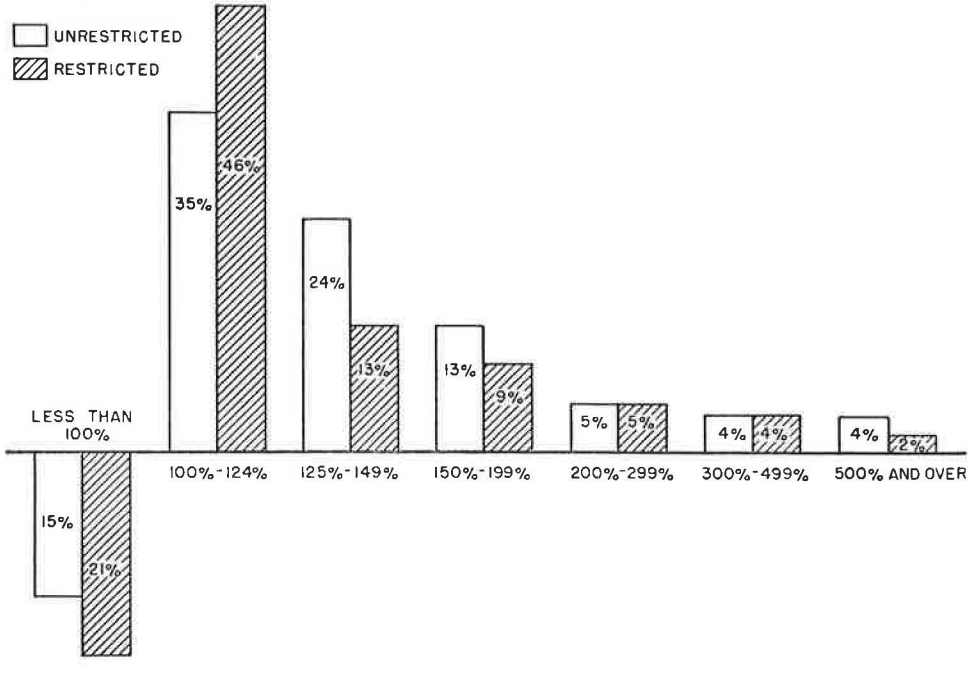


Figure 14. Value received as percent of before value, by degree of access to new highway.

## Land Use Before Highway Improvement

The influence that the before land use might have had on the value of the remainder is largely hidden because the recovery rate concept developed focuses on changes in land value irrespective of damage payments, whereas the present discussion includes damage payments. An examination of the experience of affected owners reveals that owners of partially acquired land vacant before the highway improvement received the highest return as a percent of before value, and owners of residential land had the lowest return (Table 12).

The experience of owners of agricultural land and of land in "all other" uses did not differ from the over-all median by more than 3 percent. The experience of owners of vacant parcels (with a median return as a percent of before value of 129) is also compared with that of owners of residential parcels (a median of 107) by percentage distributions (Fig. 15).

TABLE 12

VALUE RECEIVED AS PERCENT OF BEFORE VALUE[a]

| Land Use | Cases | |
|---|---|---|
| | No. | Median (%) |
| Vacant | 139 | 129 |
| Agricultural | 113 | 114 |
| Residential | 297 | 107 |
| All other[b] | 98 | 115 |

[a] Experience by land use before highway improvement.

[b] Includes wholesale and retail trade, services, manufacturing, government, and all combinations of land use.

As can be seen in Figure 15, owners of vacant parcels had fewer losses than residential property owners (11 percent vs 23 percent). A much higher proportion of owners of residential than of vacant properties realized small gains (100 to 124 percent) over the before value, whereas in each of the higher intervals of gain, owners of vacant land predominate. It is clear that owners of vacant properties generally fared better than residential land owners.

## Visibility of Highway from Remainder

A comparison of the experience of affected owners of properties from which the new highway is fully visible with those from which the highway is partially or not visible reveals an interesting pattern (Table 13). The fully visible group shows a median value received as a percent of

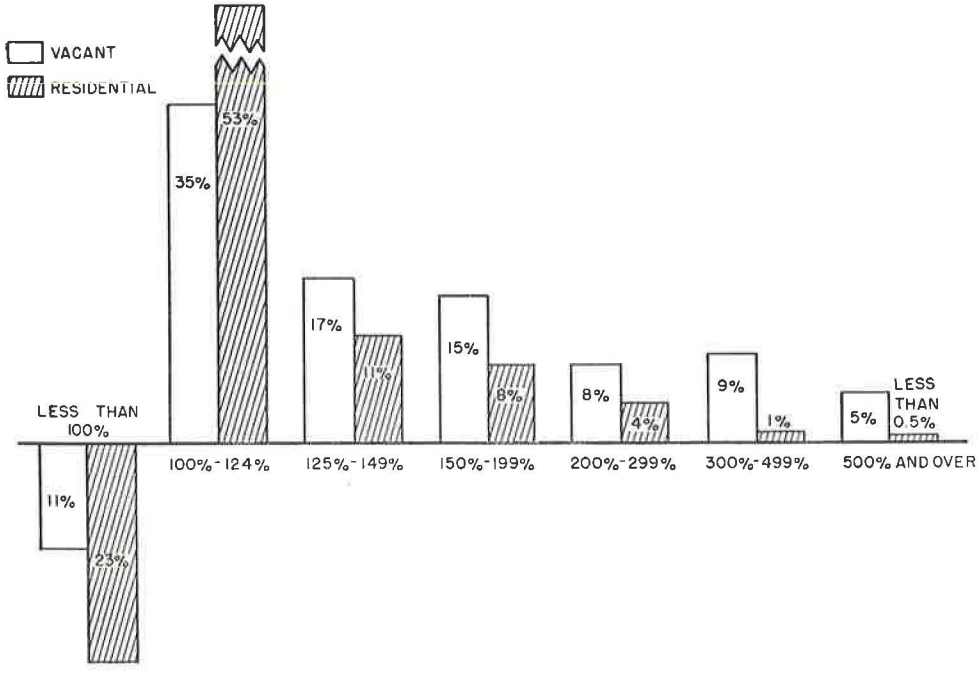


Figure 15. Percentage distribution of value received as percent of before value, by before land use.

before value of 114, slightly more than the over-all median value of 112. The partially visible group has a median slightly less than the over-all median, and the not visible group median of 105 is much less than the other groups. It should be noted, however, that the number of remainder parcels in the Bureau's bank from which the highway cannot be seen is only 27; therefore, the significance of these differences cannot be fully determined at this time.

TABLE 13

VALUE RECEIVED AS PERCENT OF BEFORE VALUE[a]

| Visibility | Cases | |
|---|---|---|
| | No. | Median (%) |
| Full | 440 | 114 |
| Partial | 156 | 111 |
| None | 27 | 105 |
| Not reported | 24 | 105 |

[a]Experience by visibility of highway from remainder.

## Nearness to Interchange

Whether a parcel was located at or near an interchange (within ½ mi) or away from an interchange had very little effect on the extent to which States met their goal to make the owner whole. The median return to owners was 112 percent of before value for both interchange and noninterchange property. Even percentage distributions of the experience of property owners in these two classifications above and below the break-even point show remarkable similarity between groups (Table 14).

TABLE 14

VALUE RECEIVED AS PERCENT OF BEFORE VALUE[a]

| Value (%) | Interchange (%) | Non-interchange (%) |
|---|---|---|
| < 100 | 18 | 22 |
| 100-124 | 48 | 44 |
| 125-149 | 12 | 14 |
| 150-199 | 11 | 9 |
| 200-299 | 5 | 5 |
| 300-499 | 4 | 4 |
| > 500 | 2 | 2 |

[a]Experience by nearness to interchange.

Thus, the experience of the 196 owners of interchange properties was very nearly the same as that of the 451 owners of noninterchange properties, so far as being made whole is concerned. This finding is in contrast to the recovery rate experience of interchange and noninterchange remainder properties discussed earlier. In that discussion, it was shown that interchange remainder properties had a median recovery rate of 164 percent vs 131 percent for parcels located away from an interchange. It appears that this contrast between the total experience of affected owners and the recovery rate experience of remainder properties resulted from appraisers' greater expectation of benefits to interchange properties than to noninterchange remainder parcels, with a consequent tendency toward a leveling off in the total experience of affected owners.

## Comparison of Aggregate Before Value with Aggregate Receipts—Entire Bank

In this section, the aggregate experience of affected owners is examined for the entire bank of partial-taking cases (where the entire remainder sold) and for various groupings

TABLE 15

COMPARISON OF AGGREGATE "BEFORE AND AFTER" VALUES[a]

| Cases | Before Value ($ × $10^6$) | Amounts Received by Owner ($ × $10^6$) | | | |
|---|---|---|---|---|---|
| | | Total | Payment For Taking | Payment For Damages | Sale Price of Entire Remainder |
| All cases: | 15.0 | 20.9 | 4.0 | 1.6 | 15.3 |
| Interchange | 3.7 | 5.8 | 1.1 | 0.3 | 4.3 |
| Noninterchange | 11.2 | 15.1 | 2.9 | 1.2 | 11.0 |
| Land use before: | | | | | |
| Vacant | 2.7 | 4.2 | 0.5 | 0.5 | 3.2 |
| Agricultural | 4.9 | 7.4 | 1.1 | 0.2 | 6.0 |
| Residential | 4.2 | 5.0 | 1.4 | 0.6 | 3.0 |
| All other uses | 3.2 | 4.3 | 1.0 | 0.3 | 3.1 |
| Type of remainder: | | | | | |
| Separated | 11.3 | 14.9 | 2.7 | 1.0 | 11.2 |
| Isolated | 1.2 | 2.8 | 0.7 | 0.1 | 1.9 |
| Landlocked | 0.2 | 0.2 | 0.1 | —[b] | 0.1 |
| All other | 2.3 | 3.0 | 0.5 | 0.4 | 2.1 |
| Type of highway system: | | | | | |
| Interstate rural | 2.3 | 3.9 | 0.5 | 0.3 | 3.1 |
| Interstate urban | 5.2 | 6.6 | 1.6 | 0.7 | 4.4 |
| FAP rural | 2.9 | 3.5 | 0.4 | 0.1 | 3.0 |
| FAP urban | 2.1 | 3.0 | 0.5 | 0.4 | 2.1 |
| FAS, local, and other State | 0.9 | 1.2 | 0.2 | —[b] | 0.9 |
| All other | 1.6 | 2.7 | 0.8 | 0.1 | 1.8 |

[a]Including State payments.

[b]Less than $50,000.

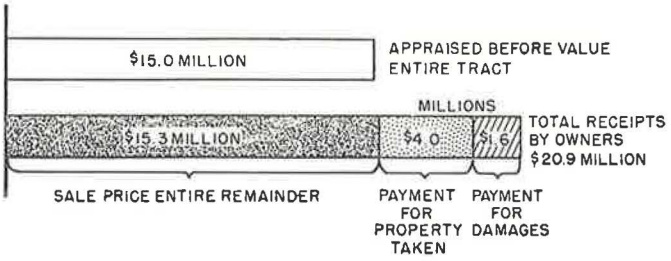


Figure 16. Aggregate appraised value before vs aggregate payments received by owners.

of these owners. For example, the total of the appraised before values of the properties of the 647 owners was $15 million. The owners of these properties were paid a total of $4 million for property taken (exclusive of damage payments) and $1.6 million in damage payments. Finally, these owners sold their remaining property for a total of $15.3 million. These findings, along with similar data for various groupings of these cases, appear in Table 15 and in Figure 16.

It is, of course, necessary to adjust for a general increase in land values in the interval between date of acquisition and date of sale. This cannot be done for individual cases, but an estimate for the group as a whole can be made. The median elapsed time between the date of acquisition by the State and the date of sale of the remainder was approximately 1¼ yr. The average percentage rise in land value, using a composite index, was 7 percent a year, or 8¾ percent in the time elapsed. Applying this index to the aggregate appraised value of the remainders at the time of the taking ($15 million - $4 million - $1.6 million = $9.4 million) produces an expected aggregate market value at the time of sale of $10.2 million ($9.4 million × 1.0875 = $10.2 million). A comparison of this estimate of the expected aggregate market value of the remainders at the time of sale with the actual aggregate sale price gives a general idea of the extent of land value increases and/or overpayments for damages. Remainders which might have been expected to sell for $10.2 million sold for $15.3 million. (This is of course an oversimplification because some State laws do not permit the use of benefits to offset the cost of taking or even to offset damages to the remainder.) Thus, a general increase in land value of the remainders of parcels partially taken for highway right-of-way was more than enough to cause the aggregate receipts of affected owners to be considerably higher than the aggregate before value of their property.

This finding, of course, should in no way be understood to mean that severance damage payments should never be made. It has already been demonstrated (Table 4) that 38 percent of affected owners did actually suffer damage and that 20 percent received either insufficient or no damage payments. In fact, the only purpose served by this kind of aggregate analysis is to indicate the outside theoretical limits of the improvement that might be made in the awarding of damages to owners of highway-severed properties. However, it appears that very careful consideration should be given to the offsetting of benefits against damage payments where appropriate, and to the offsetting of benefits against payments for property taken where appropriate and where State law permits.

## SUMMARY

It must be emphasized that the findings presented in this paper are not representative of all cases. Although information in the Bureau's bank of cases does not now permit formulas to be developed to predict the experience of remainder parcels, certain tentative observations can be made:

1. The recovery rate for cases in the Bureau's bank is typically more than 100 percent. In fact, in three out of four cases, a land value increment has followed a highway taking. The median recovery rate is now about 138 percent.

2. Certain characteristics tend to be associated with a higher-than-average recovery rate: (a) nearness to an interchange, (b) a sale at an extended period of time (e.g., over a year) after the taking, (c) a vacant (rather than, for example, residential) land use before acquisition, (d) a separated (rather than a landlocked) remainder, (e) easy access to the new highway, (f) full visibility of the highway from the remainder, and (g) proximity to a populous urban place.

3. The owner is being made whole (which approximates just compensation) in four out of five cases. Property owners who lost value generally lost very little. Gains, on the other hand, ranged from small gains to very large gains.

4. Owners of residential properties are more likely to experience losses than owners of land in other uses. Losses suffered by residential property owners may be particularly disquieting because such property owners tend to be those least able to bear losses. However, losses have been experienced by only 23 percent of the owners of residential property and, as mentioned previously, these losses have been small.

5. Gains are often associated with vacant remainders. Gains to owners of vacant property are often associated with changes of the land to a higher use. Damage payments made to owners of vacant parcels have been shown to be unrealistically high in many cases. Experience suggests that high damage payments for vacant parcels partially taken should in the future receive close scrutiny.

6. When the simultaneous effect on the recovery rate of several facts acting in combination was studied, the most influential factors were found to be (a) change in land use, (b) time elapsing from acquisition to sale, (c) travel distance to the new highway, (d) type of remainder, and (e) nearness to interchange.

For one of the groups of cases studied, a coefficient of multiple correlation of 0.86 was obtained, indicating that 73 percent of the total variation in the recovery rate was explained by the combined effect of the several independent factors used in the analysis.

## REFERENCES


1. "An Editorial." Right-of-Way, p. 5 (Oct. 1963).
2. "Manual for Highway Severance Damage Studies." U. S. Bureau of Public Roads, Washington, D. C.
3. Lewis, H., "Practical Use of Land Value Economic Studies in Right-of-Way Litigation." Paper presented at 9th Pan-American Highway Cong., OAS, Washington (May 1963).
4. Goldstein, S., "Economic Evidence in Right-of-Way Litigation." Georgetown Law Jour., 50(2):205-233.
5. "Farm Real Estate Market Developments." U. S. Dept. of Agriculture, Econ. Res. Div., C. D. 64 (Aug. 1963).
6. "16th Annual Report." Fed. Housing Admin., Housing and Home Finance Agency, p. 100 (1962).
7. "Business Statistics." (Oct. 4, 1963).
8. Kurnow, E., "Land Value Trends in the United States." Land Econ. (4):341-348 (Nov. 1960).
9. Longley, J. W., and Goley, B. T., "A Statistical Evaluation of the Influence of Highways on Rural Land Values in the United States." HRB Bull. 327, pp. 21-55 (1962).
10. "Colorado Land Economic Study—Interstate 25—North of Denver." Colo. Dept. of Highways (1963).
11. Lansing, J. B., and Blood, D. M., "A Cross-Section Analysis of Non-Business Air Travel." Amer. Stat. Assn. Jour., 53(284) (Dec. 1958).

# *Appendix*

## COMPARISON OF PRINCIPAL CHARACTERISTICS OF SUBJECT PROPERTY AND COMPARABLE

| Characteristics | Subject Parcel | Comparable Sale |
|---|---|---|
| Land use before | School | Elementary school |
| Land use after (expected) | (School) | Retail[1] |
| Size before, acres | 10 | 11 |
| Size after, acres | 8 | 8 |
| Highway characteristics | Interstate | Interstate |
| Value before, $ | 70,000 | 69,000 |
| Value of portion acquired, $ | 20,000 | 18,000 |
| Estimated benefit (+) or damage (-), $ | — | - 15,000 |
| Estimated remainder value, $ | — | 36,000 |
| Sale price of remainder, $ | — | 89,000 |
| Effect of taking, $ | — | + 38,000 |

[1] Although the elementary school was expected to continue as a school, the use changed to retail soon after the taking. In this case, which is recorded in the Bureau's bank, dollar amounts have been rounded to the nearest hundred.