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16. Abstract

Public highway agency actions limiting or denying individual property owner rights of accessing public highways is a common occurrence. Statutory laws, in most states, grant property owners rights of accessing their property from public highways. If these rights are modified, property owners are sometimes compensated. The concept that properly owner access rights may have economic value is based, in part, upon public agency compensation practices. However, very little information has ever been published regarding estimation of the value of access rights. This study is an effort to examine access rights from a legal and econometric point of view, and to develop value estimation procedures.

Access rights and their economic value are examined through an extensive review of related case law. Significant numbers of cases evolve from property owner disagreements with compensation offered by public agencies. One important fact derived from this examination is that court-mandated access right values are highly variable. The question of temporary modification or denial of access to public highways during construction or rehabilitation is also examined. Results of a survey of property owners adjacent to a recent major construction effort are included. A procedure for more thoroughly examining this issue is presented.

A two-phase effort to develop models for estimating access right values was implemented. Compensation paid by the Texas Department of Transportation (TxDOT) to property owners for access rights, as well as a number of predictor variables, was acquired from TXDOT. While large numbers of access rights acquisitions were identified, in most cases, the records did not contain documentation of specific amounts paid for access rights; that is, access rights are part of many physical property takings, but the portion of total compensation for access rights is seldom specified. Despite a lack of desirable numbers of observations, a number of econometric models were developed. These models provide, at least, a reliable starting place for estimating access rights values.

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The Value of Access Rights

conducted for the

Texas Department of Transportation

in cooperation with the

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Federal Highway Administration

by the

CENTER FOR TRANSPORTATION RESEARCH
Bureau of Engineering Research
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IMPLEMENTATION

The procedures and predictive relationships derived and presented through this study can be immediately used by Texas Department of Transportation Right of Way personnel. They can provide a reliable means of initially estimating economic value of property owner access rights. These procedures are not intended to replace an experienced appraiser opinion but can be used to enhance right of way cost estimates and even providing a reasonableness check upon appraiser opinions.

Prepared in cooperation with the Texas Department of Transportation
and the U.S. Department of Transportation, Federal Highway Administration

DISCLAIMERS

The contents of this report reflect the views of the authors, who are responsible for the facts and the accuracy of the data presented herein. The contents do not necessarily reflect the official views or policies of the Federal Highway Administration or the Texas Department of Transportation. This report does not constitute a standard, specification, or regulation. There was no invention or discovery conceived or first actually reduced to practice in the course of or under this contract, including any art, method, process, machine, manufacture, design or composition of matter, or any new and useful improvement thereof, or any variety of plant which is or may be patentable under the patent laws of the United States of America or any foreign country.

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SUMMARY

Public highway agency actions limiting or denying individual property owner rights of accessing public highways is a common occurrence. Statutory laws, in most states, grant property owners rights of accessing their property from public highways. If these rights are modified, property owners are sometimes compensated. The concept that property owner access rights may have economic value is based, in part, upon public agency compensation practices. However, very little information has ever been published regarding estimation of the value of access rights. This study is an effort to examine access rights from a legal and econometric point of view and develop value estimation procedures.

Access rights and their economic value are examined through an extensive review of related case law. Significant numbers of cases evolve from property owner disagreements with compensation offered by public agencies. One important fact derived from this examination is that court mandated access right values are highly variable. There is no generally accepted procedure for establishing the economic value of access rights, therefore, courts treat most cases individually.

The question of temporary modification or denial of access to public highways during construction or rehabilitation is also examined. Results of a survey of property owners adjacent to a recent major construction effort are included. A procedure for more thoroughly examining this issue is presented.

A two phase effort to develop models for estimating access right values was implemented. Compensation paid by the Texas Department of Transportation(TxDOT) to property owners for access rights, as well as, a number of predictor variables was acquired from TXDOT Right of Way Division files. While large numbers of access rights acquisitions were identified, in most cases, the records did not contain documentation of specific amounts paid for access rights. That is, access rights are part of many physical property takings, but the portion of total compensation for access rights is seldom specified. Despite a lack of desirable numbers of observations, a number of econometric models were developed. These models provide, at least, a reliable starting place for estimating access rights values.

CHAPTER 1

INTRODUCTION

It is often necessary for a state to purchase access rights from property owners for the purpose of constructing or improving a traffic facility. In the past, the purchase of access rights has been accomplished on a case-by-case basis. Inconsistencies in the analysis of access litigation indicate that no uniformity exists in the access rights acquisition process. Since each case is examined on its own merit, it is not unusual to find conflicting rulings within the same state.

The problem in dealing with access rights compensation lies in defining "reasonable" access. Vague descriptions in the laws prove that the definition of "reasonable" access is purely subjective. The individual judge may determine what he/she believes to be reasonable.

Kaltenbach offers a solution to this problem in "The Elastic Right–Access" [Ref 27]. He argues that access should be treated as a fixed property right, not on the basis of reasonableness. According to Kaltenbach, the right of access exists along the entire boundary between the parcel and the roadway. A property owner should be compensated for his/her access rights in proportion to the amount of access taken.

An objective of this research was to develop a mathematical model to estimate access rights compensation value in terms of physical, locational, and traffic characteristics of a property. The ultimate goal of the research team is to establish a uniform way of estimating access rights compensation so as to facilitate the implementation of access management programs.

Because this research is the first of its kind, no similar studies exist. To begin the research, access litigation and studies on related subjects were examined. When the data collection process began, it soon became apparent that limitations on data availability would require a case-specific analysis. Presented in this report are econometric models developed on a case-specific basis which estimate access rights compensation values.

Chapter 2 provides a literature review completed using access litigation and studies involving land values. Existing problems concerning access rights are given and background information on the valuation of land is provided to inform the reader about current appraisal processes. The analytical framework for the first phase of regression model development is discussed in Chapter 3. Previous research which was used in the analytical process is reviewed. A detailed description of the data acquisition process is also included in this chapter.

Chapter 4 discusses first phase model development. Following a presentation of variables used in the analysis, a thorough discussion of the descriptive statistics and of the model formulation is given. Two favorable econometric models are presented for the case study analysis. Chapter 5 presents results of an extended search for appropriate data and enhanced predictive models. Property owner access rights and their value during highway construction and reconstruction operations are discussed in Chapter 6. Finally, conclusions and recommended actions are presented in Chapter 7.

CHAPTER 2

LITERATURE REVIEW

Since this study, to the authors' knowledge, is the first of its kind, reviewing previous studies on the subject of the valuation of access rights was not a feasible task. To learn about previous access research, access litigation and studies involving land values were investigated. Contained in the following discussion are findings from background research which help define existing problems concerning access rights and valuation.

STATES HAVE ACCESS AUTHORITY

The authority to compensate for access rights, and for the loss thereof, has historically been delegated to the individual state. Although there are federal regulations to which State Highway Departments must adhere in right-of-way acquisitions, access laws vary from state to state [Ref 5]. The Supreme Court of the United States wrote,

> The right of an owner of land abutting on public highways has been a fruitful source of litigation in the courts of all the States, and the decisions have been conflicting, and often in the same state, irreconcilable in principle. The courts have modified or overruled their own decisions, and each state has in the end fixed and limited, by legislation or judicial decision, the rights of abutting owners in accordance with its own view of the law and public policy [Ref 52].

The State of Texas

The state of Texas seems to have had less access litigation than other states. The smaller number of access disputes may be due to the fact that Texas law traditionally favors individual rights. It was said in Brewster v. City of Forney, 223 S.W. 175 (See Appendix A for an explanation of the legal referencing system),

> The Constitution of Texas and the decisions of her courts reveal a zealous regard for the rights of the individual citizen. Not only will they not permit his property to be 'taken' for a public use without compensation, but will not

> permit it to be damaged unless the citizen is compensated to the extent of such damage [Ref 22].

Fewer access disputes in Texas may also be attributed to the theory TxDOT has followed regarding compensation to an owner who is left with only frontage road access. The theory, developed in the court system, states that an owner is entitled to no damages for interference with his/her direct access if he/she is provided or retains reasonable access to the through portion of the highway via a frontage road, with no consideration given to convenience, circuity of travel, or diversion of traffic [Ref 25].

Even though Texas has, for the most part, followed the above theory, divergent views exist regarding compensation to an owner left with access via a frontage road. The theory followed in State of Texas v. Meyers, 292 S.W.2d 933 (1956), stated that "if the impairment of direct access is accompanied by taking of property, the owner is entitled to damages with the frontage road to be considered in mitigation thereof" [Ref 25]. Mr. Hatch, an attorney in the Lands Division at the Office of General Counsel, Federal Highway Administration, stated,

> The right of access exists between the property and the roadway irrespective of other means of access which the property may have by reason of frontage on streets or roadways other than the one being improved through access control and upgrading. However, other means of access should be considered in mitigation of damages due the landowner [Ref 25].

THE GENERAL RULE OF REASONABLE ACCESS

Problems in dealing with access rights can be attributed to conflicting objectives set by the Federal Highway Program. The traditional objectives are: 1) to carry high volumes, and 2) to make adjacent land and facilities accessible. Because of high volumes carried by highway facilities, intense commercial development occurs along highway corridors, resulting in congestion and a reduction in the highway facility's traffic capacity. When congestion and reduction in capacity become significant, access control can be implemented by state highway officials to improve congestion problems and safety. The prevailing view from states is that an abutter is not entitled to complete access, only "reasonable" access. Consequently, a state can justify instituting access control.

An abutting land owner has the inherent right to access the public road network from his/her property. However, the traditional view held by courts is that a property owner has no absolute right to insist the highway remain available for his/her use in the same way as when it was constructed. As development along highways has occurred, the historic right of access has undergone important changes in the government's effort to control ingress and egress for public convenience. To serve the public welfare as well as the individual citizen, it becomes necessary to fix highway access at regulated points.

Each state possesses police power, which enables it to designate a regulation for the benefit of the public, making the payment of compensation through eminent domain proceedings unnecessary. A Mississippi Court stated that:

> ...The use of highways and streets may be limited, controlled, and regulated by the public authority in the exercise of the police power whenever and to the extent necessary to provide for and promote the safety, peace, health, morals and general welfare of the people... [Ref 34].

Drawing the line between a "taking" of a property right and an exercise of police power is often a difficult task. A taking occurs only when access is substantially or "unreasonably" impaired. In the words of the Minnesota Supreme Court,

> It should be noted that for practical purposes, designating a regulation as an exercise of police power is simply a convenient way of describing which activities confer a right to damages and which do not [Ref 33].

According to Kaltenbach [Ref 27], access should be considered a property right, and any denial of access along a property boundary should be considered a taking. In his opinion, the attempt to define "reasonable" access is absurd. He states,

> Since reasonable men may differ upon what is reasonable, the statement that the right to access is a most elastic right seems fully justified. This is particularly true in those cases where there is no measure or standard given upon which to determine a reasonable right to access [Ref 27].

If access were treated as a property right, the question of reasonability need not be asked. He argues that every property right, including access, should be fixed and certain, instead of "reasonable." "The police power legislation may limit the right and become a factor to consider in its valuation, but it should not change an absolute, fixed right to a reasonable one" [Ref 27].

Defining Reasonable Access

In most access litigation, acceptance of the view that only "reasonable" access need be provided is common. This allows states to liberally use their police powers as a means of controlling access, avoiding the need for eminent domain proceedings. Several factors come into play in determining whether reasonable access is provided to a property owner after a taking has occurred. Often, it is the combination of these several deciding factors which determines whether access, or loss thereof, is compensable. Cases from different states, and even within a state, will often contradict one another even though they would seem to have similar deciding factors involved. Several issues prevalent in determining whether remaining access is "reasonable" are listed below. Cases which support and repudiate the particular deciding factor are cited in Appendix B.

1) Circuity of travel - Generally, having to travel some additional distance before being able to enter or leave the property does not constitute unreasonable access.
2) Temporarily Blocked Access - When access is "significantly" blocked, the owner generally is entitled to compensation.
3) Reduction of Access - The right of access remains unimpaired if an alternative, "reasonable" means of access exists. In general, the right of access consists only of access to the system of public highways, not of a particular means of access. Reduction of access may involve the placing of curbs or even the construction of a median barrier device.

a) Median Strips - Median dividers separating lanes of travel generally do not entitle the abutting landowner to damage compensation. Placing median strips on a highway is an exercise of police power. The exercise of police power is not compensable because the government uses its inherent power to regulate movements on the highway proper rather than directly affecting rights of abutting property owners [Ref 25].

b) Curb Cuts - Curb cuts are also viewed to be an exercise of police power. Therefore, they are not compensable.

4) Cul-de-sacs - A substantial number of courts have held that when a property owner's land abuts a roadway which becomes a cul-de-sac as a result of highway improvements, the owner is entitled to compensation. Compensation is awarded based on the view that a property owner has "...an easement of way or access (which) extends along any street which his property abuts, in either direction, to the next intersecting street" [Ref 23].

5) Diversion of traffic - Property owners have no vested right to the traffic flow past their property, and the alteration of the flow is not compensable.

6) Special Injury - The owner must prove he/she has suffered a special injury different in kind and degree from that attributed to the general public in order to be compensated.

7) Access Rights for New Locations -

> Where a new highway is constructed across land where no highway previously existed, under ordinary circumstances, no access rights accrue to landowners abutting upon the new highway [Ref 20].

It is obvious from the vaguely defined factors listed above that the definition of reasonable access is a purely subjective one. Inconsistencies in the analysis of reasonable access litigation indicate that no uniformity exists, and the individual judge may determine what he/she believes to be "reasonable." Part of the problem is the failure of courts to define access as a property right. In "The Elastic Right--Access," Kaltenbach presents a conceptual, non-quantitative, solution.

> The best solution is to hold that boundary access means that the owner is entitled to cross his boundary line at every point between his property and the highway ... The extent of the right should not vary with different interpretations of what is reasonable [Ref 27].

Access should be treated as a property right, not a variable. "The variable should be the extent of damage at the time of taking, based upon the usual valuation principles including the use or potential use of the property at the time of taking" [Ref 27].

ACCESS AS A PROPERTY RIGHT

The answer to the question of property owner access rights entitlement depends upon the respondent.

> There are at least three answers: (1) a right of access at every point at which the property abuts - what might be called a "pure" right of access; (2) a right of convenient access; (3) a right if it has been used in the past [Ref 21].

Kaltenbach and several others would agree with the first answer. In People of California v. Ricciardi (144 P.2d 799, 803, 1943), the State awarded Mr. Ricciardi compensation for his right of access. It concluded that it was "not called upon to declare new rights of property in the abutting owner but to define the extent of existing rights..."[Ref 21]. In this case, access was clearly identified as a property right.

A few more cases also declare that easement of access is property, and, if it is taken, compensation should be paid. One of these is Hedrick v. Graham (96 S.E.2d 129, 1957), where the court stated that interference with the easement of access, "which is itself property, is considered ...'taking' of the property for which compensation must be allowed..." [Ref 21]. In State ex rel. Morrison v. Thelberg (350 P.2d 988, 1960), an Arizona court held that

> ...the construction of a controlled-access highway upon the right of way of the conventional highway resulting in the destruction or substantial impairment of an abutting owner's easement of access is a taking of property [Ref 21].

VALUATION OF LAND

To learn how access rights should be valued or appraised as property rights, it seemed appropriate to examine the current method of valuation for land as well as access. Discussed below are current techniques used by the Texas Department of Transportation.

When a parcel of land is taken by the state, just compensation must be offered to the property owner. Just compensation includes the fair market value of the property acquired at the date of appraisal, damages, if any, accruing to property severed from the portion taken.

> It has been suggested that an abutting landowner is entitled to compensation for limitation of access due to the conversion of a conventional highway into a limited-access highway only where a part of his land is taken in order to construct or reconstruct the new limited-access facility. However, this view is generally repudiated by law review writers as well as courts [Ref 53].

Accessibility, defined as the relative degree of effort (time and cost) by which a site can be reached, or as a location factor that will implement the most profitable use of a site in terms of ease and convenience, is an important factor which should be included in land valuation [Ref 33]. Kinney stated that commercial property values depend on consumer accessibility, which depends on the amount and character of vehicular traffic flowing by the commercial area [Ref 28].

> Analysis of a site is not complete without careful examination of its relationship to the surrounding land use patterns. This requires a study of the influence of such factors as abutting and nearby streets, contiguous and nearby sites, alleys, and traffic conditions [Ref 2].

For example, in the case of a commercial business, a corner lot means increased street frontage, more exposure, and, therefore, higher value.

To estimate a value for just compensation for the property being taken, the parcel must be appraised by a certified appraiser, if a fee appraiser is employed. Three different procedures are commonly used in the valuation or appraisal of land: the market data approach, the income approach, and the cost approach. These are discussed below.

Market data approach - The market data approach involves comparisons of the property being appraised to similar properties that have sold in the same or in a similar market area to obtain a market value estimate for the property being appraised [Ref 2]. This type of approach is essential in almost every appraisal of property. The market data approach is based on the three assumptions that there is a market for the particular property in question, that both the buyer and seller are correctly informed about the property and the state of the market for that type of property, and that the property would be available on the open market for a reasonable time [Ref 2].

Income approach - When the income approach is used, the appraiser is concerned with estimating the present value of future property ownership benefits. This approach is practical only when an income stream attributable to the real estate can be estimated [Ref 2].

Cost approach - When using the cost approach, an appraiser obtains an estimation of value of the property by adding an estimate of the replacement cost of the improvements, including depreciation, on the property to the estimated value of the land itself [Ref 2].

An appraisal submitted to the Texas Department of Transportation must contain all relevant and reliable approaches to value that are consistent with commonly accepted professional appraisal practices [Ref 36]. For a particular parcel, the value indication from only one approach may be most significant. However, when it is possible, all three approaches are applied and checked for accuracy against each other. Appraisal reports on land to be acquired by TxDOT are completed by independent appraisers and are submitted to the Department.

ACCESS MANAGEMENT

Inadequate access management may cause deterioration in service and safety of public streets. To find a solution to this problem, Congress approved Access Control Demonstration Projects in Section

150 of the Surface Transportation Assistance Act of 1978. One demonstration project selected by the Federal Highway Administration was located in Colorado. The purpose of the access control demonstration project was to

> Study the cost effectiveness of controlling access on existing highways to maintain a higher level of service and maximize the highway's flow, capacity, and safety. An after study on the project compares the effectiveness of maintaining the 'near new' design of the arterial highway by limiting the direct access to the traditional alternatives of widening and building new arterials [Ref 6].

The access control project involved purchasing access rights as well as installing new construction features which included raised medians, acceleration/deceleration lanes, frontage roads, right-in/right-out entrances, intersection modifications, and intersection signalization. Colorado's authority to implement access control is defined in the 1981 State Highway Access Code. The code recognizes that uncontrolled access leads to a cumulative negative effect on the state highway system, and regulations in the code attempt to prevent this [Ref 6].

> The authority to deny direct access without compensation when the parcel [had] alternative reasonable access to an internal subdivision street or local street system was a key element in the design and success of [the demonstration] project [Ref 6].

The Colorado project was successful in increasing travel speeds, increasing capacity, and decreasing vehicular delay on access controlled segments. Analysts also discovered that the total accident rate decreased as access management increased. The project was generally well received by the public. One reason for this may be that public participation was solicited from the onset of the project. Moreover, when compared to the cost of providing the same traffic flow improvements with new construction, the cost of access management was 34% lower. Since the cost of additional right-of-way was not included in the new construction cost estimate, the 34% difference is conservative [Ref 6].

Because of successes in access control, several states have implemented access management programs as a means of increasing traffic flow and safety in a cost-effective way. Keopke and Levinson define access management as "providing (or managing) access to land development while simultaneously preserving the flow of traffic on the surrounding road system in terms of safety, capacity, and speed" (29:2). A 1991 report stated that 71% of all governmental agencies have some type of formal access policy, and that 78% of these have been legislated into law [Ref 29].

Although access policies have been passed across the United States, few actual access management programs are in operation. Most public agencies find it difficult to distinguish between access management policies and "driveway policies" [Ref 29]. Santa Clara County in California and Lee County in Florida are two of the few counties in the United States that control access along arterials. In Florida, every property owner is provided "reasonable" facility access. Therefore, the state reasons it does not need to pay compensation to property owners for implementing partial access control.

SUMMARY

This chapter was meant to serve as a synopsis of the current problems associated with access rights compensation. The main obstacle today is defining "reasonable" access. Defining reasonable access is not an issue if access is considered a property right that exists along all parts of the boundary between the property and the adjacent roadway. From this point of view, compensation for access rights should be paid according to the amount of linear feet (meters) taken. This is the reason for developing the access rights compensation model described later.

Chapter 3 discusses the data acquisition process that was necessary for development of the compensation model discussed in Chapter 4. The model has been developed in an attempt to alleviate problems for appraisers and Texas right-of-way officials in allocating compensation for access rights. The access rights compensation model could play a role in facilitating the implementation of access management programs.

CHAPTER 3

ANALYTICAL FRAMEWORK

RELATED WORK

The idea for the development of a model which can predict the compensation value for access rights has been discussed previously. Such models might be developed using different points of view. Kaltenbach expressed a view that access should be treated as a fixed right, not an elastic one. According to his point of view, access exists at every point along the boundary between a piece of property and the roadway and any access denial along this boundary warrants compensation. The modeling approach used in the following sections uses historical TxDOT compensation and property descriptive records. The model goal is to estimate compensation for access rights using factors that are normally known or can be easily estimated.

The variable "linear feet of access" was an obvious predictive variable to include in the model. Not only does it address Kaltenbach's concept but it is a direct physical measure of highway access. Since no research studies dealing explicitly with access rights compensation could be found, studies completed on related subjects were examined and used in the access model conceptualization. From the studies, potential explanatory variables to use in this regression analysis were obtained. Many of the studies examined were attempts at modeling land values as they relate to highway improvements. In most cases, the studies characterize the value of access to the improvement as being of secondary importance. Summaries of previous work which aided in the development of a theoretical formulation of the model follow.

In "Impact of Traffic on Residential Property Values and Retail Sales in Champaign-Urbana," Kinney found that traffic did not have an important influence on the structure of residential property values [Ref 28]. Kinney stated,

> It is intuitively obvious that transportation facilities influence land values, but very little information is available regarding the cross sectional relationships of traffic and urban land values and the patterns of land use [Ref 28].

Regression analyses were performed to determine a relationship between property values and traffic volumes. Variables in Kinney's model included physical characteristics, locational attributes, and traffic factors [Ref 28]. Variables chosen for the access compensation model development process also fell into these three categories.

Skorpa and others also developed a mathematical model for predicting the impact of highway improvements on the value of adjacent land parcels [Ref 38]. Some predictor variables used in the model included parcel size, type of highway improvement, land-use type, area type (urban, urban fringe, rural), and type of access control (full, partial, or none). According to Skorpa's analysis, the type of highway improvement had the largest effect on land value, followed by area type, land-use type, access control, and size of parcel. The model given was not presented as a reliable predictive model, and appeared to be limited to cases where new highway facilities were built [Ref 38].

In another report, Skorpa and others attempted to explain the variation in land values within rural communities affected by changes in interurban transportation systems. In this study, the small community of Sealy, Texas, was used for a case study analysis. Because of data availability, the case study technique proved most appropriate. Skorpa found that traffic-serving businesses are more affected by highway facility improvements than are non-traffic-serving businesses. Consequently, highway related activities were characterized as a separate land use group. Some variables found to be the best predictors of land values included size of the parcel, land use before and after the highway change, accessibility to the public transportation terminal, accessibility to the interurban highway route, and traffic volume on the highway route. Skorpa addressed the importance of access through an accessibility index. The index was characterized by level of service near interchanges, and was described in terms of distance, interchange type, and parcel location relative to the off ramp [Ref 39].

Anderson and others attempted to determine the effect of bypasses on retail sales in a city. The data base in this study consisted of a combination of cross-sectional and time series information. Analyses included multiple regression analysis through econometric modeling, comparative trend analysis, matched pair analysis, and cluster analysis. Access was addressed as an independent dichotomous variable, taking on the value of one if the bypass was grade separated and had limited access, and zero otherwise [Ref 3].

DATA ACQUISITION

The goal of this research was to develop a multiple regression model which could predict the compensation value for access rights using physical, locational, and traffic characteristics of a property. Through analysis of previous work and expansion on Kaltenbach's ideas, appropriate variables to include in the regression analysis were chosen. Listed below is the information which was collected:

1) Date of parcel or access rights acquisition
2) Appraisal value before condemnation
3) Compensation value for access rights
4) Size of parcel in square feet (square meters)
5) Linear feet (meters) of frontage on the road being improved
6) Total street frontage, including streets other than the one being improved, in linear feet (meters)
7) Linear feet (meters) of access taken
8) Average daily traffic on the adjacent roadway at the time of acquisition
9) Block location (corner or mid-block)
10) Land-use type
11) City population
12) Distance from city center in linear feet (meters).

After determining which variables to include in the regression analysis, the data acquisition process began. Data from Texas Department of Transportation Right of Way acquisition records were made available to the research team and facilitated the acquisition process. The records provided information on individual parcels from which access rights were purchased. Only parcels where access rights were exclusively purchased could be used. This is because when access rights and land are acquired simultaneously, the value of each is not necessarily separated during the appraisal process. Consequently, in these appraisal records, it is impossible to determine the specific amount of compensation awarded exclusively to the value of access or to the value of land. For this reason, information collected was limited to those parcels where only access rights were purchased.

It soon became apparent that the database of access rights purchases was not as large as the research team would have preferred. Consequently, a sample was chosen according to data availability, not according to any random sampling technique. When the data used in model development are not randomly chosen, the reliability of the model tends to be reduced. In this case, efforts were made to maintain as statistically valid a sample as possible. These efforts are discussed in the following sections.

Methods Available for Measuring the Value of Access

Several different methods, or combinations of these, can be used to determine access compensation values. A few methods, along with their applicability to this study, are presented in the following paragraphs.

Before and After Method

The before and after technique is easy to apply and simple to understand. Some characteristic — in this case, the value of access — is measured before and after a highway improvement is made. The difference in value is then attributed to the improvement. The only characteristic measured in the before and after technique is the difference in value. Using this method, one cannot attribute the measured effect to any explanatory variables other than the highway improvements.

For this study, the before and after method was not an appropriate choice. In the case of this study, the goal is to relate the value of compensation to physical, locational, and traffic characteristics of a parcel at the time of purchase, not to a previously estimated value by which a parcel is expected to increase. The interest in this study is to relate cross-sectional characteristics, not time series characteristics, of the property to its value.

Survey-Control Area Method

A common technique used for estimating relationships is the survey-control area method. If the survey-control area method were used in this study, data would be collected on parcels where access rights were purchased and on parcels where they were not. In theory, the survey area and the control area would possess the same characteristics before highway improvements were made. Any factors, other than the highway improvement, which affect land values in the survey and control areas would be identical. After implementing the improvement, analysts could compare the increase or decrease in value of the survey area parcels to those of the control area parcels. The economic importance of access to parcels could then be determined by examining the difference in value between the survey and control areas.

The survey-control area technique could not be used in this study. No data were readily available for parcels where neither access rights nor actual land was taken. In other words, no control area was available.

Case Studies

Case studies are often combined with other methods and are used to perform a more specific analysis. The disadvantage in using the case study is that findings from it cannot claim to be universal (even if they were, the market influences are not necessarily universal). A model developed using the case study method is applicable only to those particular study conditions. The value gained from a case study lies with the fact that insights used in the specific analysis can provide ideas and form the basis for further, more general analyses.

In this study, the case study method proved to be the appropriate method. Due to limitations on data availability, a small sample of parcels, most of which are located in the same community, was chosen. The sample formed a database suitable for the purpose of performing a case study analysis. The case study method was combined with econometric modeling, the method discussed below, in the development of the access compensation model.

Econometric Models

Econometric modeling techniques are simply regression analysis techniques which attempt to estimate the functional form of dependence between economic factors and other factors. In the case of this study, compensation for access rights, the dependent variable, is expressed as a function of physical, locational, and traffic characteristics of the parcel. Econometric modeling techniques make sense only when used in connection with a strong theoretical framework. Without exception, model specifications should be derived from researcher's theories regarding the relationship that exists between variables [Ref 3].

The Influence of Data Availability

In an effort to maintain a statistically valid sample with so few data available, the case study technique was chosen as the best method for this study. In total, twenty-one cases were found in which access rights were purchased in the State of Texas. Of the twenty-one cases, thirteen are located in urban areas, and eight in rural areas. The wide variability present in several data collection categories among the rural parcels led the research team to opt for using only urban access rights acquisition cases. In the rural case, significant variability was found in parcel size, compensation, linear feet (meters) of access, and land value.

Another reason for discarding access rights parcels located in rural areas lies in the research team's theory regarding the value of access rights in urban and rural locations. The research team reasons that, in the urban case, a denial of access may decrease the value of a parcel. If the urban parcel is zoned commercial and the retail market depends on easy access to the establishment, it seems that a reduction in access will reduce land value. Conversely, in the rural case, denial of access along a parcel will most likely increase the parcel value. Usually, when a controlled-access facility is built in a rural community, the facility brings with it economic benefits. A denial of access could be interpreted as a development opportunity, thereby increasing land values in the rural area.

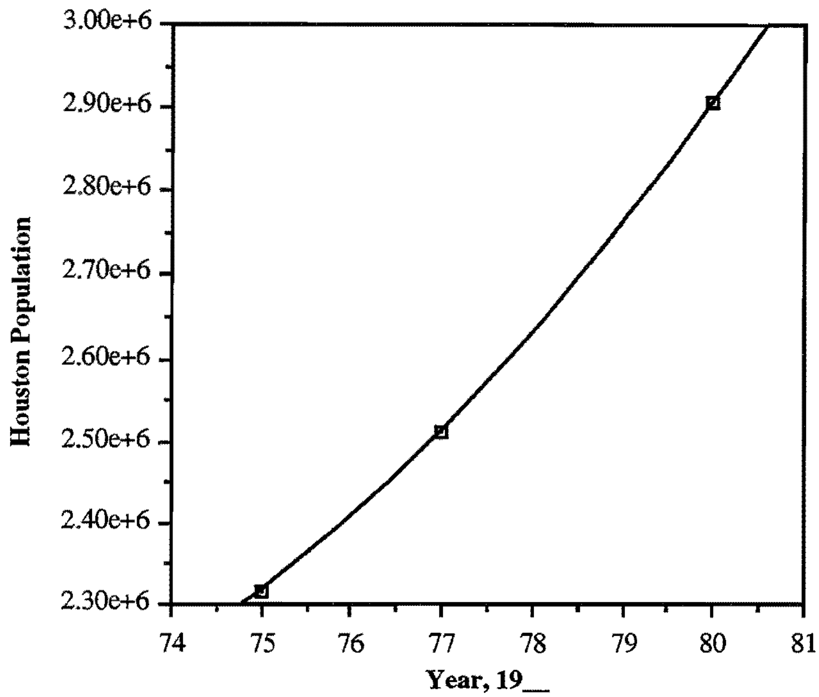
Since access control has a different effect on the value of land in urban and in rural settings, the two cases should to be treated separately, with unique econometric models describing each case. Owing to the availability of data, this study focuses on urban parcels where access rights were purchased. The data collected on each of the thirteen urban parcels are shown in Appendix C.

Collection of Data

Several parts of the data collection process were completed using Texas Department of Transportation Right of Way acquisition records. From these, the date of acquisition, compensation amount, appraisal value, size of parcel, linear feet of frontage, linear feet of access, block location, and land-use type were collected.

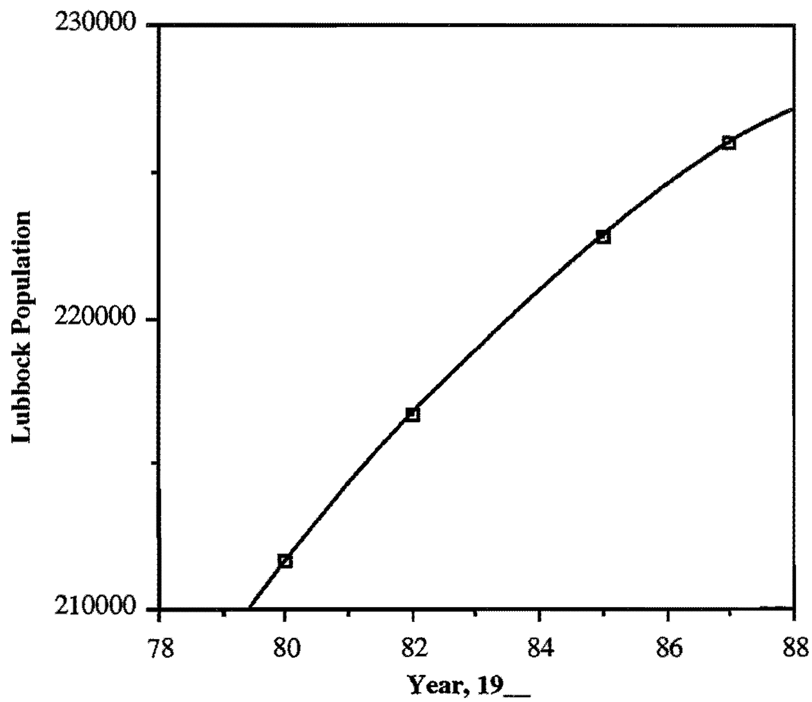
Average daily traffic values were estimated from Texas Department of Transportation average daily traffic counts and 24-hour axle counts divided by two. In most cases, the traffic volume was not given for the particular street in question. Volumes were assumed to follow a linear relationship along the street grid system, and needed volumes were estimated using linear interpolation techniques and nearby roadway volumes. Also, traffic volume counts were available only for the years 1979, 1983, and 1990. To estimate the volume for the year in which the acquisition took place, linear interpolation was used again. It is impossible to argue that the volumes derived for use in this study are one hundred percent accurate. The research team feels, however, that the volumes are on the same order of magnitude as actual volumes and are acceptable.

The database consisted of parcels located in two different cities: Lubbock, Texas, and Houston, Texas. Population values for the parcels in these two cities were calculated using Texas Almanac census data. Census population data values were plotted for each city against their respective years. By obtaining a curvilinear relationship between year and population for each city, the population of the city in the year the acquisition took place could be interpolated. The curvilinear plot for Houston, Texas, is shown in Figure 3.1, and for Lubbock, Texas, in Figure 3.2. The equations of the curves, shown at the bottom of Figure 3.1 for Houston and of Figure 3.2 for Lubbock, were those used for the population calculations.



$y = 3.3518e+7 - 9.1637e+5x + 6671.4x^2 \quad R^2 = 1.000$

Figure 3.1. Houston Population Curve Fit



$y = -1.1976e+6 + 3.8962e+4x - 347.59x^2 + 1.0095x^3 \quad R^2 = 1.000$

Figure 3.2. Lubbock Population Curve Fit

The distance of each parcel from its city center in linear feet (meters) was collected using city maps. Reasons for the collection of this piece of information lie in the assumption that the closer the parcel is located to the city center, the more valuable the land. In this study, the city center was assumed to be the location of the City Hall building.

Obtaining a Common Base for Analysis

Since the parcels which compose the database were acquired in several different years, monetary values had to be converted to a common year so that an accurate analysis could be performed. After extensive searching, no land value index for urban areas in the State of Texas could be found. For lack of a better index, the consumer price index was used. The consumer price index for the Southern region of the United States cross classified with the population of an urban center was used for the parcels located in Lubbock. Since the city of Houston is listed separately under selected local areas, the consumer price index for Houston was used for parcels located in the Houston area. All monetary values were converted to June 1992 dollars.

SUMMARY

The variables used in the following analysis were derived from Kaltenbach's theories, from studies performed on related subjects, and from the research team's theoretical framework. As discussed in the above sections, the availability of data limited the analysis to that of a case study. As a result, the model presented in the next chapter does not attempt to be a universal one. It is intended to be used as a stepping stone for further, more general, analyses. Discussed in Chapter 4 is the first phase model development and other analyses.

CHAPTER 4

MODEL DEVELOPMENT

Chapter 4 presents two case-specific econometric models. As discussed in Chapter 3, the availability of data describing access rights compensation (apart from other compensation) limited the analysis to that of a case study composed of a thirteen observation sample. The research team does not maintain that the results presented in Chapter 4 are universal. While reviewing this Chapter, the reader is asked to remember that the important aspect of this research is in the conception of the access rights compensation model, not in the case-specific model specifications presented.

Defined below are the variables used in the model development process. A discussion of the case-specific models follows.

PREDICTOR VARIABLES

The following variables were used in determining the best predictive model for access rights compensation:

COMPEN - The dependent variable. Compensation paid by the Texas Department of Transportation for access rights, converted into June, 1993 dollars.

APPB4 - A predictor variable denoting the appraised value of the parcel before access acquisition occurred, in June, 1993 dollars.

SIZE - Area of the parcel in square feet (square meters).

COSTSQFT - The appraised value of the parcel divided by its size (COSTSQFT = APPB4/SIZE).

FRONT - Linear feet (meters) of frontage on the road being improved.

ACCESS - Linear feet (meters) of access taken.

TOTFRONT - Total linear feet (meters) of frontage on all sides of the parcel, not just the side on which the roadway is being improved.

RATIO1 - Linear feet (meters) of access taken divided by linear feet (meters) of frontage on the roadway being improved (RATIO1 = ACCESS/FRONT).

RATIO2 - Linear feet (meters) of access taken divided by linear feet (meters) of frontage on all sides of the parcel (RATIO2 = ACCESS/TOTFRONT).

ADT - Average daily traffic on the road being improved at the time of access rights acquisition.

LOC - A dichotomous variable denoting the location of the parcel within the block. Location is assigned a value of one if the parcel is located on a corner, and zero otherwise.

POP - The population of the city in which the parcel is located in the year of the access rights acquisition.

DIST - The airline distance in linear feet (meters) from the parcel to the city center. The location of City Hall was used to denote the city center.

MANUF, COMM, HWCOMM - Three dichotomous variables used to denote land-use type. MANUF takes on the value of one if the parcel has a land-use classification of manufacturing, and zero otherwise. COMM takes on the value of one if the parcel is commercially zoned and its viability does not depend on highway-related activities. HWCOMM takes on the value of one if the parcel is zoned commercial and its viability *does* depend on highway-related activities; it's value is zero otherwise. When all three variables MANUF, COMM, and HWCOMM take on the value of zero, the base category is represented. The base category indicates any other zoning designation — single-family residence, for example.

In "Land Value Modeling in Rural Communities," Skorpa stated, "Previous impact studies seem to indicate that highway-related activities should be separated as one land-use group" [Ref 39]. For this reason, in this regression analysis, those parcels on which highway related businesses existed were separated from those on which non-highway-related businesses existed.

DESCRIPTIVE STATISTICS

Normality

Tests of statistical significance on multiple regression coefficients are based on assumptions about the predictor variable distributions. One assumption is that variables follow the normal distribution. Before regression analysis is performed, it is always a good idea to examine the distributions of major variables of interest [Ref 40].

Histograms for several variables in this analysis did not seem to indicate normality. Figures 4.3, 4.4, and 4.5 show histograms for variables compensation (COMPEN), appraised value per square foot (COSTSQFT), and average daily traffic (ADT), respectively. In looking at the plots, it is obvious that the data distributions do not resemble the normal distribution. One could argue that, as more cases are added to the database, the distribution of each variable will approach normality. If a large sample proved to follow a non-normal distribution, a variety of transformations could be used to solve the problem. In this case, however, the sample size is not large enough to disprove any normality assumptions.

The small sample size used in the development of the model carries disadvantages with it. With a low sample size, estimates from the regression model are probably very unstable and unlikely to replicate if one were to repeat the study. It is significant to note that in this case, the concept of the access rights compensation model is the important element, not the regression model itself. The concept of the model is illustrated using case-specific data composed of thirteen cases, since this was the largest database which could be accumulated.

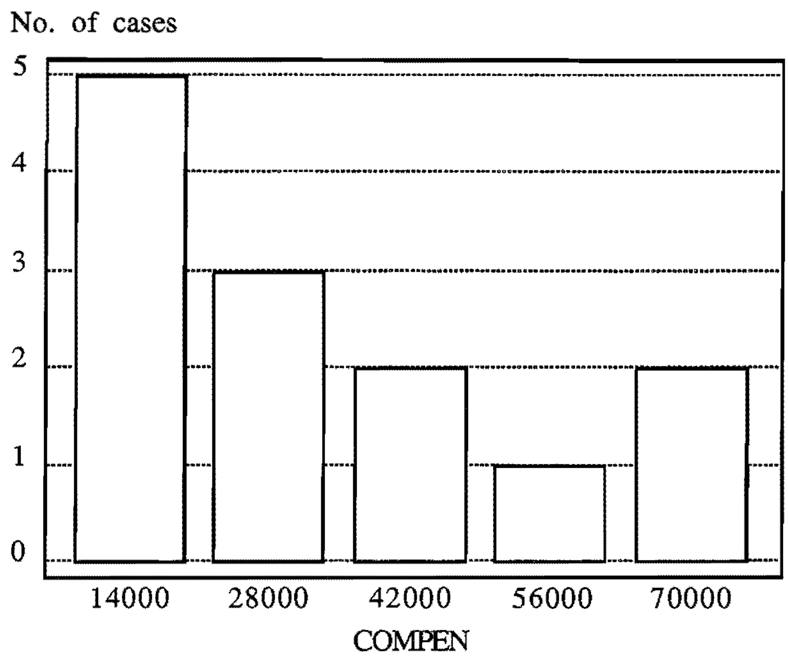


Figure 4.3. Histogram of Variable COMPEN

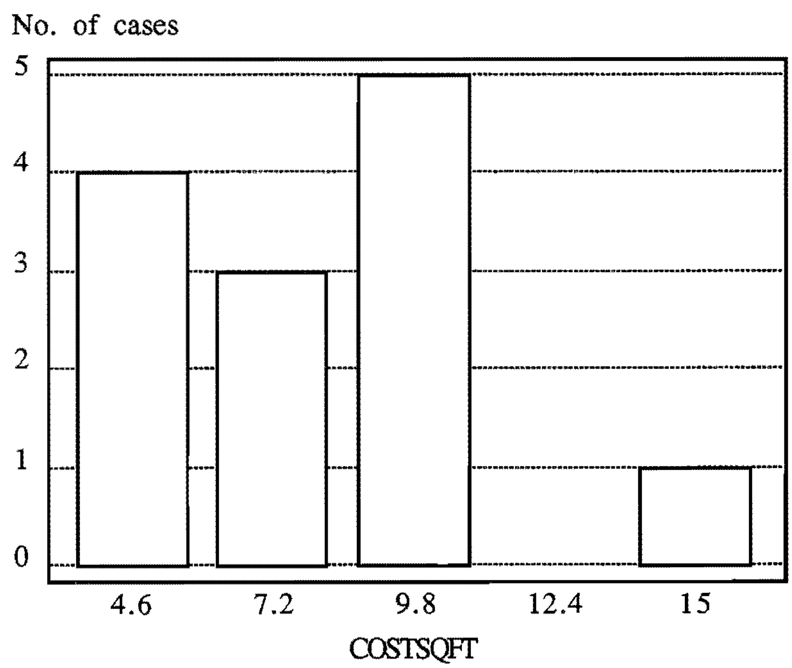


Figure 4.4. Histogram of Variable COSTSQFT

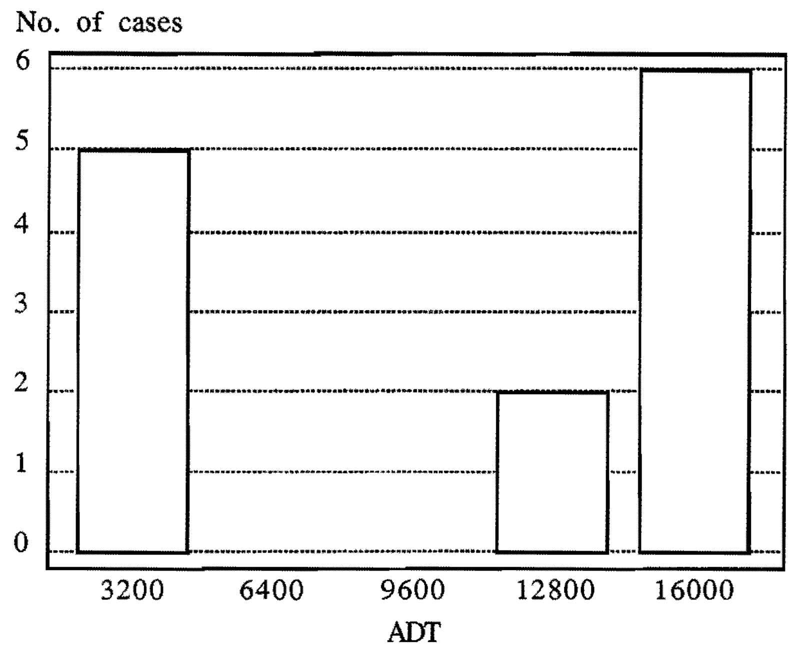


Figure 4.5. Histogram of Variable ADT

Assumption of Linearity

Another assumption in linear regression analysis is that a linear relationship exists between variables. In reality, this assumption can almost never be confirmed. However, linear regression analyses are not greatly affected by minor deviations from the linearity assumption. Usually, bivariate scatter plots are examined to study relationships between variables. If non-linear relationships appear, then transformations are performed on variables to allow for nonlinear components [Ref 40]. In the case of this study, the sample size was not large enough to identify curvilinear relationships. In other words, the assumption of the linear relationship between variables could not be disproved.

Correlation

In correlation analysis, the primary objective is to measure the strength or degree of linear association between two variables. It may be unwise to include two predictor variables in the same linear regression model if they are highly correlated. If both are included, one predictor variable will be almost completely redundant with another predictor variable, a problem termed multicollinearity.

Multicollinearity can lower the significance of each independent predictor, "fooling" the analyst into believing that neither variable has a significant model effect. In reality, one variable may be a surrogate for the other, with both variables being indicators of the same basic variability.

The correlation matrix for the variables used in this analysis is shown in Table 4.1. High correlation coefficients are emphasized in Table 4.1 with thicker outline segments. During regression analysis, special attention should be given to these highly correlated variables. Variables with a strong degree of linear association are discussed in the following paragraphs.

The two variables POP and DIST have a correlation value of 0.99548. This high degree of correlation is somewhat unexplainable since there is no intuitive relationship between a city population and parcel location. The high correlation coefficient is probably coincidental. Nevertheless, careful attention was given to the inclusion of both variables in the same model formulation.

Other high correlation coefficients exist between variables which characterize feet (meters) of frontage. The degree of linear association between FRONT and TOTFRONT is 98.6% (correlation coefficient = 0.98553) and between FRONT and RATIO1 is 85.2% (correlation coefficient = -0.85230). The highly linear relationship between FRONT and TOTFRONT is fairly obvious, since the number of linear feet of frontage on the improved road is probably some fraction of the total parcel frontage. Since FRONT is the denominator of the RATIO1 variable, the high correlation coefficient between the two is not surprising. As a remedy, only one variable which characterizes frontage is included in the model at any one time. For example, only one of the variables RATIO1, RATIO2, FRONT, or TOTFRONT is included in any particular model specification. The high correlation coefficients between these variables were expected. All were included in the pool of variables used to estimate the compensation model so that several options could be examined in searching for the most appropriate model.

High correlation coefficients were calculated between SIZE and APPB4 (0.91828), ACCESS (0.85468), FRONT (0.96415), and TOTFRONT (0.96824). Like those discussed in the previous paragraph, these correlations are intuitively obvious. A large parcel has a greater amount of frontage on the improvement, total frontage, and linear feet (meters) of access than a small parcel. Careful consideration was given to including the SIZE variable in the

TABLE 4.1 CORRELATION MATRIX FOR ALL VARIABLES

Variable	COMPEN	APPRB4	SIZE	COSTSQFT	ACCESS	FRONT	TOTFRONT	RATIO1
COMPEN	1.00000	0.13129	-0.14239	0.70778	0.18834	-0.16321	-0.21348	0.40171
APPB4	0.13129	1.00000	0.91828	-0.01658	0.87437	0.90303	0.85587	-0.77216
SIZE	-0.14239	0.91828	1.00000	-0.33932	0.85468	0.96415	0.96824	-0.82868
COSTSQFT	0.70778	-0.01658	-0.33932	1.00000	-0.17833	-0.28749	-0.36151	0.27392
ACCESS	0.18834	0.87437	0.85468	-0.17833	1.00000	0.80903	0.79130	-0.54935
FRONT	-0.16321	0.90303	0.96415	-0.28749	0.80903	1.00000	0.98553	-0.85230
TOTFRONT	-0.21348	0.85587	0.96824	-0.36151	0.79130	0.98553	1.00000	-0.82600
RATIO1	0.40171	-0.77216	-0.82868	0.27392	-0.54935	-0.85230	-0.82638	1.00000
RATIO2	0.27586	-0.36781	-0.51991	0.43287	-0.36998	-0.50782	-0.60043	0.45990
ADT	0.14776	-0.16374	-0.12534	-0.09118	-0.00292	-0.21113	-0.20860	0.29825
LOC	0.12387	0.37775	0.34125	-0.19792	0.56594	0.37594	0.39333	-0.20692
POP	0.04501	-0.24610	-0.19016	0.10533	-0.23220	-0.16773	-0.18611	0.18165
DIST	0.01788	-0.22410	-0.15941	0.06695	-0.19804	-0.13237	-0.15369	0.15839
MANUF	-0.30149	-0.36476	-0.25114	-0.33759	-0.36829	-0.25728	-0.21064	0.26953
COMM	0.55771	0.62814	0.48660	0.31654	0.61074	0.46605	0.43191	-0.38665
HWCOMM	-0.00780	-0.35371	-0.27199	0.07440	-0.38609	-0.26403	-0.21487	0.26953

TABLE 4.1 CORRELATION MATRIX FOR ALL VARIABLES (CONT)

Variable	RATIO2	ADT	LOC	POP	DIST	MANUF	COMM	HWCOMM
COMPEN	0.27586	0.14776	0.12387	0.04501	0.01788	-0.30149	0.55771	-0.00780
APPB4	-0.36781	-0.16374	0.37775	-0.24610	-0.22410	-0.36476	0.62814	-0.35371
SIZE	-0.51991	-0.12534	0.34125	-0.19016	-0.15941	-0.25114	0.48660	-0.27199
COSTSQFT	0.43287	-0.09118	-0.19792	0.10533	0.06695	-0.33759	0.31654	0.07440
ACCESS	-0.36998	-0.00292	0.56594	-0.23220	-0.19804	-0.36829	0.61074	-0.38609
FRONT	-0.50782	-0.21113	0.37594	-0.16773	-0.13237	-0.25728	0.46605	-0.26403
TOTFRONT	-0.60043	-0.20860	0.39333	-0.18611	-0.15369	-0.21064	0.43191	-0.21487
RATIO1	0.45990	0.29825	-0.20692	0.18165	0.15839	0.26953	-0.38665	0.26953
RATIO2	1.00000	0.32381	-0.60363	0.67653	0.67602	-0.09506	-0.31382	0.24831
ADT	0.32381	1.00000	-0.16815	0.25760	0.31268	-0.54970	-0.12801	0.37249
LOC	-0.60363	-0.16815	1.00000	-0.43300	-0.42435	-0.17767	0.38576	-0.17767
POP	0.67653	0.25760	-0.43300	1.00000	0.99548	-0.12404	-0.31068	0.67682
DIST	0.67602	0.31268	-0.42435	0.99548	1.00000	-0.16629	-0.32098	0.66970
MANUF	-0.09506	-0.54970	-0.17767	-0.12404	-0.16629	1.00000	-0.46057	-0.18182
COMM	-0.31382	-0.12801	0.38576	-0.31068	-0.32098	-0.46057	1.00000	-0.46057
HWCOMM	0.24831	0.37249	-0.17767	0.67682	0.66970	-0.18182	-0.46057	1.00000

access compensation model when any of the four variables with which it is highly correlated were also included.

The APPB4 variable has high correlation coefficients with ACCESS (0.87437), FRONT (0.90303), and TOTFRONT (0.85587). Again, the relationship is intuitive. Since frontage increases property value by providing an indication of prominence and accessibility, a parcel with a large amount of frontage and access will be appraised at a higher value [Ref 2].

To alleviate problems with high degrees of linear association between SIZE and other variables and APPB4 and other variables, the variable COSTSQFT, a ratio of APPB4 and SIZE, was created. As shown in the correlation matrix, this variable has no problems with multicollinearity.

FORMULATION OF THE MODEL

Several different combinations of available variables were used to obtain the best predictive model. The entire set of regression analyses results is given in Appendix D. A few interesting combinations are shown in Table 4.2. The parameter estimate is presented for each variable included in the model, with its t-statistic value given in parentheses underneath. Each column represents a different combination, or model specification, used for predicting access rights compensation. At the bottom of each column is the R-squared value. The R-squared value describes the proportion of variation in the dependent variable explained by independent variables. The higher the R-squared value, the better the model predictive power.

The regression analysis results presented in this text were completed using data in both the English and the metric form. As long as the choice of units is consistent, parameter estimates, intercept values, R-squared values, and t statistics have the same value, regardless of the unit used.

TABLE 4.2. PREDICTOR VARIABLE COEFFICIENTS AND "T" STATISTICS

Independent Variable	Equation 1	2	3	4	5	6
SIZE						-.6 [-4.104]**
COSTSQFT	7264.5 [7.790]**	6763.6 [2.987]**	5491.8 [5.355]**		5192.4 [3.323]**	
ACCESS	74.5 [1.902]*			-50.7 [-0.429]		359.7 [3.098]**
RATIO1		-4046.6 [-0.115]				
RATIO2			27827.7 [1.861]			
ADT	3.1 [5.750]**	3.2 [2.216]**	2.7 [4.700]**	1.4 [0.860]		
LOC	13157.6 [2.314]**	17185.4 [1.832]	20693.7 [3.500]**	795.3 [0.044]		-18344.0 [-1.776]
MANUF	59317.9 [5.607]**	56065.9 [2.176]**	53433.6 [5.226]**	22954.4 [0.731]		20699.5 [1.489]
COMM	27954.9 [3.915]**	32599.9 [3.642]**	37440.1 [5.222]**	46873.9 [2.110]**		44491.1 [3.971]**
HWCOMM	14571.4 [1.925]*	11600.0 [1.194]	13954.5 [1.841]	20722.5 [0.832]		35986.1 [2.580]**
R-squared	0.9607	0.9324	0.9599	0.4833	0.5010	0.8476

**Significant at 95% Confidence Level
* Significant at 90% Confidence Level

Equation 1

The model specification with the most desirable results is labeled Equation 1 in Table 4.2. The specification and associated parameter estimates are shown in complete form below (t-statistics are reported in parentheses).

$$\text{COMPEN} = -96422 + \underset{(7.790)}{7264.5\ \text{COSTSQFT}} + \underset{(1.902)}{74.5\ \text{ACCESS}} + \underset{(5.750)}{3.1\ \text{ADT}} + \underset{(2.314)}{13157.6\ \text{LOC}} + \underset{(5.607)}{59317.9\ \text{MANUF}} + \underset{(3.915)}{27954.8\ \text{COMM}} + \underset{(1.925)}{14571.4\ \text{HWCOMM}} \qquad \text{(Eq 1)}$$

The most significant predictor variable is COSTSQFT, or the appraised value per square foot (meter). COSTSQFT was expected to be highly significant, since a parcel with a high appraised value will in all probability yield high compensation for access. A regression analysis performed using only COSTSQFT (Table 4.2, Equation 5) shows an R-squared value of 0.501, meaning that the single variable COSTSQFT can account for 50 percent of all variation. With the aid of additional explanatory variables in the model specification, the R-squared value increases to 0.9607, a very encouraging result. Variables COSTSQFT, ADT, LOC, MANUF, and COMM are significant at the 95 percent level. ACCESS and HWCOMM are significant at the 90 percent level. All variables have a positive parameter estimate, meaning that as the value of each variable increases, the value of compensation increases.

Theoretically, the variable ACCESS was considered one of the most important explanatory variables. While significant here at the 90 percent level, linear feet (meters) of access did not play as important a role in the estimation technique as was expected. Instead, the appraisal value per square foot (meter) and average daily traffic proved to be the most significant predictors.

Several explanatory variables were not included in the model specification. Two locational characteristics, population and distance from city center, did not prove to be significant predictors. Also, of the many variables which characterized access and frontage, ACCESS, FRONTAGE, TOTFRONT, RATIO1, and RATIO2, the best predictor was ACCESS. Equations 2 and 3 in Table 4.2 show examples of model specifications which use RATIO1 and RATIO2, respectively, rather than ACCESS. In these model specifications, the R-squared values are slightly lower. More importantly, RATIO1 in Equation 2 and RATIO2 in Equation 3 are not statistically significant at an acceptable level.

Out of the three dichotomous variables representing land-use type, MANUF and COMM proved to be statistically significant at the 95 percent level.

HWCOMM, a variable which was given high theoretical expectations, did not prove to be a very important predictor. While significant at the 90 percent level, highway-related commercial businesses did not have as significant an effect on compensation values as was expected.

A positive aspect of this model specification is the high percent of variation (R-squared value) that can be explained with so few explanatory variables. A model with a high R-squared value and as few explanatory variables as possible is always the desired outcome. Shrinking the number of explanatory variables reduces data acquisition costs. In this model specification, only five explanatory variables were used. The three dichotomous variables, MANUF, COMM, and HWCOMM, are actually describing one characteristic, land-use type, and can be grouped into one category.

Another encouraging result is the standard error of estimate value. The standard error of estimate is the standard deviation of the dependent variable values (COMPEN values) about the estimated regression line [Ref 24]. It is often used along with the R-squared value as a summary measure of goodness of fit of the estimated regression line. The standard error of estimate is compared to the mean value of COMPEN to determine the model's goodness of fit. If the standard error of estimate is a small percentage of the mean value, the standard deviation is relatively small, meaning that the value of COMPEN can be estimated with greater precision. As the standard error of estimate becomes a significant percentage of the mean value of COMPEN, the precision with which COMPEN can be estimated is no longer as great. In this case, the standard error of estimate is $7,228.54, 28.8 percent of $25,093.20, the mean value of the dependent variable COMPEN. Although not an ideally small percentage, 29 percent indicates that the value of Y can still be predicted within an acceptable range. However, consideration should be given to using the model for predicting final right-of-way costs. Instead this model may be better suited to estimating preliminary right-of-way costs, where a 30 percent deviation from the actual cost is often acceptable.

Residual Analysis

A residual analysis was completed on the model specification to check for heteroscedasticity problems. When predicted values for COMPEN were plotted against squared residuals, the results appeared to be slightly heteroscedastic (Figure 4.6). By using the Park test to prove that the residual distribution could not be explained by any of the predictive variables, the assumption of homoscedasticity was validated.

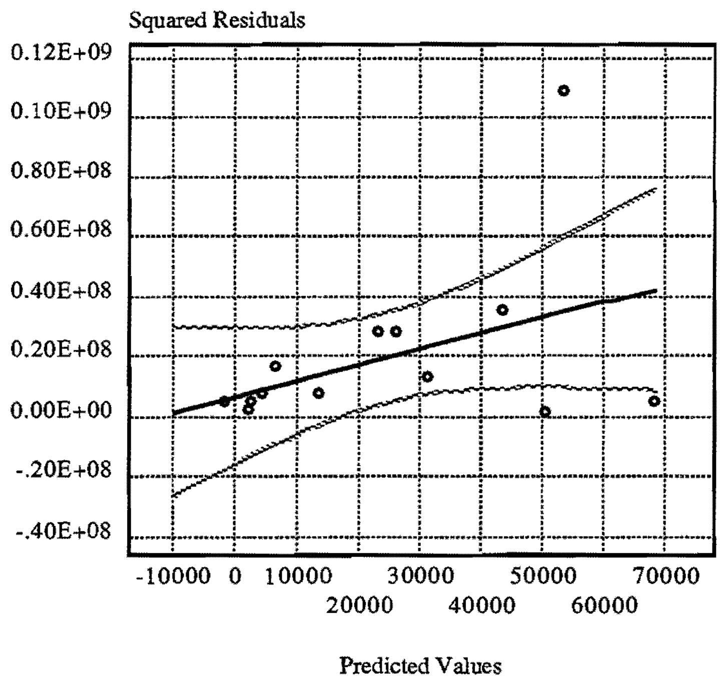


Figure 4.6. Plot of Squared Residuals Versus Predicted Values for Regression Equation 1

Equation 6

Equation 6, presented in Table 4.2 and below, is another powerful model specification. This model predicts compensation for access using physical parcel characteristics.

$$
\begin{aligned}
COMPEN = \; & -21290 - \underset{(-4.104)}{0.6\,SIZE} + \underset{(3.098)}{359.7\,ACCESS} - \\
& \underset{(-1.776)}{18344.0\,LOC} + \underset{(1.489)}{20699.5\,MANUF} + \underset{(3.971)}{44491.1\,COMM} + \\
& \underset{(2.580)}{35986.1\,HWCOMM}
\end{aligned}
\qquad \text{(Eq 6)}
$$

In this model, neither the appraised value of the parcel nor the average daily traffic passing by the parcel is needed. Although the R-squared value is not as high in this model specification (0.8476), the amount of data which needs to be acquired is significantly less, a tradeoff which should be carefully weighed. The standard error of estimate for this model specification is $12,988.38, 51.7 percent of $25,093.20, the mean value of the dependent variable COMPEN. The high percentage indicates that the value of COMPEN cannot be predicted within tight, precise intervals. Using this model, a right-of-way official needs only to know the physical dimensions of the property and its zoning designation. With so few data required, a model of this type could be an extremely important tool in predicting preliminary access rights compensation costs and could save the state a significant amount of money in future right-of-way costs. However, a significant amount of work needs to be accomplished to attain an acceptable standard error of estimate value. Although the R-squared value of the model is sufficient, a better standard error of estimate value is needed so that the value of COMPEN may be predicted with greater precision.

In the first attempt to develop a model using only physical characteristics of the property, Equation 4 in Table 4.2 was used. The model specification is the same as that of Equation 1, simply without the COSTSQFT variable. The low R-squared value of 0.4833 indicates the poor predictive capability of the model. By adding the explanatory variable of SIZE, the predictive capability of the model increased to almost 85 percent, with SIZE being the most significant predictor variable. SIZE, ACCESS, COMM, and HWCOMM proved to be statistically significant at the 95 percent level. LOC and MANUF are significant at the 88 percent and 82 percent level, respectively.

The reader may recall that SIZE and ACCESS are highly correlated, with a correlation coefficient of 0.85468. Since both variables are statistically significant in this model, any multicollinearity problems between the two do not affect the model specification.

A plot of predicted values against squared residuals showed no evidence of heteroscedasticity (Figure 4.7).

SUMMARY

This chapter presented case-specific models developed to estimate access rights compensation values. Variables used in model development were presented and defined. After discussing descriptive statistics, two favorable models were presented. The first model, Equation 1 in Table 4.2, has the highest predictive power of all the model specifications. All explanatory variables are statistically significant to at least the 90 percent confidence level. The second model presented, Equation 6 in Table 4.2, gives a specification framework which can be used for obtaining rough cost estimates. This model was not as high in predictive capacities and did not prove to be a "good fit" when the standard error of estimate value was analyzed. A positive element of Equation 6 is that it does not use as many predictor variables. With further research on the framework of this model, a similar specification could be used to estimate preliminary right-of-way costs when little in the way of data is available.

Chapter 5 presents second phase model development based upon an expanded data base, and variable transformations.

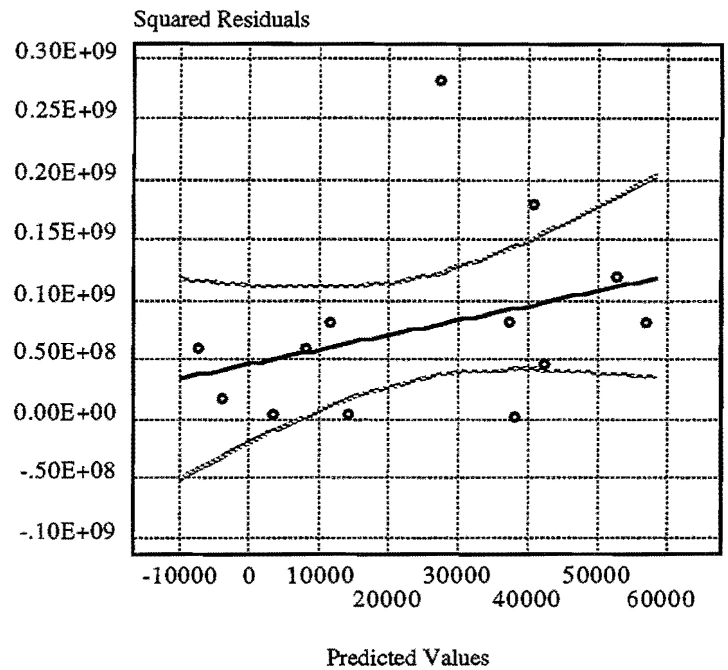


Figure 4.7. Plot of Squared Residuals Versus Predicted Values for Regression Equation 6.

CHAPTER 5

ENHANCED MODELS

As noted previously, the principle of access rights valuation in the United States was developed before the era of extensive highway construction. However, valuation was required only on rare occasions connected mainly with corporate reorganization and bankruptcy proceedings. By the mid 1940's the establishment of controlled-access highways forced state highway agencies to acquire, in a large scale, access rights of roadside property owners. The lack of precedents in access rights acquisitions, other than those related to tangible forms of property, caused agencies to develop access rights valuation procedures.

The determination of property market value before and after the considered taking has been the most commonly used procedure. Nevertheless, in theory, this procedure is not feasible for access rights because there is a limited market for access rights. Application of the before and after test to an access right is not as simple as for a tangible property that has its own marketable status. Hence, other factors most be considered in access rights valuation.

BACKGROUND

Even though the predictive power of the models of the preceding chapter is very high, they are constrained to a case study basis. The research team was unable to locate a large random sample from the right of way acquisition information files provided by the Texas Department of Transportation Right of Way Division. Thirteen cases of exclusive access rights purchases in *urban* areas were found. Since appraisers do not specify the portion of the appraised value for damages attributed to access, data uniquely describing appraised access rights values were not generally available. Therefore, models were developed using case specific data.

However, the high predictive capability of the models and inherent constraints provided insight for further analysis. The development of a universal model is feasible with a significant data base enlargement. Moreover, considerations of the traffic generation capacity of a property injured by access control present a reasonable subsequent research approach.

The research team studied the interrelation of land use and traffic demand by analyzing land use trip generation data contained in the *Trip Generation Handbook* of the Institute of Transportation Engineers [33]. In this reference, a wide selection of studies conducted by different entities has been compiled and presented by ITE. The objective was to incorporate the land use and traffic demand interrelation in the analysis as a predictive factor.

Access considerations vary in importance among various land use classifications. A selected group of land use types is presented and, for these, the function of highway access deserves close study.

TRIP GENERATION

The ITE Trip Generation Handbook presents trip generation rates for literally hundreds of different land uses and time periods. These data were examined to identify similarities among rates and different land uses. Despite clear exceptions within categories, six major land use categories were identified as having common within category features. These are described through the following paragraphs.

Commercial Zones

More than any other factor, economic activity is responsible for the existence of urban communities and urban community growth. Typically a metropolitan region is composed of a central business district, main business thoroughfares, secondary commercial sub centers serving neighborhoods, small commercial clusters and in the outer edges of the metropolitan area, large regional shopping centers. Commercial development constitutes a geographic framework for the metropolitan community's structure. The land-use characteristics as well as the access needs of each commercial district differ. For evaluating access control effects, the appraiser must be aware of what goes on in each district.

The CBD is typically the place where most major traffic arteries converge. In its core are the major office buildings, hotels, banks, and centers of professional services. In the largest cities the CBD is characterized by the highest concentration of trucks, taxis, mass-transit vehicles and pedestrians. In these types of cities, for instance New York City, taxi or mass-transit travel is most practical. Therefore, passenger car access is not a primordial need, but vehicular access for freight trucks is very important. However, in cities with high auto dependency, Los Angeles for instance, passenger car access might be an urgent need.

Outside the CBD, the main businesses consist of retail commercial and service establishments. Streets linked to these developments are heavily traveled by most existing transportation modes and the traffic generation potential is extremely high. Sites abutting these streets are preferred locations for dealerships, furniture and appliance stores, a wide range of consumer goods and services and light manufacturing. Access is needed for customers and freight trucks.

Large shopping centers are among the largest traffic generators of any metropolitan region. Parking areas of such centers normally occupy from three to nine times the space devoted to stores and storage structures. Accessibility is an extremely important factor in shopping center site location, and adequate means of access both to the customer parking areas and motor freight loading vehicles are prominent considerations

Generally commercial land uses have the largest trip generation rates. Table 3 presents, for 42 generic land uses, average daily trip ends per 1000 square feet of flow area and per acre. The 14 largest trip generation rates, cases 33 through 46, constitute commercial land uses.

Institutional Sites

Institutional sites present difficulty for access valuation because of the variety of specialized institutions such as, schools, universities, hospitals, churches, and theaters. Nevertheless, there is a common factor among them. Most institutional land uses are significant generators of traffic and are seriously handicapped if adequate parking space and convenient access to adjacent streets are not provided. Cases 24 through 32, of Table 3, are institutional land uses and they have daily trip generation rates that rank just below the top ranked commercial generators.

Urban Residential Areas

Urban residential areas are characterized by multiple-unit residential property. These multiple-unit residences are normally located near freeways enjoying easy accessibility to principal thoroughfares for long-distance trips and easy access to offices, factories, and commercial centers. Though not the largest trip generators, the strong likelihood of many units occupying small land areas can create very large numbers of trip ends. In Table 5.3 these land uses are characterized by Cases 13 through 17 and 21 and 22.

Suburban Residential Areas

For suburban residents, accessibility is a very important consideration. The main factors involving suburban residential site selection are the surrounding neighborhood and accessibility to commercial, industrial and other centers. Direct access to a main highway is not a controlling element and is sometimes considered undesirable.

Studies conducted in California, Colorado, Oregon, Texas, Virginia, and Washington [20] revealed that control of direct access from a residential site to a highway has a minor influence on market value in comparison with factors such as general accessibility of the parcel, lot size and improvements. Where alternatives, such a frontage road or secondary street access, are available, compensation due to denial of direct access is in most cases negligible.

Deterioration of property values of residents adjacent to a controlled-access highway is sometimes observed. However, denial of direct access is not likely to be the cause. Increased noise, dust and fumes from passing traffic are likely to be the main causes. Cases 10 and 3 describe trip generating characteristics of this land use type and the low rates confirm minimal access importance.

Industrial Sites

Industrial sites depend upon ready access to a labor supply and freight hauling facilities. Industrial sites are described in Table 5.3 by several Cases stretching across the low end of the trip generating spectrum. They include Case 1 which has the smallest trip rate to Cases 8 and 11 which have moderate rate ranking just below urban residential rates.

Undeveloped Land

Open, undeveloped or farm/ranch land is typically located in rural areas. However, near urbanizing areas, such land may be undergoing transition from rural to urban patterns. The generation of trips per unit area is generally very low. Hence, the problem of identifying the effects of access control is not so complicated because trip generation rates and access needs are minimal.

In many of the cases, when access to undeveloped land is modified , the access needs can be satisfied with alternative route provisions. The market approach tends to appraise damages due to access control to undeveloped land as negligible when reasonable substitute routes are provided. However, farm land uses, such as dairying, are more difficult. For these types of farm land uses trip generations rates are larger and accessibility to highways is a decisive productivity and marketing factor.

ENHANCED MODEL DEVELOPMENT

Discussions of the preceding paragraphs have demonstrated, at least qualitatively, that land use categories and trip generation rates vary together. Access and therefore access rights may be more important for land use categories having large trip generation rates. However, is there a relationship among land use, trip generation characteristics and access value? This section presents enhanced models which include land use predictor variables.

Data obtained from *Trip Generation* [33] was analyzed to determine potential traffic generation and attraction among land use categories. The method of weighted average trip generation rates (weighted trip ends per unit of independent variable) was used. The estimated number of trips for a given site was calculated by multiplying the number of trips ends per independent variable unit by the number of units of the independent variable associated with a site. As a common basis for the analysis, acres of land was used as the independent variable. On the cases where the data was not associated with acres of land, but with others independent variables such as number of employees, number of dwelling units, and 1000 square feet gross floor area, transformations were made to obtain estimated trips per acre.

Table 5.3: Land Uses and Daily Average Vehicle Trip End Rates (AVTE)

Case	Land Use	AVTE/1000 Sq ft GFA	AVTE/Acres
1	General Heavy Industrial	1.50	6.25
2	Commercial Airport	53.41	10.43
3	Single-Family Detached Housing	3.82	27.61
4	Manufacturing	3.85	38.88
5	Mobile Home Park	9.62	39.13
6	Mini-Warehouse	2.61	39.37
7	General Office Building	19.72	44.17
8	General Light Industrial	6.97	51.80
9	Warehousing	4.88	56.08
10	Single-Family Detached Housing	3.82	57.30
11	Industrial Park	6.97	62.90
12	Research and Development	7.70	79.61
13	High-Rise Residential	4.18	83.60
14	High-Rise Apartment	6.00	105.00
15	Residential	5.86	117.20
16	Mid-Rise Apartment	7.15	125.00
17	Low-Rise Residential	6.50	130.00
18	New Car Sales	47.91	143.73
19	Building Materials and Lumber	30.56	149.12
20	Business Park	14.37	159.75
21	Apartment	9.25	161.75
22	Low-Rise Apartment	9.41	164.75
23	Office Park	11.42	195.11
24	Church	9.32	202.98
25	Synagogue	10.64	231.74
26	Elementary School	10.72	233.48
27	High School	10.90	237.40
28	Clinic	23.79	259.07
29	Specialty Retail Center	40.67	359.12
30	Hospital	16.78	365.46
31	Quality Restaurant	96.51	420.40
32	Library	45.50	495.50
33	Discount Club	78.02	624.16
34	Hotel	29.00	631.62
35	Shopping Center (large)	30.00	653.40
36	Discount Store	70.13	701.30
37	Supermarket	87.82	702.56
38	Resort Hotel	33.83	736.88
39	Motel	34.30	746.98
40	Day Care Center	79.26	863.14
41	Shopping Center (medium)	40.00	871.20
42	Medical-Dental Office Building	34.17	914.39
43	Shopping Center (small)	90.00	1960.20
44	Fast Food Restaurant with Drive-	632.12	2528.48
45	Fast Food Restaurant	786.22	3144.88
46	Convenience Market (Open 24	737.99	7379.90

[1]Gross Floor Area

The value of access rights is associated with land value. In the models presented in Chapter 4, 50% percent of variance of the compensation paid by the Texas Department of Transportation for access rights acquisitions was explained by the cost per unit area of the parcel. On the other hand, land value is associated with traffic generation potential. For instance, commercial land value is generally much higher than residential . Moreover, the value of access rights is considerably higher for commercial or industrial zones than for residential zones.

DATA COLLECTION

Hundreds of files describing partial takings of land and access rights acquisitions in urban areas across the State are filed at the Texas Department of Transportation Right of Way Division. However, appraisers do not specify how much of the appraised award for property damages is due exclusively to access rights acquisitions. For this reason much of the available data did not facilitate model development.

Having no other feasible alternative for the enlargement of the original 13 observation data base, files containing data from partial acquisitions were studied in detail to obtain approximate appraised values of access rights. After extensive study of 115 cases of partial takings, 18 cases were selected. Several cases were rejected because it was impossible to determine the specific amount of compensation awarded exclusively to the value of access. From the 18 cases 10 were in dispute, the owners did not agree with the original appraised value of their respective properties. Therefore, eight cases were added to the original data base.

Each case consists of several pieces of information. The date of acquisition, compensation amount, appraisal value, size of the parcel, linear feet of access taken, linear feet of frontage, block location and land use category were collected using the Texas Department of Transportation Right of Way Division records. The average daily traffic on the road being improved at the time of access rights acquisition was determined using traffic volume maps provided by the TxDOT Transportation Planning Division. The Texas Almanac and State Industrial Guide [22-31] and census data were used to estimate the population of the city during the year of the access acquisition.

All monetary values, including those of the original data base, were converted to June, 1993 dollars. The consumer price index for the Southern region of the United States cross classified with the population of an urban center was used [3-12]. No consumer price index was found for any land use category nor for land in general. Therefore, the consumer price index including all listed commodities was used.

Predictor Variables

In Chapter 4, variables used in the case study models were presented. In addition to those variables the following were used:

RESID1 - Dichotomous variable used to denote residential land use in urban areas.
RESID2 - Dichotomous variable used to denote residential land use in suburban areas
FARM - Dichotomous variable used to denote farm land use
INSTITU - Dichotomous variable used to denote institutional land use (that is, hospital, church, school, etc.)
INDUST - Dichotomous variable used to denote industrial land use. Manufacturing land use lies under this category.
SQACCESS - $(ACCESS)^2$
CUACCESS - $(ACCESS)^3$
APPB4 - Appraised value of the parcel before access acquisition occurred, in June, 1993 dollars
COMPEN - Compensation for access rights converted to June 1993 dollars
COMPSQFT - COMPEN/SIZE
COMPFT - COMPEN/ACCESS
FRONT - Linear feet of frontage on the road being improved
TOTFRONT - Total linear frontage on all sides of the parcel
RATIO1 - ACCESS/FRONT
RATIO2 - ACCESS/TOTFRONT
POP - Population of the city in which the parcel was located in the year of the access rights acquisition.

The new variables incorporated to the study were RESID1, RESID2, FARM, INSTITU, INDUST, SQACCESS, CUACCESS, COMPSQFT and COMPFT. The variables RESID1 and FARM, were not used for model building because none of the observed cases fell into these land use categories. The variables SQACCESS, CUACCESS, COMPSQFT and COMPFT are the product of the transformation of previously defined variables with the purpose of improving the relationship among the predictors and the dependent variable.

NORMALITY ASSUMPTION VERIFICATION

The normality of the disturbance term as well as explanatory variables, in least squares regression, is a basic assumption. If normality is not present, statistics resulting from hypotheses tests may not be reliable. One objective of enlarging the original data base was to get a sample space large enough that normality would be approached.

The variables ACCESS, FRONT, TOTFRONT and COSTSQFT approximate normal distributions whereas COMPEN and ADT do not. One could assume that the size of the database is not large enough and as it increases, the variables will approximate normality.

CORRELATION MATRIX

The correlation matrix of all variables, using the 21 cases, is presented in Table 5.4. Because the correlation matrix is symmetric, only the lower half of the matrix is shown. As expected the variables: ACCESS, TOTFRONT, FRONT, RATIO1 and RATIO2 are highly correlated. Multicollinearity problems could be present if two or more of these variables are added simultaneously to a regression model. The variables ADT and COSTSQFT have relatively high correlations with the dependent variable and a moderate correlation among them (0.212). Both variables could be included in the same model.

Table 5.4: Correlation Matrix

	COMPEN	*COMPSQFT*	*COMPFT*	*APPB4*	*SIZE*	*COSTSQFT*	*ACCESS*	*SQACCESS*
COMPEN	1							
COMPSQFT	0.3530	1						
COMPFT	0.9057	0.3494	1					
APPB4	0.2668	-0.2117	0.2488	1				
SIZE	-0.0377	-0.2602	-0.0521	0.9128	1			
COSTSQFT	0.5340	0.5651	0.5428	-0.0476	-0.2645	1		
ACCESS	0.0934	-0.3797	-0.1256	0.6014	0.5817	-0.1800	1	
SQACCESS	0.0388	-0.3775	-0.1536	0.6645	0.6902	-0.2600	0.9711	1
CUACCESS	0.0004	-0.3595	-0.1621	0.7079	0.7700	-0.3172	0.9185	0.9850
FRONT	0.2382	-0.3097	0.2003	0.1800	-0.0634	0.0164	0.4871	0.4203
TOTFRONT	0.1219	-0.3945	0.0501	0.4577	0.3157	-0.1788	0.7312	0.7233
RATIO1	-0.2806	0.3580	-0.4083	-0.6059	-0.6481	-0.0414	-0.1140	-0.1866
RATIO2	-0.2474	0.4395	-0.2931	-0.3017	-0.1408	0.0905	-0.2168	-0.2677
ADT	0.5074	0.1580	0.5108	0.5001	0.3217	0.2117	0.0653	0.1021
LOC	-0.1478	-0.4367	-0.2937	-0.1985	-0.2203	-0.0690	0.3212	0.2515
POP	0.0683	0.4882	0.0918	0.0412	0.0279	0.0510	-0.1629	-0.1303

Table 5.4: Correlation Matrix (Continued)

	CUACCESS	*FRONT*	*TOTFRONT*	*RATIO1*	*RATIO2*	*ADT*	*LOC*	*POP*
COMPEN								
COMPSQFT								
COMPFT								
APPB4								
SIZE								
COSTSQFT								
ACCESS								
SQACCESS								
CUACCESS	1							
FRONT	0.3311	1						
TOTFRONT	0.6757	0.8994	1					
RATIO1	-0.2121	-0.6630	-0.5579	1				
RATIO2	-0.2657	-0.5291	-0.5599	0.6827	1			
ADT	0.1294	0.0874	0.0951	-0.5242	-0.1911	1		
LOC	0.1554	0.3542	0.3107	-0.0163	-0.3705	-0.3618	1	
POP	-0.0962	-0.1120	-0.1358	-0.0020	0.4094	0.1748	-0.3581	1

CURVE ESTIMATION

A curve estimation analysis[1] of the explanatory variables and the dependent variable was conducted to identify the best representation of the relationship between the dependent variable and each predictor. The results of the analysis are presented in Appendix F. For most predictors variables the relation with the dependent variable is best represented by a linear function, however, for ACCESS a cubic function is best. Therefore, the variable ACCESS was transformed by raising it to the third power.

MODEL SELECTION AND ANALYSIS

After extensive model building and regression analysis three models were selected. A complete list of the regression analysis outputs is given in Appendix G. The selected models are shown below (*t*-statistics are given in parentheses):

1. $$\text{COMPEN} = -116088 + \underset{(10.532)}{6128.6\ \text{COSTSQFT}} + \underset{(9.883)}{3.18\ \text{ADT}} + \underset{(10.364)}{71146.1\ \text{MANUF}}$$

$$+ \underset{(6.125)}{30816.4\ \text{HWCOMM}} + \underset{(7.725)}{35245.3\text{COMM}} + \underset{(6.736)}{358.7\ \text{ACCESS}}$$

$$- \underset{(-4.878)}{0.00226\ \text{CUACCESS}}$$

R-Square = 0.987

2. $$\text{COMPEN} = -52372 + \underset{(2.698)}{3.566\ \text{ADT}} + \underset{(1.309)}{80870\ \text{COMM}} - \underset{(-2.110)}{163550.5\ \text{RESID2}}$$

$$\underset{(-2.729)}{-.0402\ \text{SIZE}} + \underset{(2.769)}{0.143\ \text{APPB4}}$$

R-Square = 0.762

The first model was developed using the original 13 observation database. The predictive capability of the model is very high (R-Square = 0.987). Almost 99% percent of the variability of the dependent variable can be explained by the predictors. All coefficients are statistically significant at a 99% level. The model is also conceptually significant, although the weight assigned

[1] Only the 13 cases of exclusive access rights purchuses were used for the analysis.

to manufacturing land use is double that for commercial sites, which seems too high considering commercial land values.

The second model was developed using the expanded database. The predictive capability of the second model is lower than for the first (R-Square = 0.76). A larger sample space, generally improves econometric models, however it introduces more variability to the problem for which the correlation of the dependent variable.

All variables are statistically significant at a 95% level, except for COMM which is significant at a 79% level. Only two dichotomous variables denoting land use categories, COMM and RESID2 entered the model. The reason for this was the lack of data representing the other land use categories.

Although the second model is significant statistically, the negative sign for the coefficient of RESID2 and the absence of the variable ACCESS present conceptuality problems. The negative coefficient for RESID2 does not indicate that the value of access rights is negative for suburban residential land use. The negative sign represents land use impacts on access right values in conjunction with the intercept and the two land use categories in the model when in reality there are more categories that should probably be present.

SUMMARY

The models presented offer advantages over those introduced in Chapter 4. The first one offers enhanced predictive ability through minor variable transformations. The second is based on a larger data set and requires fewer predictor variables but yields acceptable predictive ability.

The following chapter presents a discussion about a related access rights issue. During construction and rehabilitation property owner access rights are sometimes limited or even denied. The concept of associating economic value with these "losses" is discussed in the following chapter.

CHAPTER 6

ECONOMIC VALUE OF MODIFIED OR REDUCED PROPERTY ACCESS DURING CONSTRUCTION PERIODS

Despite the frequency of urban roadway rehabilitation projects, there have been few attempts to determine systematically the effects on businesses of such projects. Most studies have been limited to capturing business owners' perceptions of revenue changes during the construction period. Such attempts fail to account for variations in the construction projects, the nature and extent of reduced property access, and uses of the sites. In addition, collecting information about perceived revenue changes without some underlying framework, limits our understanding about likely impacts in the future.

One recent systematic study was conducted by de Solminihac and Harrison Transportation Research Record 1395 on rehabilitation of the Southwest Freeway in Houston. Two key questions addressed in that research were:

1. Do road construction activities significantly affect the sales of the abutting businesses?
2. Do road construction activities affect some businesses more than others?

After analyzing historical sales data and interviewing business owners, the researchers found that both questions could be answered affirmatively. Among the key findings:

- 49 percent of business owners said they had been affected considerably by the construction, while another 32 percent said they had been affected somewhat;
- About one-third of the owners said their sales were off by less than 20 percent, about an equal proportion said their sales had declined between 20 and 40 percent, and about one of every eight owners said their sales had contracted by more than 40 percent;
- Some types of businesses were particularly negatively affected: food stores (-37 percent),automotive outlets (-32 percent), general merchandise (-28 percent), and home furnishings (-17 percent);

- Fewer than 10 percent of the owners would consider selling temporary access rights to the contractor and closing down during the construction period for fear that customers would not return upon completion of the project; and
- After construction was completed, about half of the owners believed their revenues improved while about one-third of the owners said there had been no change.

While anecdotal information and personal experience would suggest that many businesses would suffer revenue losses, this research detected differential effects by type of business, a finding which cannot be immediately explained. Whether these findings are part of a pattern, which would occur if data from other rehabilitation projects were examined, is unknown. One approach for understanding this issue of differential effects by consumers is presented next.

CONSUMER BUYING BEHAVIOR

It is evident that the costs of restricted access to certain types of sites is either negligible or only of nominal interest. For instance, buildings where only the office workers are affected or buildings where the patrons have no alternatives to on-site transactions (e.g. certain types of government buildings), will suffer detrimental effects, but they are of marginal interest. That would be the case as well for essentially manufacturing businesses in which there are no significant on-site transactions, for instance, a bread factory. Retail establishments, then, deserve most of the attention.

Estimating the sales potential of retail establishments is a well developed field within locational analysis. One of the most influential theoretical models, known as the "Huff model," seems especially well-suited for estimating the potential, temporary effects from reduced access during roadway rehabilitation. While quite abstract, the Huff model (citation) can be used to estimate demand for different types of retail establishments in the same area and can incorporate survey data from consumers. More importantly, the predictive capabilities of Huff model have been verified consistently over the past two decades. Key assumptions of the Huff model pertaining to the problem at hand are:

1. A consumer's choice of a particular type of retail establishment depends on the number of items of the kind a consumer desires which are being carried; in other words, consumers will show a willingness to travel farther distances

for various goods and services as the size of the merchandise offering increases;

2. A consumer's choice of an establishment will be inversely related to the effort and expense involved in getting from the consumer's point of origin to a given retail establishment as measured by travel time. Consumers display differences in terms of their willingness to travel various distances for different products based on:
3. Product substitutability--when consumers are unwilling to substitute other products, they are more willing to travel farther on a shopping trip;
4. Anticipated absolute price differential--the greater the expected cost savings, the farther consumers are willing to travel on their shopping journey; and
5. Absolute price of a product-purchasing high cost products in relation to a consumer's income usually entails wider selection because of its sizable outlay and anticipated higher risks; to achieve this wider selection, consumers are willing to travel farther.

What does this mean in practice? As Huff has demonstrated empirically, people are more willing to travel farther for expensive home furnishings than everyday clothing. Or, as another example, most consumers will drive much farther to visit a car dealer than to buy a bottle of milk. For the latter, travel time is the sole criterion, while car selection involves many of the relationships just listed.

Based on the above assumptions, the Huff model then can be used to estimate the potential sales for a new retail establishment in different possible locations. This is accomplished by calculating multiple, possible trading areas from which a new retail establishment would draw customers. The retail trade area is not a fixed line circumscribing a store, but a series of zonal probability contours radiating away from the store. Once multiple, possible trading areas are determined, one can compare the different areas and select that one which would yield the largest potential sales.

Because the Huff model was developed for estimating retail trade areas of competing locations at a single point in time, it needs some adaptation for estimating temporary changes in the trade areas of a single location. For the purposes of estimating the economic effects from temporary access restriction, the difference between the retail trade area prior to construction and the retail trade area during construction should correspond to any changes in revenue during the period in which there is restricted access. Put differently, the retail trade area during the construction period will usually be less favorable than prior to construction. The extent to which the trade area has changed, will predict the temporary decline in a store's revenues.

DATA COLLECTION

It should be recognized from the outset that the data collection process will have its difficulties. In contrast with permanent takings, the "temporary taking" time period is shorter in duration. Therefore, the data collection burden on businesses will be more concentrated, and the data will be more subject to short-term economic and/or geographic factors. Ideally, there would be a control group of businesses which closely approximate the affected businesses, and which would be willing to provide detailed financial information that could be compared to information from the affected businesses. Barring that, trend data (two years prior to construction and two years after construction) for the affected businesses should be sought, at least for a small number of businesses in each type of retail category.

A variety of data should be collected. From each affected business, data would be needed about the type of firm, its size (product offerings), and number of years in operation at the location (buying loyalty). Changes in travel time to the retail location and other travel problems could be measured by variables such as: (1) length of time construction has occurred (% of year); (2) amount of area in the temporary taking; (3) proportion of pre-construction entrances and exits affected; (4) amount of time, if any, in which there had been total access blockage during business hours; and (5) changes in average daily traffic at the location.

Data should be collected also from a consumer or patron survey of a sample of retail establishments. Data should be collected on situational factors of the reduced access: (1) perceived seriousness of the access restriction (roughness of road surface, proximity to moving heavy equipment, reduced visibility etc.); (2) predictability of entering and exiting the business; (3) other congestion-related variables; and (4) alterations in buying behavior such as purchasing at other stores and substituting or postponing a purchase. This survey would identify also if there had been any exogenous changes in the retail trade area independent of the construction impacts, for instance, if a new retail establishment had opened nearby during the restricted access time period. Obtaining reliable data on retail sales, the dependent variable, will prove challenging. Business owners usually are unwilling to spend much time in calculating revenues for less than annual time periods, and many retail establishments will be staffed by employees who are not privy to detailed revenue information. In addition, most business owners are reluctant to supply proprietary sales data for survey purposes. For all these reasons, percentage changes in revenues should be requested rather than total revenues.

These gross estimates should be supplemented where possible by other data collection methods. For example, researchers might design the study to include actual observation of customers at a sample of establishments. Counting the number of walk-in customers at a fast food establishment during a two-hour workday period before, and during, construction, may be as valid an indicator of revenue changes as hastily supplied estimates from the manager on duty. And it must be remembered that in some types of retail establishments, such as home furnishings, off-premise sales may comprise a significant proportion of total sales. In such cases, off-premise sales must be excluded, if construction impacts are to be assessed accurately.

Besides revenues, the total economic impact to a retail establishment needs to incorporate expenses which can be reasonably related to roadway rehabilitation. In the research by de Solminihac and Harrison, it was discovered that the majority of businesses had adopted mitigation strategies of some sort. Some had increased their advertising, others began offering free pickup and delivery, some purchased new signs for entrances and exits to property, while still others disseminated information about alternate routes to their site. These additional costs need to be included in the calculations.

SUMMARY

An overall methodology for estimating the economic impacts from temporary access reduction has been specified. The methodology is based on a model for analyzing consumer spatial buying behavior. The model is sufficiently abstract to deal with the complexity of consumer buying behavior from different types of retail establishments. It has been used in numerous empirical studies, and its predictive capabilities have been demonstrated over the past two decades.

Field testing the methodology during construction periods would be relatively straightforward, although not without some difficulty. The major problem which would need to be addressed in greater detail is obtaining reliable revenue data for both affected businesses and businesses serving as a control group. Various survey research strategies used by business school researchers should be investigated for their potential applicability prior to beginning a field test.

The next Chapter provides a short summary of information presented through the previous report elements. Applications and suggestions for further investigation are also provided.

CHAPTER 7

SUMMARY AND CONCLUSIONS

SUMMARY

The principal problem in dealing with access rights compensation lies in defining reasonable access. By treating access as a fixed property right, rather than as a "reasonable" one, problems with access rights compensation can be alleviated. A mathematical model which uses physical, locational, and traffic characteristics can be developed to estimate access rights compensation values.

Developing a multiple regression model to estimate the value of access rights was one research goal. In the past, very little research has been completed in the area of access rights compensation. Kaltenbach's theories given in "The Elastic Right—Access" [Ref 27], studies performed on related subjects, and theories developed by the research team combined to form the theoretical framework for the access rights compensation model.

Model development was done in two parts. First, a well defined, but small data set was used to develop a series of six predictive "case study" models. This effort is described in Chapter 4. Second, the data set was expanded slightly through an exhaustive secondary search. Enhanced models, described in Chapter 5, were developed using more observations and additional land use oriented variables. Two "case study" models developed through the first development phase are worthy of note:

The first model, Equation 1, has excellent predictive capability (R-squared = 0.9607). It is shown below (t statistics are given in parentheses):

$$
\begin{aligned}
\text{1. COMPEN} = \; & -96422 + \underset{(7.790)}{7264.5\ \text{COSTSQFT}} + \underset{(1.902)}{74.5\ \text{ACCESS}} \\
& + \underset{(5.750)}{3.1\ \text{ADT}} + \underset{(2.314)}{13157.6\ \text{LOC}} + \underset{(5.607)}{59317.9\ \text{MANUF}} \\
& + \underset{(3.915)}{27954.8\ \text{COMM}} + \underset{(1.925)}{14571.4\ \text{HWCOMM}}
\end{aligned}
$$

The model is composed of five explanatory variables. COSTSQFT denotes the appraised value per square foot (meter) of the parcel in June 1992 dollars. ACCESS is the number of linear feet (meters) of access that was taken. ADT is average daily traffic passing by the property at the time of acquisition. LOC is a dichotomous variable which denotes the block location, corner or mid-block, of the parcel. MANUF, COMM, and HWCOMM are three dichotomous variables which describe the parcel's land-use classification. The dependent variable, COMPEN, denotes the compensation value for access rights given in June 1992 dollars. All explanatory variables are significant to at least the 90 percent level. Although this is only a case study multiple regression model, the statistical significance of the predictor variables, along with the high predictive capability of the model, are promising.

The second regression model, Equation 2, includes only physical characteristics of the parcel. The model specification is shown below (t statistics are given in parentheses):

$$2.\quad COMPEN = -21290 - \underset{(-4.104)}{0.6\,SIZE} + \underset{(3.098)}{359.7\,ACCESS}$$

$$- \underset{(-1.776)}{18344.0\,LOC} + \underset{(1.489)}{20699.5\,MANUF}$$

$$+ \underset{(3.971)}{44491.1\,COMM} + \underset{(2.580)}{35986.1\,HWCOMM}$$

The explanatory variable SIZE refers to the area of the parcel in square feet (meters). In this model, all explanatory variables are significant to at least the 82 percent level. The model was not as high in its predictive capabilities (R-squared = 0.8476) or in its measure of goodness of fit (standard error of estimate = 51.7 percent of the mean value of COMPEN). Nevertheless, the use of a model similar to Equation 2 could prove advantageous for state Right of Way officials when calculating preliminary right-of-way cost estimates. Texas Department of Transportation Right of Way officials would not need to obtain costly appraisals from independent appraisers. Also, the fewer number of variables needed for the execution of this model could save Texas Department of Transportation officials time and money in the data acquisition process.

The second analysis phase yielded two enhanced models. The first, shown below is based upon the 13 case study observations but features variable transformations and resulting improved predictive ability. The second is based upon the expanded, 30 observation data set, using the same variables.

3. $$\text{COMPEN} = -116088 + \underset{(10.532)}{6128.6\ \text{COSTSQFT}} + \underset{(9.883)}{3.18\ \text{ADT}} + \underset{(10.364)}{71146.1\ \text{MANUF}}$$

$$+ \underset{(6.125)}{30816.4\ \text{HWCOMM}} + \underset{(7.725)}{35245.3\ \text{COMM}} + \underset{(6.736)}{358.7\ \text{ACCESS}}$$

$$- \underset{(-4.878)}{0.00226\ \text{CUACCESS}}$$

4. $$\text{COMPEN} = -93528 + \underset{(4.323)}{231.8\ \text{ACCESS}} + \underset{(6.552)}{6008.4\ \text{COSTSQFT}} - \underset{(-2.742)}{0.2\ \text{SIZE}}$$

$$+ \underset{(5.186)}{2.66\ \text{ADT}} + \underset{(5.794)}{58912.4\ \text{MANUF}} + \underset{(3.477)}{24573.2\ \text{HWCOMM}}$$

$$+ \underset{(4.669)}{31420.4\ \text{COMM}}$$

CONCLUSIONS

The econometric models developed for estimating access rights compensation values mark the beginning of research which will eventually lead to using these types of models as cost forecasting tools. If all required data are known, Equations 1, 3 or 4 can predict compensation values fairly accurately. Equation 2 is presented mainly as a concept to encourage the development of a model which can forecast right-of-way costs using minimal information.

The model specifications were formed using case-specific data, since taking a random sample from available right-of-way acquisition information was simply not feasible. The research results presented here do not claim to be universal results, only case-specific. It is the hope of this research team that the presented discussions and results will provide insight for further research in the area of access rights compensation.

One significant difficulty in developing a universal model lies in the availability of appropriate data. It is known that access plays an important role in the valuation of land. The problem lies in the fact that appraisers do not specify the portion of the appraised value of a parcel which is attributed to access. If this were the case, all access rights acquisitions, including those which involve both land and access, could be included in the sample. Then, a valid random sample could be accumulated.

Access rights compensation is an important issue which has been given little attention in the past. Much more research and many analyses are needed to establish uniform methods for valuating access rights.

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APPENDIX A

THE KEY NUMBER CLASSIFICATION SYSTEM

The KEY NUMBER Classification System

The KEY NUMBER classification system is universally recognized as the standard classification for American case law. Cases are grouped according to regions in the West American Digest System, published by West Publishing Company. Regions include the Pacific (P), Atlantic (A), North Western (N.W.), North Eastern (N.E.), Southern (So.), South Western (S.W.), and South Eastern (S.E.). An index is provided to facilitate finding desired cases.

The West American Digest System indexes case law using a Descriptive-Word Index, a Table of Cases, and a Defendant-Plaintiff Table. Each case is indexed with the KEY NUMBER system. For example, the KEY NUMBER classification for Brewster v. City of Forney is

223 S.W. 175,

meaning the case can be found in Volume 223 of the South Western Reporter on page 175. Sometimes, the Reporter abbreviation will be followed by a "2d," meaning the second edition. For example, the KEY NUMBER classification for State of Texas v. Meyers is

292 S.W.2d 933,

meaning the case is located in Volume 292 of the South Western Reporter, Second Edition, page 933.

APPENDIX B

SUPPORTING CASE LAW

SUPPORTING CASE LAW

The following list contains examples of litigation which support or repudiate the listed deciding factor in determining reasonable access.

1) Circuity of Travel

<u>Supporting Cases</u>
Brill v. Commonwealth of Pennsylvania, DOT, 348 A.2d 451, 1974.
Small v. Kemp, DOT Kansas, 727 P.2d 904, 1986.
Ray v. State Highway Commission, Kansas, 410 P.2d 278, 1966.
State Department of Highways, CO, 626 P.2d 661, 1981.
Brock v. State Highway Comm., Kansas, 404 P.2d 934, 1965.
Triangle, Inc v. State of Alaska, 632 P.2d 965, 1981.
State of Idaho v. Bastian, 546 P.2d 399, 1976.

<u>Conflicting Cases</u>
DuPuy v. City of Waco, TX, 396 S.W.2d 103, 1965.
TIAAA v. City of Wichita, KS, 559 P.2d 347, 1977.

2) Temporarily Blocked Access

<u>Supporting Cases</u>
State of Louisiana DOT v. Triana, 537 So.2d 792, 1989.
Filler v. City of Minot, ND, 281 N.W.2d 237, 1979.

<u>Conflicting Cases</u>
Dickie's Sports v. DOT of the State of Louisiana, 477 So.2d 744, 1985.

3) Reduction of Access

<u>Supporting Cases</u>:
St. Luke's v. City of Rochester, NY, 453 N.Y.S.2d 1012, 1982.
Midella Enterprises v. Missouri St. Highway Comm., 570 S.W.2d 298, 1978.
Wolfe v. Town of Windham, NH, 327 A.2d 721, 1974.

a) Median Strips

<u>Supporting Cases</u>
St. Highway Comm. of Virginia v. Easley, 207 S.E.2d 870, 1974.
Brill v . PennDOT, 348 A.2d 451, 1975.
Merit Oil v. State of New Hampshire, 461 A.2d 97, 1983.
State of Idaho v. Bastian, 546 P.2d 399, 1976.
Walker v. State of Washington, 295 P.2d 328, 1956.
In Re Condemnation of 1315 to 1391 Washington Boulevard, 383 A.2d 1289, 1978.

<u>Conflicting Cases</u>
State Department of Highways v. Strickland, 290 So.2d 714, 1974.
State of Missouri v. Johnson, 287 S.W.2d 835, 1956.

b) Curb Cuts

<u>Supporting Cases</u>
Tucci v. State of New York, 280 N.Y.S.2d 789, 1967.
Mississippi State Highway Comm. v. Hale, 531 So.2d 623, 1988.

<u>Conflicting Cases</u>
DeKalb County, GA v. Glaze, 375 S.E.2d 66, 1988.
Tracy v. PennDOT, 402 A.2d 286, 1979.

4) Cul-de-sacs

<u>Supporting Cases</u>
East Park Church v. Washington County, TN, 567 S.W.2d 768, 1978.
DuPuy v. City of Waco, TX, 396 S.W.2d 103, 1965.
TIAAA v. City of Wichita, KS, 559 P.2d 347, 1977.

<u>Conflicting Cases</u>
Jones v. City of Jennings, MO, 595 S.W.2d 1, 1979.

5) Diversion of Traffic

<u>Supporting Cases</u>
State of Idaho v. Bastian, 546 P.2d 399, 1976.
Merit Oil v. State of New Hampshire, 461 A.2d 97, 1983.
Armenian Church v. Director of Public Works, 360 A.2d 534, 1976.
Hecton v. State of California, DOT, 58 Cal.App.3d 653, 1976.
Holloway v. Purcell, Dept. of Public Works, 217 P.2d 665, 1950.
Small v. Kemp, State of Kansas, 7272 P.2d 904, 1986.

Conflicting Cases
No directly conflicting cases were found

6) Special Injury

Supporting Cases
City of Richmond, Indiana v. Burger Chef, 333 N.E.2d 797, 1975.
St. Highway Comm., MS, 509 S.2d 856, 1987.

Conflicting Cases
No directly conflicting cases were found

7) Access Rights for New Locations

Supporting Cases
Cracchiolo v. State of Arizona, 435 P.2d 726, 1968.
Klumok v. State Highway Department, GA, 167 S.E.2d 722, 1969.

Conflicting Cases
No directly conflicting cases were found

APPENDIX C

CASE STUDY MODEL DATA

Case Number	Date of Acquisition	Consumer Price Index	Compensation Value at Time of Purchase	Compensation Value in June, 1993 Dollars	Appraised Value at Time of Purchase	Appraised Value in June, 1993 Dollars	Size in ft^2 (m^2)	Linear Feet (m) of Frontage on Improved Road
1	11/8/79	241.8	$16,650.00	$28,569.42	$18,500.00	$31,743.80	4060 (377.2)	70 (21.3)
2	6/1/84	167.1	$1,402.00	$1,849.20	$18,840.00	$24,849.41	9350 (869)	78 (23.8)
3	8/20/84	168.6	$49,000.00	$64,054.57	$199,500.00	$260,793.59	34155 (3173)	188.26 (57.4)
4	11/28/84	170.2	$500.00	$647.47	$26,000.00	$33,668.63	10496 (975)	149.95 (45.7)
5	7/12/85	172.8	$16,300.00	$20,790.05	$33,300.00	$42,472.92	6358 (591)	52.98 (16.1)
6	8/6/85	173.5	$22,000.00	$27,946.97	$340,000.00	$431,907.78	25675 (11676)	372.94 (113.7)
7	8/6/85	173.5	$500.00	$635.16	$594,894.00	$755,703.96	98298 (18423)	904.61 (275.7)
8	8/8/85	173.5	$29,910.00	$37,995.18	$45,550.00	$57,862.94	6358 (591)	52.98 (16.1)
9	9/20/85	181.7	$13,500.00	$16,375.34	$31,550.00	$38,269.79	6500 (604)	52 (15.8)
10	3/21/86	173.6	$500.00	$634.79	$193,500.00	$245,664.75	31909 (2965)	120 (36.6)
11	6/26/87	180.8	$40,643.00	$49,544.90	$341,000.00	$415,688.05	56120 (5214)	229.5 (70.0)
12	12/9/87	182.6	$55,000.00	$66,385.54	$279,000.00	$336,755.75	22750 (2114)	182 (55.5)
13	6/2/88	186	$9,100.00	$10,783.01	$97,500.00	$115,532.26	16250 (1510)	130 (39.6)

COLLECTED DATA, Continued

Case Number	Feet (m) of Access Taken	Total Linear Feet (m) of Street Frontage	ADT Year of Acquisition	Block Location	Land Use	Population at Time of Appraisal	Distance From City Center in Feet (m)
1	70 (21.3)	70 (21.3)	14000	Mid	Highway Commercia	2761000	25520 (7779)
2	78 (23.8)	203 (61.9)	1105	Corner	Manufacturing	220950	200 (61)
3	188.26 (57.4)	328.26 (100.1)	12810	Corner	Commercial	220950	1383 (422)
4	149.95 (45.7)	289.95 (88.4)	15370	Corner	SFR	220950	2383 (726)
5	52.98 (16.1)	225.96 (68.9)	13745	Corner	Highway Commercia	222800	800 (24)
6	300 (91.4)	1038.17 (316.4)	12820	Corner	Commercial	222800	967 (295)
7	290 (88.4)	2178.47 (664.0)	2670	Corner	Commercial	222800	1633 (498)
8	52.98 (16.1)	105.96 (32.3)	13745	Mid	Commercial	222800	800 (244)
9	52 (15.8)	104 (31.7)	1335	Mid	Manufacturing	222800	317 (97)
10	90 (27.4)	120 (36.6)	11870	Mid	Night Club	224455	1417 (432)
11	194.04 (59.1)	349.5 (106.5)	12290	Corner	Commercial	225955	800 (244)
12	182 (55.5)	307 (93.6)	905	Corner	Commercial	225955	183 (56)
13	88.81 (27.1)	255 (77.7)	1240	Corner	Commercial	227265	317 (97)

APPENDIX D

CASE STUDY
REGRESSION ANALYSIS RESULTS

(Refer to Chapter 3)

The entire set of regression analyses results, completed for the derivation of the access rights compensation model, are presented in the following pages of Appendix C. Regression analyses were completed using STATISTICA Software.

STATISTICA REGRESSION STATS — VARIABLES CURRENTLY IN THE EQUATION

Variable	Beta in	Partial Cor.	Semipart Cor.	Tolernce	R-square	t(6)
COSTSQFT	.921942	.800532	.347377	.1419696	.8580304	2.986937
RATIO1	-.034780	-.051442	-.013395	.1483350	.8516650	-.115180
ADT	.816243	.703846	.257670	.0996524	.9003476	2.215584
LOC	.350926	.633807	.213089	.3687166	.6312834	1.832257
MANUF	.894983	.697349	.253019	.0799241	.9200759	2.175596
COMM	.719027	.852190	.423548	.3469874	.6530126	3.641892
HWCOMM	.185172	.470900	.138813	.5619620	.4380380	1.193585

STATISTICA REGRESSION STATS — VARIABLES CURRENTLY IN THE EQUATION

Variable	p-level
COSTSQFT	.0244167
RATIO1	.9120602
ADT	.0686138
LOC	.1166228
MANUF	.0725002
COMM	.0108104
HWCOMM	.2776883

STATISTICA REGRESSION STATS — MULTIPLE REGRESSION RESULTS

```
Standard Regression
Dependent Variable =COMPEN              No. of cases =    13
Multiple R =     .965594619                     F =9.847847519
R-sqr =          .932372969                    df = 7, 5
Adjusted R-sqr = .837695125                     p = .011422492
Standard error of estimate =9477.6061556
Intercept =-84245.49096
Std. Error =16630.837713        t( 5) =-5.065619208     p< .003881457
```

STATISTICA REGRESSION STATS — VARIABLES CURRENTLY IN THE EQUATION

Variable	Beta in	Partial Cor.	Semipart Cor.	Tolernce	R-square	t(6)
COSTSQFT	.7485928	.9227735	.4793113	.4099625	.5900375	5.354674
RATIO2	.2677392	.6396580	.1665649	.3870284	.6129717	1.860796
ADT	.6919819	.9030173	.4207241	.3696623	.6303377	4.700161
LOC	.4225656	.8427036	.3132979	.5497010	.4502990	3.500038
MANUF	.8529630	.9193740	.4677832	.3007660	.6992340	5.225886
COMM	.8257841	.9192743	.4674557	.3204407	.6795593	5.222227
HWCOMM	.2227558	.6355632	.1647721	.5471537	.4528463	1.840768

STATISTICA REGRESSION STATS — VARIABLES CURRENTLY IN THE EQUATION

Variable	p-level
COSTSQFT	.0017369
RATIO2	.1121000
ADT	.0033256
LOC	.0128257
MANUF	.0019650
COMM	.0019719
HWCOMM	.1152555

STATISTICA REGRESSION STATS — MULTIPLE REGRESSION RESULTS

```
Standard Regression
Dependent Variable =COMPEN              No. of cases =    13
Multiple R =     .979763943                         F =17.114947278
R-sqr =          .959937384                      df = 7, 5
Adjusted R-sqr = .903849722                       p = .003246514
Standard error of estimate =7294.7119619
Intercept =-93697.69421
Std. Error =13770.236117        t( 5) =-6.804363659     p<  .001044176
```

STATISTICA REGRESSION STATS — VARIABLES CURRENTLY IN THE EQUATION

Variable	Beta in	Partial Cor.	Semipart Cor.	Tolernce	R-square	t(5)
ACCESS	.28618	.500165	.158031	.3049302	.6950698	1.15521
RATIO2	1.29998	.923860	.660424	.2580904	.7419096	4.82771
ADT	.18543	.420471	.126792	.4675246	.5324754	.92686
LOC	.18079	.398107	.118735	.4313103	.5686897	.86796
DIST	-1.03037	-.843719	-.430039	.1741913	.8258088	-3.14359
MANUF	.66476	.808694	.376139	.3201646	.6798354	2.74959
COMM	1.23801	.936164	.728550	.3463133	.6536868	5.32572
HWCOMM	1.12404	.878363	.502761	.2000584	.7999416	3.67520

STATISTICA REGRESSION STATS — VARIABLES CURRENTLY IN THE EQUATION

Variable	p-level
ACCESS	.3002089
RATIO2	.0047660
ADT	.3965383
LOC	.4251064
DIST	.0255626
MANUF	.0403299
COMM	.0031255
HWCOMM	.0143653

STATISTICA REGRESSION STATS — MULTIPLE REGRESSION RESULTS

```
Standard Regression
Dependent Variable =COMPEN              No. of cases =    13
Multiple R =      .961844484                  F =6.179563699
R-sqr =           .925144811                 df = 8, 4
Adjusted R-sqr = .775434434                   p = .048105840
Standard error of estimate =11148.192439
Intercept =-101655.0936
Std. Error =23250.994776         t( 4) =-4.372075028     p<  .011948675
```

STATISTICA REGRESSION STATS	VARIABLES CURRENTLY IN THE EQUATION					
Variable	Beta in	Partial Cor.	Semipart Cor.	Tolernce	R-square	t(4)
COSTSQFT	.798087	.843086	.230665	.0835343	.9164657	2.715364
ACCESS	.240043	.667090	.131752	.3012550	.6987450	1.550965
RATIO2	.304452	.399828	.064182	.0444414	.9555587	.755541
ADT	.683348	.871982	.262082	.1470921	.8529078	3.085191
LOC	.334927	.807498	.201419	.3616617	.6383383	2.371080
DIST	-.092610	-.132210	-.019625	.0449058	.9550942	-.231022
MANUF	.913161	.948646	.441232	.2334746	.7665254	5.194128
COMM	.755542	.885468	.280359	.1376930	.8623070	3.300352
HWCOMM	.330896	.480792	.080678	.0594462	.9405538	.949729

STATISTICA REGRESSION STATS	VARIABLES CURRENTLY IN THE EQUATION
Variable	p-level
COSTSQFT	.0532412
ACCESS	.1958513
RATIO2	.4919753
ADT	.0367456
LOC	.0767306
DIST	.8286336
MANUF	.0065425
COMM	.0299235
HWCOMM	.3960295

STATISTICA REGRESSION STATS | MULTIPLE REGRESSION RESULTS

```
Standard Regression
Dependent Variable =COMPEN              No. of cases =    13
Multiple R =     .989116460                         F =15.064100250
R-sqr =          .978351371                        df = 9, 3
Adjusted R-sqr = .913405482                         p = .023617605
Standard error of estimate =6922.7408429
Intercept =-102633.0113
Std. Error =14442.760812         t( 3) =-7.106190615     p< .005733693
```

STATISTICA REGRESSION STATS	VARIABLES CURRENTLY IN THE EQUATION					
Variable	Beta in	Partial Cor.	Semipart Cor.	Tolernce	R-square	t(7)
COSTSQFT	.762001	.742672	.623890	.6703553	.3296447	2.716573
ACCESS	.225752	.310385	.183679	.6620005	.3379995	.799785
RATIO2	.137041	.129748	.073612	.2885371	.7114629	.320527
ADT	.230175	.346249	.207626	.8136663	.1863337	.904055
LOC	.248074	.295736	.174157	.4928553	.5071447	.758322
DIST	-.047770	-.058514	-.032974	.4764633	.5235367	-.143575

STATISTICA REGRESSION STATS	VARIABLES CURRENTLY IN THE EQUATION
Variable	p-level
COSTSQFT	.0299134
ACCESS	.4501190
RATIO2	.7579252
ADT	.3960121
LOC	.4730116
DIST	.8898818

STATISTICA REGRESSION STATS — MULTIPLE REGRESSION RESULTS

```
Standard Regression
Dependent Variable =COMPEN              No. of cases =    13
Multiple R =     .826761940                       F =2.159910152
R-sqr =          .683535306                      df = 6, 6
Adjusted R-sqr = .367070612                       p = .185533881
Standard error of estimate =18715.890946
Intercept =-43506.09859
Std. Error =25303.431614         t( 6) =-1.719375429     p<  .136342034
```

STATISTICA REGRESSION STATS — VARIABLES CURRENTLY IN THE EQUATION

Variable	Beta in	Partial Cor.	Semipart Cor.	Tolernce	R-square	t(6)
COSTSQFT	.9902220	.9611783	.6909087	.4868286	.5131714	7.789208
ACCESS	.2771772	.6479447	.1687227	.3705373	.6294627	1.902156
ADT	.7968294	.9320000	.5100002	.4096473	.5903527	5.749672
LOC	.2686786	.7190874	.2052387	.5835156	.4164844	2.313833
MANUF	.9468949	.9288504	.4973045	.2758299	.7241701	5.606542
COMM	.6165761	.8683659	.3472961	.3172681	.6827319	3.915368
HWCOMM	.2326046	.6523625	.1707204	.5386840	.4613160	1.924677

STATISTICA REGRESSION STATS — VARIABLES CURRENTLY IN THE EQUATION

Variable	p-level
COSTSQFT	.0002359
ACCESS	.1058529
ADT	.0012048
LOC	.0599532
MANUF	.0013726
COMM	.0078437
HWCOMM	.1025986

STATISTICA REGRESSION STATS — MULTIPLE REGRESSION RESULTS

```
Standard Regression
Dependent Variable =COMPEN              No. of cases =    13
Multiple R =     .980133093                      F =17.442849720
R-sqr =          .960660881                      df = 7, 5
Adjusted R-sqr = .905586114                       p = .003106029
Standard error of estimate =7228.5437147
Intercept =-96422.44650
Std. Error =14206.732611         t( 5) =-6.787095185     p< .001056399
```

Park's Test for Heteroscedasticity

STATISTICA REGRESSION STATS — VARIABLES CURRENTLY IN THE EQUATION

Variable	Beta in	Partial Cor.	Semipart Cor.	Tolernce	R-square	t(12)
LN-COSTSQF	.2247012	.2247012	.2247012	1.000000	.000000	.7648074

STATISTICA REGRESSION STATS — VARIABLES CURRENTLY IN THE EQUATION

Variable	p-level
LN-COSTSQF	.4591634

STATISTICA REGRESSION STATS — MULTIPLE REGRESSION RESULTS

```
Standard Regression
Dependent Variable =LN-RESIDSQUARED          No. of cases =    13
Multiple R =      .224701182                   F = .584930329
R-sqr =           .050490621                  df = 1,11
Adjusted R-sqr = .000000000                    p = .460479558
Standard error of estimate =1.215322938
Intercept =15.140966740
Std. Error =1.341314515        t(11) =11.288155444      p< .000000218
```

Park's Test for Heteroscedasticity

STATISTICA REGRESSION STATS — VARIABLES CURRENTLY IN THE EQUATION

Variable	Beta in	Partial Cor.	Semipart Cor.	Tolernce	R-square	t(12)
LN-ACCESS	-.358714	-.358714	-.358714	1.000000	.000000	-1.27454

STATISTICA REGRESSION STATS — VARIABLES CURRENTLY IN THE EQUATION

Variable	p-level
LN-ACCESS	.2265988

STATISTICA REGRESSION STATS — MULTIPLE REGRESSION RESULTS

```
Standard Regression
Dependent Variable =LN-RESIDSQUARED              No. of cases =    13
Multiple R =     .358713813                        F =1.624459959
R-sqr =          .128675600                       df = 1,11
Adjusted R-sqr = .049464291                        p = .228736997
Standard error of estimate =1.164211818
Intercept =19.300267926
Std. Error =2.505216585        t(11) =7.704031675      p< .000009331
```

Park's Test for Heteroscedasticity

STATISTICA REGRESSION STATS — VARIABLES CURRENTLY IN THE EQUATION

Variable	Beta in	Partial Cor.	Semipart Cor.	Tolernce	R-square	t(12)
LN-ADT	.2870078	.2870078	.2870078	1.000000	.000000	.9937041

STATISTICA REGRESSION STATS — VARIABLES CURRENTLY IN THE EQUATION

Variable	p-level
LN-ADT	.3399825

STATISTICA REGRESSION STATS — MULTIPLE REGRESSION RESULTS

```
Standard Regression
Dependent Variable =LN-RESIDSQUARED            No. of cases =    13
Multiple R =     .287007820                      F = .987447909
R-sqr =          .082373489                     df = 1,11
Adjusted R-sqr = .000000000                      p = .341723263
Standard error of estimate =1.194744505
Intercept =13.642791122
Std. Error =2.528691209         t(11) =5.395198541      p< .000218248
```

STATISTICA REGRESSION STATS	VARIABLES CURRENTLY IN THE EQUATION					
Variable	Beta in	Partial Cor.	Semipart Cor.	Tolernce	R-square	t(7)
COSTSQFT	.6947662	.6957114	.5299864	.5819049	.4180950	2.372389
ACCESS	.2214754	.2397165	.1351149	.3721824	.6278176	.604818
LOC	.0680305	.0990806	.0544860	.6414512	.3585488	.243897
MANUF	.2835383	.3491724	.2039049	.5171682	.4828318	.912744
COMM	.4418968	.4205775	.2536707	.3295331	.6704669	1.135511
HWCOMM	.2931790	.3671623	.2160013	.5428089	.4571911	.966891

STATISTICA REGRESSION STATS	VARIABLES CURRENTLY IN THE EQUATION
Variable	p-level
COSTSQFT	.0494322
ACCESS	.5643830
LOC	.8143044
MANUF	.3917285
COMM	.2935398
HWCOMM	.3658085

STATISTICA REGRESSION STATS — MULTIPLE REGRESSION RESULTS

```
Standard Regression
Dependent Variable =COMPEN              No. of cases =    13
Multiple R =     .836994993                        F =2.339574082
R-sqr =          .700560618                       df = 6, 6
Adjusted R-sqr = .401121236                        p = .162339076
Standard error of estimate =18205.488310
Intercept =-35963.42620
Std. Error =24059.992939        t( 6) =-1.494739682     p< .185606003
```

STATISTICA REGRESSION STATS	VARIABLES CURRENTLY IN THE EQUATION					
Variable	Beta in	Partial Cor.	Semipart Cor.	Tolernce	R-square	t(7)
COSTSQFT	.8910003	.9341690	.6817083	.5853848	.4146152	6.412666
ADT	.7793034	.8868865	.4998890	.4114660	.5885340	4.702335
LOC	.3364990	.7199110	.2700930	.6442570	.3557430	2.540700
MANUF	.8543813	.8740921	.4685661	.3007726	.6992275	4.407689
COMM	.7239496	.8589514	.4368031	.3640447	.6359553	4.108902
HWCOMM	.1841808	.4690141	.1382824	.5636960	.4363040	1.300789

STATISTICA REGRESSION STATS	VARIABLES CURRENTLY IN THE EQUATION
Variable	p-level
COSTSQFT	.0003629
ADT	.0022025
LOC	.0386245
MANUF	.0031276
COMM	.0045221
HWCOMM	.2345120

STATISTICA REGRESSION STATS — MULTIPLE REGRESSION RESULTS

```
Standard Regression
Dependent Variable =COMPEN              No. of cases =    13
Multiple R =      .965501700                      F =13.747855969
R-sqr =           .932193534                     df = 6, 6
Adjusted R-sqr = .864387067                       p = .002809065
Standard error of estimate =8663.3015068
Intercept =-84251.39874
Std. Error =15201.863617        t( 6) =-5.542175674     p<  .001456622
```

STATISTICA REGRESSION STATS	VARIABLES CURRENTLY IN THE EQUATION					
Variable	Beta in	Partial Cor.	Semipart Cor.	Tolernce	R-square	t(9)
COSTSQFT	.8104486	.8107198	.7859508	.9404588	.0595412	3.916856
ACCESS	.2182180	.2997581	.1783275	.6678138	.3321862	.888711
ADT	.2565840	.4023854	.2494599	.9452405	.0547595	1.243206
LOC	.2039152	.2760213	.1629872	.6388630	.3611370	.812261

STATISTICA REGRESSION STATS	VARIABLES CURRENTLY IN THE EQUATION
Variable	p-level
COSTSQFT	.0035278
ACCESS	.3972887
ADT	.2452020
LOC	.4375979

STATISTICA REGRESSION STATS — MULTIPLE REGRESSION RESULTS

```
Standard Regression
Dependent Variable =COMPEN              No. of cases =    13
Multiple R =      .823340168                      F =4.209040347
R-sqr =           .677889031                     df = 4, 8
Adjusted R-sqr =  .516833547                      p = .039955650
Standard error of estimate =16352.390951
Intercept =-38485.37974
Std. Error =17576.529177        t( 8) =-2.189589273     p<  .059959400
```

STATISTICA REGRESSION STATS — VARIABLES CURRENTLY IN THE EQUATION

Variable	Beta in	Partial Cor.	Semipart Cor.	Tolernce	R-square	t(5)
COSTSQFT	.927645	.929435	.484000	.2722242	.7277759	5.037777
FRONT	-.135269	-.247933	-.049175	.1321594	.8678406	-.511848
ACCESS	.382404	.593656	.141751	.1374075	.8625925	1.475438
ADT	.711487	.845844	.304683	.1833851	.8166149	3.171339
LOC	.223578	.588534	.139876	.3914048	.6085951	1.455914
MANUF	.882392	.893178	.381636	.1870576	.8129424	3.972310
COMM	.623310	.876616	.350049	.3153916	.6846083	3.643536
HWCOMM	.257322	.677911	.177189	.4741526	.5258474	1.844294

STATISTICA REGRESSION STATS — VARIABLES CURRENTLY IN THE EQUATION

Variable	p-level
COSTSQFT	.0039744
FRONT	.6305552
ACCESS	.2001145
ADT	.0247777
LOC	.2051874
MANUF	.0106117
COMM	.0148484
HWCOMM	.1244585

STATISTICA REGRESSION STATS — MULTIPLE REGRESSION RESULTS

```
Standard Regression
Dependent Variable =COMPEN              No. of cases =    13
Multiple R =      .981365930                     F =13.042461054
R-sqr =           .963079089                    df = 8, 4
Adjusted R-sqr = .889237267                      p = .012652556
Standard error of estimate =7829.4220951
Intercept =-89855.60741
Std. Error =20034.502205         t( 4) =-4.485043177     p< .010947371
```

STATISTICA REGRESSION STATS	VARIABLES CURRENTLY IN THE EQUATION					
Variable	Beta in	Partial Cor.	Semipart Cor.	Tolernce	R-square	t(5)
COSTSQFT	1.000130	.9744614	.6965964	.4851202	.5148798	8.679032
ACCESS	.207277	.5939604	.1185153	.3269240	.6730760	1.476606
ADT	.816867	.9554576	.5196854	.4047419	.5952581	6.474864
LOC	.369880	.8262153	.2354244	.4051172	.5948828	2.933199
DIST	.191329	.5873491	.1164954	.3707289	.6292711	1.451439
MANUF	.964319	.9529945	.5049002	.2741382	.7258617	6.290651
COMM	.625509	.9098553	.3519994	.3166774	.6833226	4.385630
HWCOMM	.094544	.3100822	.0523563	.3066666	.6933333	.652317

STATISTICA REGRESSION STATS	VARIABLES CURRENTLY IN THE EQUATION
Variable	p-level
COSTSQFT	.0003358
ACCESS	.1998149
ADT	.0013095
LOC	.0325119
DIST	.2063674
MANUF	.0014924
COMM	.0071170
HWCOMM	.5429918

STATISTICA REGRESSION STATS | MULTIPLE REGRESSION RESULTS

```
Standard Regression
Dependent Variable =COMPEN               No. of cases =    13
Multiple R =     .987031940                    F =18.903950219
R-sqr =          .974232051                   df = 8, 4
Adjusted R-sqr = .922696153                    p = .006304249
Standard error of estimate =6540.8385422
Intercept =-99345.31064
Std. Error =13011.913953        t( 4) =-7.634949862     p<  .001580598
```

STATISTICA REGRESSION STATS	VARIABLES CURRENTLY IN THE EQUATION					
Variable	Beta in	Partial Cor.	Semipart Cor.	Tolernce	R-square	t(5)
COSTSQFT	.9895805	.9731305	.6940055	.4918397	.5081603	8.452650
ACCESS	.2096317	.6034615	.1242733	.3514321	.6485679	1.513588
ADT	.7924021	.9536863	.5206230	.4316736	.5683264	6.340935
LOC	.3289562	.8173361	.2329468	.5014612	.4985388	2.837179
MANUF	.9438202	.9499691	.4994323	.2800108	.7199892	6.082843
COMM	.5829040	.9031760	.3454947	.3513084	.6486916	4.207957
HWCOMM	.0677364	.2888553	.0495449	.5350010	.4649990	.603433

STATISTICA REGRESSION STATS	VARIABLES CURRENTLY IN THE EQUATION
Variable	p-level
COSTSQFT	.0003805
ACCESS	.1905482
ADT	.0014396
LOC	.0363667
MANUF	.0017361
COMM	.0084248
HWCOMM	.5725468

STATISTICA REGRESSION STATS | MULTIPLE REGRESSION RESULTS

```
Standard Regression
Dependent Variable =COMPEN              No. of cases =    12
Multiple R =     .986425376                       F =20.620080429
R-sqr =          .973035022                      df = 7, 4
Adjusted R-sqr = .925846311                       p = .005472545
Standard error of estimate =6684.4408748
Intercept =-98119.27335
Std. Error =13196.639596        t( 4) =-7.435171100     p<  .001747223
```

STATISTICA REGRESSION STATS	VARIABLES CURRENTLY IN THE EQUATION					
Variable	Beta in	Partial Cor.	Semipart Cor.	Tolernce	R-square	t(4)
COSTSQFT	1.052693	.9764326	.6471815	.3779621	.6220379	7.836211
ACCESS	.155340	.5131665	.0855274	.3031398	.6968601	1.035584
ADT	.755989	.9577195	.4761827	.3967497	.6032503	5.765722
LOC	.340045	.8586788	.2396654	.4967510	.5032490	2.901920
DIST	.188495	.4910612	.0806372	.1830089	.8169912	.976373
MANUF	1.090534	.9455844	.4157136	.1453150	.8546851	5.033549
COMM	.710157	.9066437	.3074048	.1873754	.8126246	3.722123
HWCOMM	.135190	.5079218	.0843472	.3892720	.6107280	1.021294

STATISTICA REGRESSION STATS	VARIABLES CURRENTLY IN THE EQUATION
Variable	p-level
COSTSQFT	.0014322
ACCESS	.3588944
ADT	.0044906
LOC	.0440331
DIST	.3841648
MANUF	.0073152
COMM	.0204366
HWCOMM	.3648558

STATISTICA REGRESSION STATS — MULTIPLE REGRESSION RESULTS

```
Standard Regression
Dependent Variable =COMPEN              No. of cases =    12
Multiple R =     .989715811                   F =17.951104438
R-sqr =          .979537386                   df = 8, 3
Adjusted R-sqr = .924970416                   p = .018512033
Standard error of estimate =6723.8029225
Intercept =-110292.1405
Std. Error =18211.132093        t( 3) =-6.056303362     p< .009031992
```

STATISTICA REGRESSION STATS	VARIABLES CURRENTLY IN THE EQUATION					
Variable	Beta in	Partial Cor.	Semipart Cor.	Tolernce	R-square	t(4)
COSTSQFT	.981736	.948752	.492696	.2518651	.7481349	5.199903
FRONT	-.016635	-.034322	-.005636	.1147943	.8852057	-.059483
ACCESS	.223707	.412112	.074230	.1101021	.8898979	.783419
ADT	.781643	.889892	.320150	.1677608	.8322392	3.378859
LOC	.322007	.723028	.171765	.2845382	.7154617	1.812809
MANUF	.935766	.923450	.394953	.1781382	.8218617	4.168331
COMM	.583778	.902823	.344561	.3483664	.6516336	3.636489
HWCOMM	.072255	.267654	.045589	.3980865	.6019135	.481144

STATISTICA REGRESSION STATS	VARIABLES CURRENTLY IN THE EQUATION
Variable	p-level
COSTSQFT	.0065166
FRONT	.9554210
ACCESS	.4771690
ADT	.0278148
LOC	.1440760
MANUF	.0140501
COMM	.0220330
HWCOMM	.6555499

STATISTICA REGRESSION STATS | MULTIPLE REGRESSION RESULTS

Standard Regression
Dependent Variable =COMPEN No. of cases = 12
Multiple R = .986441477 F =13.548329865
R-sqr = .973066788 df = 8, 3
Adjusted R-sqr = .901244888 p = .027627530
Standard error of estimate =7713.9798133
Intercept =-97264.15755
Std. Error =20942.546654 t(3) =-4.644332858 p< .018818330

STATISTICA REGRESSION STATS	VARIABLES CURRENTLY IN THE EQUATION					
Variable	Beta in	Partial Cor.	Semipart Cor.	Tolernce	R-square	t(3)
COSTSQFT	.934913	.975170	.461285	.2434422	.7565578	6.22732
FRONT	-.428230	-.680958	-.097409	.0517425	.9482576	-1.31502
ACCESS	.445290	.773142	.127701	.0822436	.9177564	1.72395
ADT	.430454	.743142	.116344	.0730518	.9269482	1.57063
LOC	.175935	.606337	.079876	.2061243	.7938758	1.07832
DIST	.439851	.769771	.126330	.0824896	.9175104	1.70544
MANUF	1.078827	.968993	.410820	.1450106	.8549894	5.54605
COMM	.902344	.943063	.297018	.1083480	.8916520	4.00972
HWCOMM	.341470	.775256	.128574	.1417760	.8582240	1.73574

STATISTICA REGRESSION STATS	VARIABLES CURRENTLY IN THE EQUATION
Variable	p-level
COSTSQFT	.0083493
FRONT	.2799867
ACCESS	.1831850
ADT	.2142973
LOC	.3598671
DIST	.1866557
MANUF	.0115582
COMM	.0278310
HWCOMM	.1810127

STATISTICA REGRESSION STATS | MULTIPLE REGRESSION RESULTS

```
Standard Regression
Dependent Variable =COMPEN              No. of cases =    12
Multiple R =     .994497851                    F =20.027617482
R-sqr =          .989025976                   df = 9, 2
Adjusted R-sqr = .939642869                    p = .048443366
Standard error of estimate =6030.6343644
Intercept =-104511.3029
Std. Error =16914.936335        t( 2) =-6.178640037     p< .025208469
```

STATISTICA REGRESSION STATS — VARIABLES CURRENTLY IN THE EQUATION

Variable	Beta in	Partial Cor.	Semipart Cor.	Tolernce	R-square	t(5)
COSTSQFT	1.084175	.892124	.385660	.1265351	.8734649	3.949273
RATIO1	-.175062	-.317089	-.065299	.1391338	.8608662	-.668684
ADT	.975564	.838574	.300630	.0949624	.9050376	3.078534
LOC	.482003	.812890	.272593	.3198391	.6801609	2.791436
MANUF	1.091341	.833685	.294844	.0729901	.9270099	3.019289
COMM	.624147	.888539	.378241	.3672519	.6327481	3.873302
HWCOMM	-.007408	-.029403	-.005745	.6014609	.3985392	-.058831

STATISTICA REGRESSION STATS — VARIABLES CURRENTLY IN THE EQUATION

Variable	p-level
COSTSQFT	.0108586
RATIO1	.5333239
ADT	.0275154
LOC	.0383797
MANUF	.0294403
COMM	.0117210
HWCOMM	.9553665

STATISTICA REGRESSION STATS — MULTIPLE REGRESSION RESULTS

Standard Regression	
Dependent Variable =COMPEN	No. of cases = 12
Multiple R = .980742159	F =14.409074602
R-sqr = .961855182	df = 7, 4
Adjusted R-sqr = .895101750	p = .010745430
Standard error of estimate =7950.2873763	
Intercept =-90981.98685	
Std. Error =14465.249515 t(4) =-6.289693569	p< .003264179

STATISTICA REGRESSION STATS — VARIABLES CURRENTLY IN THE EQUATION

Variable	Beta in	Partial Cor.	Semipart Cor.	Tolernce	R-square	t(4)
COSTSQFT	1.122244	.925315	.396134	.1245973	.8754027	4.226533
RATIO1	-.104133	-.226431	-.037738	.1313373	.8686627	-.402647
ADT	.854192	.837572	.248878	.0848912	.9151088	2.655397
LOC	.439546	.831221	.242719	.3049297	.6950703	2.589684
DIST	.242645	.555988	.108588	.2002746	.7997254	1.158580
MANUF	1.215915	.888171	.313774	.0665930	.9334069	3.347805
COMM	.776267	.911009	.358622	.2134285	.7865716	3.826309
HWCOMM	.105428	.365099	.063664	.3646466	.6353534	.679259

STATISTICA REGRESSION STATS — VARIABLES CURRENTLY IN THE EQUATION

Variable	p-level
COSTSQFT	.0134072
RATIO1	.7077984
ADT	.0566617
LOC	.0607041
DIST	.3110855
MANUF	.0286272
COMM	.0186770
HWCOMM	.5342466

STATISTICA REGRESSION STATS — MULTIPLE REGRESSION RESULTS

```
Standard Regression
Dependent Variable =COMPEN             No. of cases =    12
Multiple R =     .986735340                      F =13.854679286
R-sqr =          .973646630                     df = 8, 3
Adjusted R-sqr = .903370977                      p = .026768366
Standard error of estimate =7630.4912428
Intercept =-108977.9172
Std. Error =20833.019710        t( 3) =-5.231018771     p< .013593595
```

STATISTICA REGRESSION STATS — VARIABLES CURRENTLY IN THE EQUATION

Variable	Beta in	Partial Cor.	Semipart Cor.	Tolernce	R-square	t(5)
COSTSQFT	.7655951	.7406821	.2205838	.0830135	.9169865	2.204885
RATIO2	.1752563	.2366102	.0487261	.0772994	.9227006	.487050
ADT	.6829219	.7903095	.2580842	.1428173	.8571827	2.579727
LOC	.3849503	.8222244	.2890487	.5638100	.4361900	2.889239
MANUF	.8514114	.9116142	.4437490	.2716414	.7283586	4.435573
COMM	.7698799	.8005134	.2672584	.1205082	.8794918	2.671429
HWCOMM	.1446828	.2257435	.0463650	.1026945	.8973054	.463450

STATISTICA REGRESSION STATS — VARIABLES CURRENTLY IN THE EQUATION

Variable	p-level
COSTSQFT	.0786089
RATIO2	.6468230
ADT	.0494485
LOC	.0342172
MANUF	.0067928
COMM	.0442726
HWCOMM	.6625161

STATISTICA REGRESSION STATS — MULTIPLE REGRESSION RESULTS

```
Standard Regression
Dependent Variable =COMPEN               No. of cases =    12
Multiple R =      .979778246                    F =13.701943199
R-sqr =           .959965411                   df = 7, 4
Adjusted R-sqr = .889904880                     p = .011798482
Standard error of estimate =8144.8434043
Intercept =-93372.79707
Std. Error =16115.863447        t( 4) =-5.793843897     p<  .004411698
```

STATISTICA REGRESSION STATS	VARIABLES CURRENTLY IN THE EQUATION					
Variable	Beta in	Partial Cor.	Semipart Cor.	Tolernce	R-square	t(4)
COSTSQFT	.763988	.8410751	.2201197	.0830126	.9169874	2.693170
RATIO2	.330844	.5277603	.0879597	.0706841	.9293159	1.076189
ADT	.529024	.7939962	.1848953	.1221518	.8778481	2.262198
LOC	.355824	.8813196	.2640392	.5506375	.4493625	3.230525
DIST	.321027	.7066942	.1413999	.1940065	.8059935	1.730032
MANUF	1.102849	.9479811	.4215825	.1461279	.8538721	5.158072
COMM	1.059648	.9042246	.2997409	.0800145	.9199855	3.667336
HWCOMM	.410090	.6225449	.1126148	.0754106	.9245894	1.377845

STATISTICA REGRESSION STATS	VARIABLES CURRENTLY IN THE EQUATION
Variable	p-level
COSTSQFT	.0544786
RATIO2	.3424236
ADT	.0864700
LOC	.0319596
DIST	.1586767
MANUF	.0067069
COMM	.0214413
HWCOMM	.2403125

STATISTICA REGRESSION STATS	MULTIPLE REGRESSION RESULTS

```
Standard Regression
Dependent Variable =COMPEN              No. of cases =    12
Multiple R =     .989928965                     F =18.336974036
R-sqr =          .979959357                     df = 8, 3
Adjusted R-sqr = .926517641                      p = .017956110
Standard error of estimate =6654.1142157
Intercept =-120362.8335
Std. Error =20414.141134         t( 3) =-5.896051796     p<  .009739711
```

STATISTICA REGRESSION STATS	VARIABLES CURRENTLY IN THE EQUATION					
Variable	Beta in	Partial Cor.	Semipart Cor.	Tolernce	R-square	t(7)
ACCESS	-.188544	-.172460	-.125852	.4455509	.5544491	-.428864
ADT	.360489	.331130	.252252	.4896503	.5103497	.859594
LOC	.016241	.017970	.012919	.6328095	.3671905	.044025
MANUF	.366422	.285885	.214449	.3425176	.6574824	.730773
COMM	1.033856	.652700	.619271	.3587905	.6412095	2.110278
HWCOMM	.330795	.321574	.244119	.5446093	.4553907	.831878

STATISTICA REGRESSION STATS	VARIABLES CURRENTLY IN THE EQUATION
Variable	p-level
ACCESS	.6809111
ADT	.4184751
LOC	.9661143
MANUF	.4886500
COMM	.0727586
HWCOMM	.4329361

STATISTICA REGRESSION STATS	MULTIPLE REGRESSION RESULTS

```
Standard Regression
Dependent Variable =COMPEN               No. of cases =    13
Multiple R =      .695202199                      F = .935381849
R-sqr =           .483306098                     df = 6, 6
Adjusted R-sqr = .000000000                       p = .531277657
Standard error of estimate =23914.678194
Intercept =-12644.25652
Std. Error =30706.696798         t( 6) =-.411775210      p<  .694809854
```

STATISTICA REGRESSION STATS — VARIABLES CURRENTLY IN THE EQUATION

Variable	Beta in	Partial Cor.	Semipart Cor.	Tolernce	R-square	t(12)
COSTSQFT	.7077789	.7077789	.7077789	1.000000	.000000	3.322939

STATISTICA REGRESSION STATS — VARIABLES CURRENTLY IN THE EQUATION

Variable	p-level
COSTSQFT	.0060770

STATISTICA REGRESSION STATS — MULTIPLE REGRESSION RESULTS

Standard Regression	
Dependent Variable =COMPEN	No. of cases = 13
Multiple R = .707778882	F =11.041921341
R-sqr = .500950946	df = 1,11
Adjusted R-sqr = .455582850	p = .006795794
Standard error of estimate =17357.963634	
Intercept =-9757.647063	
Std. Error =11540.110022	t(11) =-.845541944 p< .415821999

STATISTICA REGRESSION STATS	VARIABLES CURRENTLY IN THE EQUATION					
Variable	Beta in	Partial Cor.	Semipart Cor.	Tolernce	R-square	t(6)
SIZE	-1.38721	-.839791	-.603654	.1893610	.8106390	-3.45883
ACCESS	1.32619	.758192	.453789	.1170842	.8829157	2.60013
ADT	.01646	.027398	.010696	.4224618	.5775382	.06129
LOC	-.36938	-.557335	-.261958	.5029316	.4970684	-1.50097
MANUF	.34103	.455235	.199530	.3423102	.6576898	1.14327
COMM	.98798	.834561	.591176	.3580483	.6419517	3.38733
HWCOMM	.57220	.720097	.405000	.5009764	.4990236	2.32058

STATISTICA REGRESSION STATS	VARIABLES CURRENTLY IN THE EQUATION
Variable	p-level
SIZE	.0134866
ACCESS	.0406552
ADT	.9531195
LOC	.1840363
MANUF	.2964829
COMM	.0147240
HWCOMM	.0594020

STATISTICA REGRESSION STATS — MULTIPLE REGRESSION RESULTS

```
Standard Regression
Dependent Variable =COMPEN            No. of cases =    13
Multiple R =     .920708471                     F =3.975831742
R-sqr =          .847704088                    df = 7, 5
Adjusted R-sqr = .634489812                     p = .073924795
Standard error of estimate =14222.718641
Intercept =-21984.86051
Std. Error =18460.708816        t( 5) =-1.190900129     p<  .287140846
```

STATISTICA REGRESSION STATS	VARIABLES CURRENTLY IN THE EQUATION					
Variable	Beta in	Partial Cor.	Semipart Cor.	Tolernce	R-square	t(6)
SIZE	.422408	.414302	.179779	.1811401	.8188599	1.017874
RATIO1	1.146911	.751384	.449715	.1537498	.8462502	2.546194
ADT	-.322571	-.385633	-.165069	.2618683	.7381316	-.934589
LOC	-.150595	-.307196	-.127489	.7166739	.2833261	-.721814
MANUF	-.341288	-.360994	-.152880	.2006584	.7993416	-.865573
COMM	.731858	.706549	.394318	.2902943	.7097057	2.232546
HWCOMM	.166374	.296817	.122757	.5444046	.4555953	.695024

STATISTICA REGRESSION STATS	VARIABLES CURRENTLY IN THE EQUATION
Variable	p-level
SIZE	.3480117
RATIO1	.0437143
ADT	.3860698
LOC	.4975618
MANUF	.4199823
COMM	.0670307
HWCOMM	.5130423

STATISTICA REGRESSION STATS	MULTIPLE REGRESSION RESULTS

```
Standard Regression
Dependent Variable =COMPEN            No. of cases =    13
Multiple R =     .918707081                  F =3.865135272
R-sqr =          .844022701                  df = 7, 5
Adjusted R-sqr = .625654484                  p = .077906623
Standard error of estimate =14393.592172
Intercept =-99103.33215
Std. Error =39319.501874        t( 5) =-2.520462555     p< .053144660
```

STATISTICA REGRESSION STATS — VARIABLES CURRENTLY IN THE EQUATION

Variable	Beta in	Partial Cor.	Semipart Cor.	Tolernce	R-square	t(6)
SIZE	-.274470	-.399793	-.207662	.5724337	.4275663	-.975299
RATIO2	.547387	.605979	.362688	.4390115	.5609885	1.703385
ADT	.270381	.369862	.189535	.4913882	.5086118	.890160
LOC	.290343	.413291	.216089	.5539173	.4460827	1.014876
MANUF	.492204	.501531	.276005	.3144438	.6855562	1.296273
COMM	1.180848	.831595	.712893	.3644695	.6355305	3.348147
HWCOMM	.365848	.505754	.279123	.5820915	.4179086	1.310920

STATISTICA REGRESSION STATS — VARIABLES CURRENTLY IN THE EQUATION

Variable	p-level
SIZE	.3670780
RATIO2	.1393868
ADT	.4076525
LOC	.3493279
MANUF	.2425047
COMM	.0154548
HWCOMM	.2378208

STATISTICA REGRESSION STATS — MULTIPLE REGRESSION RESULTS

```
Standard Regression
Dependent Variable =COMPEN             No. of cases =    13
Multiple R =      .879387079                     F =2.436812167
R-sqr =           .773321635                    df = 7, 5
Adjusted R-sqr = .455971925                      p = .171984076
Standard error of estimate =17351.759970
Intercept =-54373.60688
Std. Error =33882.225719        t( 5) =-1.604782617     p< .169447973
```

STATISTICA REGRESSION STATS	VARIABLES CURRENTLY IN THE EQUATION					
Variable	Beta in	Partial Cor.	Semipart Cor.	Tolernce	R-square	t(7)
SIZE	-1.11449	-.756688	-.544006	.2382619	.7617381	-2.83507
ACCESS	.85997	.619562	.370988	.1861034	.8138966	1.93339
ADT	.15542	.223188	.107617	.4794618	.5205382	.56084
MANUF	.36084	.410064	.211322	.3429811	.6570189	1.10130
COMM	.98259	.781113	.587995	.3581026	.6418974	3.06432
HWCOMM	.48136	.598842	.351453	.5330936	.4669064	1.83159

STATISTICA REGRESSION STATS	VARIABLES CURRENTLY IN THE EQUATION
Variable	p-level
SIZE	.0252222
ACCESS	.0944498
ADT	.5923939
MANUF	.3071879
COMM	.0182124
HWCOMM	.1096898

STATISTICA REGRESSION STATS — MULTIPLE REGRESSION RESULTS

```
Standard Regression
Dependent Variable =COMPEN            No. of cases =    13
Multiple R =     .882656163                     F =3.526564424
R-sqr =          .779081903                    df = 6, 6
Adjusted R-sqr = .558163805                     p = .075247273
Standard error of estimate =15637.363083
Intercept =-25657.70074
Std. Error =20117.785694       t( 6) =-1.275373996     p<  .249329865
```

STATISTICA REGRESSION STATS	VARIABLES CURRENTLY IN THE EQUATION					
Variable	Beta in	Partial Cor.	Semipart Cor.	Tolernce	R-square	t(10)
SIZE	-1.12072	-.582283	-.565304	.2544310	.7455690	-2.14868
ACCESS	1.14623	.593985	.582765	.2584896	.7415103	2.21505
ADT	.01064	.013099	.010340	.9440053	.0559947	.03930

STATISTICA REGRESSION STATS	VARIABLES CURRENTLY IN THE EQUATION
Variable	p-level
SIZE	.0571916
ACCESS	.0511216
ADT	.9694237

STATISTICA REGRESSION STATS | MULTIPLE REGRESSION RESULTS

```
Standard Regression
Dependent Variable =COMPEN              No. of cases =    13
Multiple R =      .614033277                     F =1.815694272
R-sqr =           .377036865                    df = 3, 9
Adjusted R-sqr = .169382487                      p = .214401901
Standard error of estimate =21440.426346
Intercept =860.39919735
Std. Error =15566.462630        t( 9) = .055272622      p<  .957129300
```

STATISTICA REGRESSION STATS	VARIABLES CURRENTLY IN THE EQUATION					
Variable	Beta in	Partial Cor.	Semipart Cor.	Tolernce	R-square	t(11)
SIZE	-1.12557	-.594992	-.584343	.2695206	.7304794	-2.34099
ACCESS	1.15034	.603354	.597206	.2695206	.7304794	2.39252

STATISTICA REGRESSION STATS	VARIABLES CURRENTLY IN THE EQUATION
Variable	p-level
SIZE	.0391039
ACCESS	.0357020

STATISTICA REGRESSION STATS — MULTIPLE REGRESSION RESULTS

```
Standard Regression
Dependent Variable =COMPEN             No. of cases =    13
Multiple R =     .613946215                   F =3.024779943
R-sqr =          .376929955                  df = 2,10
Adjusted R-sqr = .252315946                   p = .093904071
Standard error of estimate =20341.919648
Intercept =1148.6378667
Std. Error =13026.932921        t(10) = .088174083      p<  .931478083
```

STATISTICA REGRESSION STATS — VARIABLES CURRENTLY IN THE EQUATION

Variable	Beta in	Partial Cor.	Semipart Cor.	Tolernce	R-square	t(9)
SIZE	-1.28506	-.612823	-.594100	.2137330	.7862670	-2.19347
ACCESS	1.43178	.602547	.578383	.1631851	.8368149	2.13544
ADT	-.05228	-.062996	-.048356	.8554052	.1445948	-.17853
LOC	-.25669	-.240685	-.189968	.5477025	.4522975	-.70138

STATISTICA REGRESSION STATS — VARIABLES CURRENTLY IN THE EQUATION

Variable	p-level
SIZE	.0559331
ACCESS	.0614754
ADT	.8622584
LOC	.5007983

STATISTICA REGRESSION STATS — MULTIPLE REGRESSION RESULTS

Standard Regression
Dependent Variable =COMPEN No. of cases = 13
Multiple R = .642747817 F =1.407879312
R-sqr = .413124757 df = 4, 8
Adjusted R-sqr = .119687135 p = .314657778
Standard error of estimate =22072.493600
Intercept =3846.7783630
Std. Error =16581.367199 t(8) = .231994040 p< .822367072

STATISTICA REGRESSION STATS	VARIABLES CURRENTLY IN THE EQUATION					
Variable	Beta in	Partial Cor.	Semipart Cor.	Tolernce	R-square	t(8)
SIZE	-1.17093	-.774968	-.591258	.2549714	.7450287	-3.24426
ACCESS	.91519	.643023	.404852	.1956917	.8043084	2.22144
MANUF	.25014	.355729	.183531	.5383328	.4616672	1.00704
COMM	.91024	.776897	.594965	.4272361	.5727639	3.26460
HWCOMM	.49177	.598213	.359958	.5357688	.4642312	1.97510

STATISTICA REGRESSION STATS	VARIABLES CURRENTLY IN THE EQUATION
Variable	p-level
SIZE	.0118022
ACCESS	.0570540
MANUF	.3433991
COMM	.0114483
HWCOMM	.0836807

STATISTICA REGRESSION STATS	MULTIPLE REGRESSION RESULTS

```
Standard Regression
Dependent Variable =COMPEN              No. of cases =    13
Multiple R =     .876070992                       F =4.621515311
R-sqr =          .767500384                      df = 5, 7
Adjusted R-sqr = .601429229                       p = .034901675
Standard error of estimate =14852.022505
Intercept =-18773.54146
Std. Error =15138.725298        t( 7) =-1.240100543     p<  .254892260
```

STATISTICA REGRESSION STATS — VARIABLES CURRENTLY IN THE EQUATION

Variable	Beta in	Partial Cor.	Semipart Cor.	Tolernce	R-square	t(8)
SIZE	-.515340	-.572708	-.439769	.7282185	.2717815	-1.84840
LOC	-.014270	-.020524	-.012922	.8200021	.1799979	-.05431
MANUF	.090776	.109852	.069570	.5873633	.4126367	.29241
COMM	1.007859	.718606	.650465	.4165312	.5834689	2.73398
HWCOMM	.330187	.372564	.252713	.5857782	.4142218	1.06218

STATISTICA REGRESSION STATS — VARIABLES CURRENTLY IN THE EQUATION

Variable	p-level
SIZE	.1017260
LOC	.9580181
MANUF	.7774127
COMM	.0256873
HWCOMM	.3191635

STATISTICA REGRESSION STATS — MULTIPLE REGRESSION RESULTS

```
Standard Regression
Dependent Variable =COMPEN              No. of cases =    13
Multiple R =     .777021447                   F =2.133232966
R-sqr =          .603762329                  df = 5, 7
Adjusted R-sqr = .320735422                   p = .175542682
Standard error of estimate =19388.863768
Intercept =5437.0952685
Std. Error =15139.809803        t( 7) = .359125731      p< .730089486
```

STATISTICA REGRESSION STATS	VARIABLES CURRENTLY IN THE EQUATION					
Variable	Beta in	Partial Cor.	Semipart Cor.	Tolernce	R-square	t(7)
SIZE	-1.10020	-.460126	-.249715	.0515166	.9484833	-1.26944
FRONT	-.06880	-.037274	-.017973	.0682457	.9317544	-.09136
ACCESS	.90898	.636357	.397497	.1912304	.8087696	2.02069
MANUF	.24694	.349354	.179655	.5292944	.4707056	.91328
COMM	.90908	.776442	.593673	.4264722	.5735278	3.01796
HWCOMM	.48933	.594682	.356417	.5305315	.4694685	1.81186

STATISTICA REGRESSION STATS	VARIABLES CURRENTLY IN THE EQUATION
Variable	p-level
SIZE	.2448587
FRONT	.9297624
ACCESS	.0830455
MANUF	.3914630
COMM	.0194422
HWCOMM	.1129067

STATISTICA REGRESSION STATS	MULTIPLE REGRESSION RESULTS

```
Standard Regression
Dependent Variable =COMPEN            No. of cases =    13
Multiple R =     .876255327                     F =3.307066231
R-sqr =          .767823398                    df = 6, 6
Adjusted R-sqr = .535646797                     p = .085617289
Standard error of estimate =16030.870212
Intercept =-18236.60486
Std. Error =17365.017865        t( 6) =-1.050192116     p< .334076941
```

STATISTICA REGRESSION STATS	VARIABLES CURRENTLY IN THE EQUATION					
Variable	Beta in	Partial Cor.	Semipart Cor.	Tolernce	R-square	t(7)
SIZE	-1.39632	-.858703	-.654152	.2194771	.7805229	-4.10437
ACCESS	1.33790	.784446	.493789	.1362175	.8637825	3.09820
LOC	-.37458	-.586916	-.283001	.5707889	.4292111	-1.77564
MANUF	.33043	.519497	.237351	.5159765	.4840235	1.48922
COMM	.98130	.851121	.632944	.4160299	.5839701	3.97131
HWCOMM	.57445	.725195	.411179	.5123404	.4876595	2.57988

STATISTICA REGRESSION STATS	VARIABLES CURRENTLY IN THE EQUATION
Variable	p-level
SIZE	.0045480
ACCESS	.0173660
LOC	.1190507
MANUF	.1800386
COMM	.0053833
HWCOMM	.0364788

STATISTICA REGRESSION STATS	MULTIPLE REGRESSION RESULTS

```
Standard Regression
Dependent Variable =COMPEN              No. of cases =    13
Multiple R =     .920646337                       F =5.561235371
R-sqr =          .847589677                      df = 6, 6
Adjusted R-sqr = .695179355                       p = .027802952
Standard error of estimate =12988.382335
Intercept =-21290.88046
Std. Error =13314.800388        t( 6) =-1.599038652     p<  .160928339
```

STATISTICA REGRESSION STATS	VARIABLES CURRENTLY IN THE EQUATION					
Variable	Beta in	Partial Cor.	Semipart Cor.	Tolernce	R-square	t(7)
COSTSQFT	.8910003	.9341690	.6817083	.5853848	.4146152	6.412666
ADT	.7793034	.8868865	.4998890	.4114660	.5885340	4.702335
LOC	.3364990	.7199110	.2700930	.6442570	.3557430	2.540700
MANUF	.8543813	.8740921	.4685661	.3007726	.6992275	4.407689
COMM	.7239496	.8589514	.4368031	.3640447	.6359553	4.108902
HWCOMM	.1841808	.4690141	.1382824	.5636960	.4363040	1.300789

STATISTICA REGRESSION STATS	VARIABLES CURRENTLY IN THE EQUATION
Variable	p-level
COSTSQFT	.0003629
ADT	.0022025
LOC	.0386245
MANUF	.0031276
COMM	.0045221
HWCOMM	.2345120

STATISTICA REGRESSION STATS — MULTIPLE REGRESSION RESULTS

Standard Regression
Dependent Variable =COMPEN   No. of cases = 13
Multiple R = .965501700   F =13.747855969
R-sqr = .932193534   df = 6, 6
Adjusted R-sqr = .864387067   p = .002809065
Standard error of estimate =8663.3015068
Intercept =-84251.39874
Std. Error =15201.863617   t(6) =-5.542175674   p< .001456622

STATISTICA REGRESSION STATS	VARIABLES CURRENTLY IN THE EQUATION					
Variable	Beta in	Partial Cor.	Semipart Cor.	Tolernce	R-square	t(6)
COSTSQFT	.9220387	.9592850	.6994387	.5754413	.4245587	7.594629
ADT	.7884048	.9292853	.5181125	.4318665	.5681335	5.625757
LOC	.4024942	.8361339	.3139114	.6082683	.3917317	3.408506
MANUF	.8809037	.9201196	.4838249	.3016613	.6983387	5.253457
COMM	.6528512	.8938167	.4104682	.3953035	.6046965	4.456936
HWCOMM	.0058663	.0223665	.0046072	.6167907	.3832093	.050025

STATISTICA REGRESSION STATS	VARIABLES CURRENTLY IN THE EQUATION
Variable	p-level
COSTSQFT	.0002712
ADT	.0013486
LOC	.0143450
MANUF	.0019134
COMM	.0042971
HWCOMM	.9617251

STATISTICA REGRESSION STATS — MULTIPLE REGRESSION RESULTS

```
Standard Regression
Dependent Variable =COMPEN              No. of cases =    12
Multiple R =     .978565879                       F =18.816666788
R-sqr =          .957591179                      df = 6, 5
Adjusted R-sqr = .906700594                       p = .002742904
Standard error of estimate =7497.8741016
Intercept =-90238.66758
Std. Error =13601.759148         t( 5) =-6.634338000     p< .001172224
```

APPENDIX E

EXPANDED DATA BASE

(Refer to Chapter 5)

CASE	DATE	COMPEN	COMPSQFT	COMPFT	APPB4	SIZE	COSTSQFT	ACCESS	SQACCESS
1	22-Apr-1981	$26,898.82	6.63	384.27	$29,887.58	4060	7.36	70.00	4900.00
2	01-Jun-1984	$1,953.24	0.21	25.04	$26,247.47	9350	2.81	78.00	6084.00
3	31-Dec-1984	$67,658.36	1.98	359.39	$275,466.19	34155	8.07	188.26	35441.83
4	31-Jul-1986	$667.05	0.06	4.45	$34,686.53	10496	3.30	149.95	22485.00
5	02-Oct-1985	$21,770.74	3.42	410.92	$44,476.42	6358	7.00	52.98	2806.88
6	12-Dec-1985	$29,216.20	0.23	97.39	$451,523.10	125675	3.59	300.00	90000.00
7	06-Aug-1985	$670.89	0.00	2.31	$798,220.88	198298	4.03	290.00	84100.00
8	09-Jun-1986	$39,902.85	6.28	753.17	$60,768.14	6358	9.56	52.98	2806.88
9	08-Aug-1986	$17,979.41	2.77	345.76	$42,018.54	6500	6.46	52.00	2704.00
10	21-Mar-1986	$670.51	0.02	7.45	$259,486.18	31909	8.13	90.00	8100.00
11	26-Jun-1987	$52,332.36	0.93	269.70	$439,075.22	56120	7.82	194.04	37651.52
12	09-Dec-1987	$70,120.48	3.08	385.28	$355,702.08	22750	15.64	182.00	33124.00
13	02-Jun-1988	$11,389.68	0.70	87.61	$122,032.26	16250	7.51	130.00	16900.00
14	07-Jan-1993	$342,210.90	4.69	2828.19	$1,041,160.29	72963	14.27	121.00	14641.00
15	25-Feb-1993	$682,820.70	2.91	6322.41	$2,800,939.81	234300	11.95	108.00	11664.00
16	17-May-1990	$18,014.71	0.79	1095.79	$216,938.41	22913	9.47	16.44	270.27
17	16-May-1990	$0.00	0.00	.00	$2,802,068.80	344603	8.13	221.10	48885.21
18	09-May-1990	$6,797.98	0.45	87.15	$16,708.13	14995	1.11	78.00	6084.00
19	09-Dec-1991	$614,117.58	4.15	2291.48	$1,626,871.06	147928	11.00	268.00	71824.00
20	21-Feb-1990	$65,768.53	5.11	722.73	$119,521.61	12881	9.28	91.00	8281.00
21	05-Apr-1991	$0.00	0.00	.00	$6,375,401.48	2293870	2.78	351.00	123201.00

CASE	CUACCESS	FRONT	TOTFRONT	RATIO1	RATIO2	ADT	LOC	POP	LAND USE
1	343000.00	70.00	70.00	1.00	1.00	14000	0	2,761,000	HWCOMM
2	474552.00	78.00	203.00	1.00	0.38	1105	1	220,950	INDUST
3	6672278.46	188.26	328.26	1.00	0.57	12810	1	220,950	COMM
4	3371626.12	149.95	289.95	1.00	0.52	15370	1	220,950	RESID2
5	148708.52	52.98	225.96	1.00	0.23	13745	1	222,800	HWCOMM
6	27000000.00	372.94	1038.17	0.80	0.29	12820	1	222,800	COMM
7	24389000.00	904.61	2178.47	0.32	0.13	2670	1	222,800	COMM
8	148708.52	52.98	105.96	1.00	0.50	13745	0	222,800	COMM
9	140608.00	52.00	104.00	1.00	0.50	1335	0	222,800	INDUST
10	729000.00	120.00	120.00	0.75	0.75	11870	0	224,455	Night Club
11	7305901.25	229.50	349.50	0.85	0.56	12290	1	225,955	COMM
12	6028568.00	182.00	307.00	1.00	0.59	905	1	225,955	COMM
13	2197000.00	130.00	255.00	1.00	0.51	1240	1	227,265	COMM
14	1771561.00	171.00	367.14	0.71	0.33	60360	0	576,147	COMM
15	1259712.00	490.00	800.00	0.22	0.14	61540	0	576,147	COMM
16	4443.30	176.44	206.44	0.09	0.08	54000	1	559,173	RESID2
17	10808519.93	678.14	1421.14	0.33	0.16	53000	1	559,173	RESID2
18	474552.00	154.10	232.96	0.51	0.33	54000	0	559,173	RESID2
19	19248832.00	349.14	786.14	0.77	0.34	60360	1	559,173	COMM
20	753571.00	91.00	91.00	1.00	1.00	71000	0	559,173	INDUST
21	43243551.00	.00	880.00	#NULL!	0.40	57000	0	559,173	RESID2

APPENDIX F

EXAMINATION OF LINEAR AND CURVILINEAR MODEL FORMS

C U R V E   E S T I M A T I O N

MODEL: MOD_1.

Dependent variable.. COMPEN   Method.. LINEAR

Listwise Deletion of Missing Data

Multiple R	.70721
R Square	.50015
Adjusted R Square	.45471
Standard Error	18310.02104

Analysis of Variance:

	DF	Sum of Squares	Mean Square
Regression	1	3690072298.1	3690072298.1
Residuals	11	3687825573.7	335256870.3

F = 11.00670   Signif F = .0069

-------------------- Variables in the Equation --------------------

Variable	B	SE B	Beta	T	Sig T
COSTSQFT	5198.077056	1566.802006	.707214	3.318	.0069
(Constant)	-10248.031107	12116.34942		-.846	.4157

Dependent variable.. COMPEN   Method.. LOGARITH

Listwise Deletion of Missing Data

Multiple R	.67643
R Square	.45756
Adjusted R Square	.40825
Standard Error	19074.10602

Analysis of Variance:

	DF	Sum of Squares	Mean Square
Regression	1	3375861147.2	3375861147.2
Residuals	11	4002036724.6	363821520.4

F = 9.27889   Signif F = .0111

-------------------- Variables in the Equation --------------------

Variable	B	SE B	Beta	T	Sig T
COSTSQFT	34566.119284	11347.56107	.676435	3.046	.0111
(Constant)	-37487.504858	21582.03115		-1.737	.1103

Dependent variable.. COMPEN Method.. QUADRATI

Listwise Deletion of Missing Data

Multiple R	.70724
R Square	.50019
Adjusted R Square	.40023
Standard Error	19203.00042

Analysis of Variance:

	DF	Sum of Squares	Mean Square
Regression	2	3690345620.2	1845172810.1
Residuals	10	3687552251.5	368755225.2

F = 5.00379 Signif F = .0312

-------------------- Variables in the Equation --------------------

Variable	B	SE B	Beta	T	Sig T
COSTSQFT	5357.933590	6097.272559	.728963	.879	.4002
COSTSQFT**2	-9.161614	336.514423	-.022585	-.027	.9788
(Constant)	-10822.527233	24632.47928		-.439	.6697

Dependent variable.. COMPEN Method.. CUBIC

Listwise Deletion of Missing Data

Multiple R	.70949
R Square	.50338
Adjusted R Square	.33784
Standard Error	20177.06762

Analysis of Variance:

	DF	Sum of Squares	Mean Square
Regression	3	3713871353.2	1237957117.7
Residuals	9	3664026518.6	407114057.6

F = 3.04081 Signif F = .0853

-------------------- Variables in the Equation --------------------

Variable	B	SE B	Beta	T	Sig T
COSTSQFT	-4906.738587	43178.29108	-.667577	-.114	.9120
COSTSQFT**2	1355.710099	5688.775691	3.342006	.238	.8170
COSTSQFT**3	-51.020066	212.240119	-2.055265	-.240	.8154
(Constant)	10399.685611	91998.72571		.113	.9125

Dependent variable.. COMPEN Method.. EXPONENT

Listwise Deletion of Missing Data

Multiple R	.57033
R Square	.32528
Adjusted R Square	.26394
Standard Error	1.56164

Analysis of Variance:

	DF	Sum of Squares	Mean Square
Regression	1	12.932343	12.932343
Residuals	11	26.825800	2.438709

F = 5.30295 Signif F = .0418

-------------------- Variables in the Equation --------------------

Variable	B	SE B	Beta	T	Sig T
COSTSQFT	.307726	.133630	.570329	2.303	.0418
(Constant)	1217.283618	1257.924919		.968	.3540

MODEL: MOD_2.

Dependent variable.. COMPEN Method.. LINEAR

Listwise Deletion of Missing Data

Multiple R	.17330
R Square	.03003
Adjusted R Square	-.05815
Standard Error	25506.35749

Analysis of Variance:

	DF	Sum of Squares	Mean Square
Regression	1	221580873.4	221580873.4
Residuals	11	7156316998.4	650574272.6

F = .34059 Signif F = .5713

-------------------- Variables in the Equation --------------------

Variable	B	SE B	Beta	T	Sig T
ACCESS	49.774489	85.288233	.173300	.584	.5713
(Constant)	19240.985959	13936.29469		1.381	.1948

Dependent variable.. COMPEN Method.. LOGARITH

Listwise Deletion of Missing Data

Multiple R	.20892
R Square	.04365
Adjusted R Square	-.04329
Standard Error	25326.71243

Analysis of Variance:

	DF	Sum of Squares	Mean Square
Regression	1	322031883.1	322031883.1
Residuals	11	7055865988.7	641442362.6

F = .50204 Signif F = .4933

-------------------- Variables in the Equation --------------------

Variable	B	SE B	Beta	T	Sig T
ACCESS	8131.362251	11476.05690	.208921	.709	.4933
(Constant)	-12505.241431	55143.65151		-.227	.8248

Dependent variable.. COMPEN Method.. QUADRATI

Listwise Deletion of Missing Data

Multiple R	.38193
R Square	.14587
Adjusted R Square	-.02495
Standard Error	25103.14270

Analysis of Variance:

	DF	Sum of Squares	Mean Square
Regression	2	1076220138.0	538110069.0
Residuals	10	6301677733.7	630167773.4

F = .85392 Signif F = .4546

-------------------- Variables in the Equation --------------------

Variable	B	SE B	Beta	T	Sig T
ACCESS	489.938811	387.173617	1.705826	1.265	.2344
ACCESS**2	-1.308670	1.123743	-1.569864	-1.165	.2712
(Constant)	-7785.812235	26957.80969		-.289	.7786

Dependent variable.. COMPEN Method.. CUBIC

Listwise Deletion of Missing Data

Multiple R	.76956
R Square	.59222
Adjusted R Square	.45629
Standard Error	18283.54327

Analysis of Variance:

	DF	Sum of Squares	Mean Square
Regression	3	4369306280.1	1456435426.7
Residuals	9	3008591591.6	334287954.6

F = 4.35683 Signif F = .0372

-------------------- Variables in the Equation --------------------

Variable	B	SE B	Beta	T	Sig T
ACCESS	-3860.908829	1414.613215	-13.442578	-2.729	.0233
ACCESS**2	28.153935	9.422682	33.773107	2.988	.0153
ACCESS**3	-.056690	.018062	-20.826298	-3.139	.0120
(Constant)	162366.630492	57658.22228		2.816	.0202

Dependent variable.. COMPEN   Method.. EXPONENT

Listwise Deletion of Missing Data

Multiple R	.03800
R Square	.00144
Adjusted R Square	-.08933
Standard Error	1.89978

Analysis of Variance:

	DF	Sum of Squares	Mean Square
Regression	1	.057409	.0574091
Residuals	11	39.700733	3.6091576

F = .01591   Signif F = .9019

-------------------- Variables in the Equation --------------------

Variable	B	SE B	Beta	T	Sig T
ACCESS	-.000801	.006352	-.037999	-.126	.9019
(Constant)	11822.551370	12271.93401		.963	.3561

MODEL: MOD_3.

Dependent variable.. COMPEN Method.. LINEAR

Listwise Deletion of Missing Data

Multiple R	.13391
R Square	.01793
Adjusted R Square	-.07135
Standard Error	25664.98046

Analysis of Variance:

	DF	Sum of Squares	Mean Square
Regression	1	132294430.3	132294430.3
Residuals	11	7245603441.4	658691221.9

F = .20084 Signif F = .6627

-------------------- Variables in the Equation --------------------

Variable	B	SE B	Beta	T	Sig T
ADT	.545282	1.216721	.133907	.448	.6627
(Constant)	21470.791059	12818.79674		1.675	.1221

Dependent variable.. COMPEN Method.. LOGARITH

Listwise Deletion of Missing Data

Multiple R	.09554
R Square	.00913
Adjusted R Square	-.08095
Standard Error	25779.75912

Analysis of Variance:

	DF	Sum of Squares	Mean Square
Regression	1	67342089.1	67342089.1
Residuals	11	7310555782.7	664595980.2

F = .10133 Signif F = .7562

-------------------- Variables in the Equation --------------------

Variable	B	SE B	Beta	T	Sig T
ADT	1998.899339	6279.520563	.095538	.318	.7562
(Constant)	9029.707390	54563.17230		.165	.8716

Dependent variable.. COMPEN Method.. QUADRATI

Listwise Deletion of Missing Data

Multiple R	.18318
R Square	.03356
Adjusted R Square	-.15973
Standard Error	26702.66904

Analysis of Variance:

	DF	Sum of Squares	Mean Square
Regression	2	247572533.0	123786266.5
Residuals	10	7130325338.7	713032533.9

F = .17361 Signif F = .8431

-------------------- Variables in the Equation --------------------

Variable	B	SE B	Beta	T	Sig T
ADT	4.631633	10.241424	1.137412	.452	.6607
ADT**2	-.000272	.000676	-1.011260	-.402	.6961
(Constant)	15839.025081	19340.54142		.819	.4319

Dependent variable.. COMPEN Method.. CUBIC

Listwise Deletion of Missing Data

Multiple R	.58354
R Square	.34052
Adjusted R Square	.12070
Standard Error	23251.15789

Analysis of Variance:

	DF	Sum of Squares	Mean Square
Regression	3	2512350784.6	837450261.5
Residuals	9	4865547087.1	540616343.0

F = 1.54907 Signif F = .2682

-------------------- Variables in the Equation --------------------

Variable	B	SE B	Beta	T	Sig T
ADT	-50.310037	28.285677	-12.354872	-1.779	.1090
ADT**2	.007271	.003732	27.049132	1.948	.0832
ADT**3	-2.79955237E-07	1.3678E-07	-14.776451	-2.047	.0710
(Constant)	76317.523402	34010.44092		2.244	.0515

Dependent variable.. COMPEN Method.. EXPONENT

Listwise Deletion of Missing Data

Multiple R	.11970
R Square	.01433
Adjusted R Square	-.07528
Standard Error	1.88748

Analysis of Variance:

	DF	Sum of Squares	Mean Square
Regression	1	.569622	.5696218
Residuals	11	39.188521	3.5625928

F = .15989 Signif F = .6969

-------------------- Variables in the Equation --------------------

Variable	B	SE B	Beta	T	Sig T
ADT	3.57802486E-05	8.9481E-05	.119696	.400	.6969
(Constant)	7719.197331	7277.153894		1.061	.3115

MODEL: MOD_4.

Dependent variable.. COMPEN Method.. LINEAR

Listwise Deletion of Missing Data

Multiple R	.13772
R Square	.01897
Adjusted R Square	-.07022
Standard Error	25651.46131

Analysis of Variance:

	DF	Sum of Squares	Mean Square
Regression	1	139925733.4	139925733.4
Residuals	11	7237972138.4	657997467.1

F = .21265 Signif F = .6537

-------------------- Variables in the Equation --------------------

Variable	B	SE B	Beta	T	Sig T
SIZE	-.059070	.128095	-.137715	-.461	.6537
(Constant)	28648.927191	8815.381441		3.250	.0077

Dependent variable.. COMPEN Method.. LOGARITH

Listwise Deletion of Missing Data

Multiple R	.07017
R Square	.00492
Adjusted R Square	-.08554
Standard Error	25834.39024

Analysis of Variance:

	DF	Sum of Squares	Mean Square
Regression	1	36324960.0	36324960.0
Residuals	11	7341572911.8	667415719.3

F = .05443 Signif F = .8198

-------------------- Variables in the Equation --------------------

Variable	B	SE B	Beta	T	Sig T
SIZE	1433.068931	6142.748351	.070168	.233	.8198
(Constant)	12092.318763	61101.07029		.198	.8467

Dependent variable.. COMPEN Method.. QUADRATI

Listwise Deletion of Missing Data

Multiple R	.48903
R Square	.23915
Adjusted R Square	.08698
Standard Error	23692.82961

Analysis of Variance:

	DF	Sum of Squares	Mean Square
Regression	2	1764396120.7	882198060.4
Residuals	10	5613501751.1	561350175.1

F = 1.57156 Signif F = .2550

-------------------- Variables in the Equation --------------------

Variable	B	SE B	Beta	T	Sig T
SIZE	.715598	.470502	1.668339	1.521	.1592
SIZE**2	-4.11549807E-06	2.4193E-06	-1.866016	-1.701	.1198
(Constant)	16660.262170	10768.62155		1.547	.1529

Dependent variable.. COMPEN Method.. CUBIC

Listwise Deletion of Missing Data

Multiple R	.52413
R Square	.27472
Adjusted R Square	.03296
Standard Error	24383.66392

Analysis of Variance:

	DF	Sum of Squares	Mean Square
Regression	3	2026830276.1	675610092.0
Residuals	9	5351067595.6	594563066.2

F = 1.13631 Signif F = .3855

-------------------- Variables in the Equation --------------------

Variable	B	SE B	Beta	T	Sig T
SIZE	1.330734	1.044865	3.102460	1.274	.2347
SIZE**2	-1.33727162E-05	1.4154E-05	-6.063348	-.945	.3694
SIZE**3	3.22936723E-11	4.8608E-11	2.838619	.	.
(Constant)	10539.713729	14411.63037		.731	.4832

Dependent variable.. COMPEN Method.. EXPONENT

Listwise Deletion of Missing Data

Multiple R	.26420
R Square	.06980
Adjusted R Square	-.01476
Standard Error	1.83360

Analysis of Variance:

	DF	Sum of Squares	Mean Square
Regression	1	2.775198	2.7751976
Residuals	11	36.982945	3.3620859

F = .82544 Signif F = .3831

-------------------- Variables in the Equation --------------------

Variable	B	SE B	Beta	T	Sig T
SIZE	-8.31889265E-06	9.1564E-06	-.264201	-.909	.3831
(Constant)	14809.483209	9331.969370		1.587	.1408

APPENDIX G

MULTIPLE REGRESSION ANALYSIS

* * * * M U L T I P L E   R E G R E S S I O N * * * *

Equation Number 1   Dependent Variable..   COMPEN

Block Number 1. Method: Enter
ADT   COMM   RESID2   APPB4   SIZE

Variable(s) Entered on Step Number
1.. SIZE
2.. COMM
3.. ADT
4.. RESID2
5.. APPB4

Multiple R	.87306
R Square	.76224
Adjusted R Square	.68298
Standard Error	110999.29761

Analysis of Variance

	DF	Sum of Squares	Mean Square
Regression	5	592478733267.52200	118495746653.504
Residual	15	184812661048.02610	12320844069.8684

F = 9.61750   Signif F = .0003

------------------ **Variables in the Equation** ------------------

Variable	B	SE B	Beta	T	Sig T
ADT	3.565653	1.321383	.463640	2.698	.0165
COMM	80869.984776	61781.65866	.209934	1.309	.2102
RESID2	-163550.5469	77500.42974	-.362072	-2.110	.0520
APPB4	.143249	.051736	1.103656	2.769	.0143
SIZE	-.402000	.147327	-1.007559	-2.729	.0155
(Constant)	-52372.06688	50950.04327		-1.028	.3203

Residuals Statistics:

	Min	Max	Mean	Std Dev	N
*PRED	-160369.1094	554970.9375	98617.1901	172116.0558	21
*RESID	-235919.6875	196816.5313	.0000	96128.2115	21
*ZPRED	-1.5047	2.6514	.0000	1.0000	21
*ZRESID	-2.1254	1.7731	.0000	.8660	21

Total Cases = 29

Durbin-Watson Test = 2.38192

* * * *   M U L T I P L E   R E G R E S S I O N   * * * *

Equation Number 1   Dependent Variable..   COMPSQFT

Block Number 1. Method: Enter
COMM   RESID2   HWCOMM   INDUST   LOC   SIZE   COSTSQFT

Variable(s) Entered on Step Number
1..   COSTSQFT
2..   HWCOMM
3..   LOC
4..   INDUST
5..   SIZE
6..   RESID2
7..   COMM

Multiple R	.91744
R Square	.84170
Adjusted R Square	.75647
Standard Error	1.09356

Analysis of Variance

	DF	Sum of Squares	Mean Square
Regression	7	82.66512	11.80930
Residual	13	15.54646	1.19588

F =   9.87498   Signif F = .0003

------------------ **Variables in the Equation** ------------------

Variable	B	SE B	Beta	T	Sig T
COMM	3.763583	1.226802	.869174	3.068	.0090
RESID2	2.729599	1.301146	.537592	2.098	.0560
HWCOMM	6.340511	1.365775	.860647	4.642	.0005
INDUST	3.895690	1.279966	.630362	3.044	.0094
LOC	-2.223436	.557429	-.508798	-3.989	.0015
SIZE	-6.85154E-07	5.8749E-07	-.152772	-1.166	.2645
COSTSQFT	.255189	.077346	.436846	3.299	.0058
(Constant)	-2.032338	1.263699		-1.608	.1318

Residuals Statistics:

	Min	Max	Mean	Std Dev	N
*PRED	-.6900	6.1840	2.1152	2.0330	21
*RESID	-1.7071	2.1101	.0000	.8817	21
*ZPRED	-1.3798	2.0013	.0000	1.0000	21
*ZRESID	-1.5610	1.9296	.0000	.8062	21

Total Cases =   29

Durbin-Watson Test =   1.88496

*** * * * M U L T I P L E   R E G R E S S I O N * * * ***

Equation Number 1   Dependent Variable..   COMPEN

Block Number 1. Method: Enter
ADT   COMM   RESID2   SIZE   APPB4   ACCESS

Variable(s) Entered on Step Number
1..   ACCESS
2..   ADT
3..   COMM
4..   RESID2
5..   SIZE
6..   APPB4

Multiple R	.87787
R Square	.77065
Adjusted R Square	.67236
Standard Error	112843.85487

Analysis of Variance

	DF	Sum of Squares	Mean Square
Regression	6	599019096174.76900	99836516029.1282
Residual	14	178272298140.77930	12733735581.4842

F =   7.84032   Signif F = .0008

------------------ **Variables in the Equation** ------------------

Variable	B	SE B	Beta	T	Sig T
ADT	3.326583	1.384139	.432554	2.403	.0307
COMM	109789.47598	74653.79782	.285007	1.471	.1635
RESID2	-151372.8541	80599.76917	-.335113	-1.878	.0814
SIZE	-.381114	.152584	-.955212	-2.498	.0256
APPB4	.149439	.053301	1.151349	2.804	.0141
ACCESS	-304.024501	424.214564	-.145825	-.717	.4854
(Constant)	-26662.83533	63006.05168		-.423	.6786

Residuals Statistics:

	Min	Max	Mean	Std Dev	N
*PRED	-171311.2188	584285.0625	98617.1901	173063.4416	21
*RESID	-218459.2344	224936.0938	.0000	94411.9426	21
*ZPRED	-1.5597	2.8063	.0000	1.0000	21
*ZRESID	-1.9359	1.9933	.0000	.8367	21

Total Cases =   29

Durbin-Watson Test =   2.37633

* * * * M U L T I P L E   R E G R E S S I O N * * * *

Equation Number 1   Dependent Variable..   COMPEN

Block Number 1. Method: Enter
ADT   LOC   COSTSQFT   COMM   RESID2

Variable(s) Entered on Step Number

1.. RESID2
2.. LOC
3.. COSTSQFT
4.. COMM
5.. ADT

Multiple R	.80371
R Square	.64595
Adjusted R Square	.52794
Standard Error	135448.98150

Analysis of Variance

	DF	Sum of Squares	Mean Square
Regression	5	502094995487.91400	100418999097.583
Residual	15	275196398827.63390	18346426588.5089

F = 5.47349   Signif F = .0046

------------------ **Variables in the Equation** ------------------

Variable	B	SE B	Beta	T	Sig T
ADT	5.390285	1.632993	.700896	3.301	.0049
LOC	18116.364460	71308.63149	.046600	.254	.8029
COSTSQFT	5406.427030	10252.01934	.104032	.527	.6057
COMM	121239.44734	79093.32215	.314730	1.533	.1461
RESID2	-162095.4554	105181.3292	-.358851	-1.541	.1441
(Constant)	-122077.7889	90380.54490		-1.351	.1968

Residuals Statistics:

	Min	Max	Mean	Std Dev	N
*PRED	-165341.3750	402094.0313	98617.1901	158444.7846	21
*RESID	-245029.6719	287309.7500	.0000	117302.2589	21
*ZPRED	-1.6659	1.9153	.0000	1.0000	21
*ZRESID	-1.8090	2.1212	.0000	.8660	21

Total Cases =   29

Durbin-Watson Test = 2.54870

* * * * M U L T I P L E   R E G R E S S I O N * * * *

Equation Number 1   Dependent Variable..   COMPEN

Block Number 1. Method: Enter   ADT   LOC   COSTSQFT ACCESS

Variable(s) Entered on Step Number

1.. ACCESS
2.. ADT
3.. COSTSQFT
4.. LOC

Multiple R	.68636
R Square	.47109
Adjusted R Square	.33887
Standard Error	160295.72935

Analysis of Variance

	DF	Sum of Squares	Mean Square
Regression	4	366175860751.62260	91543965187.9056
Residual	16	411115533563.92570	25694720847.7454

F =   3.56275   Signif F = .0292

------------------ Variables in the Equation ------------------

Variable	B	SE B	Beta	T	Sig T
ADT	2.960038	1.580272	.384892	1.873	.0794
LOC	-10887.65743	81970.47397	-.028006	-.133	.8960
COSTSQFT	24949.285216	9905.121276	.480081	2.519	.0228
ACCESS	341.361829	419.025618	.163734	.815	.4272
(Constant)	-217007.3556	112799.0270		-1.924	.0724

Residuals Statistics:

	Min	Max	Mean	Std Dev	N
*PRED	-127959.9141	358984.2188	98617.1901	135309.9887	21
*RESID	-207332.1406	382543.9375	.0000	143372.8589	21
*ZPRED	-1.6745	1.9242	.0000	1.0000	21
*ZRESID	-1.2934	2.3865	.0000	.8944	21

Total Cases =   29

Durbin-Watson Test = 2.27011

* * * * M U L T I P L E   R E G R E S S I O N * * * *

Equation Number 1   Dependent Variable..   COMPEN

Block Number 1. Method: Enter
ADT LOC INDUST COMM HWCOMM RESID2 COSTSQFT

Variable(s) Entered on Step Number

1.. COSTSQFT
2.. HWCOMM
3.. LOC
4.. INDUST
5.. ADT
6.. RESID2
7.. COMM

Multiple R	.80594
R Square	.64954
Adjusted R Square	.46083
Standard Error	144756.79138

Analysis of Variance

	DF	Sum of Squares	Mean Square
Regression	7	504882521865.88400	72126074552.2692
Residual	13	272408872449.66380	20954528649.9741

F = 3.44203   Signif F = .0261

------------------ **Variables in the Equation** ------------------

Variable	B	SE B	Beta	T	Sig T
ADT	5.521938	1.808192	.718014	3.054	.0092
LOC	19660.744598	78545.80011	.050572	.250	.8063
INDUST	-39213.34632	175257.6964	-.071323	-.224	.8264
COMM	104684.94974	165710.1375	.271756	.632	.5385
HWCOMM	7217.830040	182573.1158	.011013	.040	.9691
RESID2	-184780.5019	193991.7723	-.409072	-.953	.3582
COSTSQFT	4657.442908	11208.52425	.089620	.416	.6845
(Constant)	-102749.5436	167195.3364		-.615	.5495

Residuals Statistics:

	Min	Max	Mean	Std Dev	N
*PRED	-167605.4844	406121.5938	98617.1901	158884.0020	21
*RESID	-227542.1719	285387.8125	.0000	116706.6563	21
*ZPRED	-1.6756	1.9354	.0000	1.0000	21
*ZRESID	-1.5719	1.9715	.0000	.8062	21

Total Cases = 29

Durbin-Watson Test = 2.58365

* * * * M U L T I P L E   R E G R E S S I O N * * * *

Equation Number 1   Dependent Variable..   COMPEN

Block Number 1. Method: Enter
ACCESS   ADT   LOC   INDUST   COMM   HWCOMM   RESID2
COSTSQFT   RATIO2

Variable(s) Entered on Step Number
1.. RATIO2
2.. COSTSQFT
3.. HWCOMM
4.. ADT
5.. ACCESS
6.. INDUST
7.. LOC
8.. RESID2
9.. COMM

Multiple R	.83302
R Square	.69392
Adjusted R Square	.44350
Standard Error	147065.07544

Analysis of Variance

	DF	Sum of Squares	Mean Square
Regression	9	539381893750.50100	59931321527.8335
Residual	11	237909500565.04710	21628136415.0043

F =   2.77099   Signif F = .0572

------------------ **Variables in the Equation** ------------------

Variable	B	SE B	Beta	T	Sig T
ACCESS	-7.519423	482.480208	-.003607	-.016	.9878
ADT	5.001384	2.011074	.650327	2.487	.0302
LOC	-14946.33250	89936.59843	-.038445	-.166	.8710
INDUST	-42292.95627	181486.6783	-.076924	-.233	.8200
COMM	59895.711268	175795.0460	.155486	.341	.7397
HWCOMM	-98.354483	188280.6467	-1.501E-04	-.001	.9996
RESID2	-232306.7690	200949.0775	-.514287	-1.156	.2722
COSTSQFT	6812.772734	13189.80659	.131093	.517	.6157
RATIO2	-207154.1292	168411.6280	-.267530	-1.230	.2443
(Constant)	41944.494253	213125.7934		.197	.8476

Residuals Statistics:

	Min	Max	Mean	Std Dev	N
*PRED	-214181.8906	462290.7500	98617.1901	164222.6985	21
*RESID	-144357.9375	223050.5469	.0000	109066.3790	21
*ZPRED	-1.9047	2.2145	.0000	1.0000	21
*ZRESID	-.9816	1.5167	.0000	.7416	21

Total Cases =   29

Durbin-Watson Test =   2.46882

*** * * * M U L T I P L E   R E G R E S S I O N * * * ***

Equation Number 1   Dependent Variable..   COMPEN

Block Number 1. Method: Enter
ACCESS   ADT   LOC   INDUST   COMM   HWCOMM   RESID2   RATIO1
COSTSQFT

Variable(s) Entered on Step Number

1.. COSTSQFT
2.. RATIO1
3.. ACCESS
4.. HWCOMM
5.. LOC
6.. INDUST
7.. ADT
8.. RESID2
9.. COMM

Multiple R	.80913
R Square	.65470
Adjusted R Square	.34392
Standard Error	162749.94040

Analysis of Variance

	DF	Sum of Squares	Mean Square
Regression	9	502204345598.47500	55800482844.2750
Residual	10	264875431017.72010	26487543101.7720

F = 2.10667   Signif F = .1307

------------------ **Variables in the Equation** ------------------

Variable	B	SE B	Beta	T	Sig T
ACCESS	-41.893005	724.587247	-.017580	-.058	.9550
ADT	5.173124	2.410449	.653757	2.146	.0574
LOC	12264.249298	112259.6604	.030679	.109	.9152
INDUST	-15609.76773	213709.9183	-.028461	-.073	.9432
COMM	119902.16203	189468.8088	.306120	.633	.5410
HWCOMM	28423.518815	220042.2565	.043541	.129	.8998
RESID2	-178321.5834	232649.9813	-.364216	-.766	.4611
RATIO1	-74235.24779	170555.7988	-.112729	-.435	.6726
COSTSQFT	4074.946774	14427.27975	.075534	.282	.7834
(Constant)	-34425.41003	249448.5353		-.138	.8930

Residuals Statistics:

	Min	Max	Mean	Std Dev	N
*PRED	-188022.3125	431658.2500	103548.0496	162578.6199	20
*RESID	-211251.6094	251162.4688	.0000	118071.2165	20
*ZPRED	-1.7934	2.0182	.0000	1.0000	20
*ZRESID	-1.2980	1.5432	.0000	.7255	20

Total Cases = 29

Durbin-Watson Test = 2.48249

*** * * * M U L T I P L E   R E G R E S S I O N * * * ***

Equation Number 1   Dependent Variable..   COMPEN

Block Number 1. Method: Enter
ACCESS   ADT   LOC   INDUST   COMM   HWCOMM   RESID2   RATIO1

Variable(s) Entered on Step Number

1.. RATIO1
2.. COMM
3.. LOC
4.. HWCOMM
5.. ADT
6.. INDUST
7.. ACCESS
8.. RESID2

Multiple R	.80743
R Square	.65194
Adjusted R Square	.39881
Standard Error	155793.71982

Analysis of Variance

	DF	Sum of Squares	Mean Square
Regression	8	500091262136.73700	62511407767.0921
Residual	11	266988514479.45890	24271683134.4963

F =   2.57549   Signif F = .0740

------------------ **Variables in the Equation** ------------------

Variable	B	SE B	Beta	T	Sig T
ACCESS	-128.380825	628.637345	-.053874	-.204	.8419
ADT	5.536574	1.951126	.699688	2.838	.0162
LOC	20059.593870	104163.2035	.050179	.193	.8508
INDUST	-33627.46534	195249.2195	-.061312	-.172	.8664
COMM	122999.61650	181066.5157	.314028	.679	.5110
HWCOMM	15962.946955	206360.3956	.024453	.077	.9397
RESID2	-202711.5675	206797.2244	-.414031	-.980	.3480
RATIO1	-68302.38647	162023.0245	-.103719	-.422	.6815
(Constant)	-2267.557958	212463.3803		-.011	.9917

Residuals Statistics:

	Min	Max	Mean	Std Dev	N
*PRED	-187375.4844	432533.2813	103548.0496	162236.2251	20
*RESID	-211448.1406	250287.4375	.0000	118541.2463	20
*ZPRED	-1.7932	2.0278	.0000	1.0000	20
*ZRESID	-1.3572	1.6065	.0000	.7609	20

Total Cases =   29

Durbin-Watson Test =   2.51765

*** * * * M U L T I P L E   R E G R E S S I O N * * * ***

Equation Number 1   Dependent Variable..   COMPEN

Block Number 1. Method: Enter
ACCESS   RATIO2   ADT   LOC   INDUST   COMM   HWCOMM   RESID2

Variable(s) Entered on Step Number

1.. RESID2
2.. LOC
3.. HWCOMM
4.. INDUST
5.. ACCESS
6.. RATIO2
7.. ADT
8.. COMM

Multiple R	.82855
R Square	.68650
Adjusted R Square	.47750
Standard Error	142501.37125

Analysis of Variance

	DF	Sum of Squares	Mean Square
Regression	8	533611704616.88100	66701463077.1101
Residual	12	243679689698.66710	20306640808.2223

F = 3.28471   Signif F = .0315

------------------ Variables in the Equation ------------------

Variable	B	SE B	Beta	T	Sig T
ACCESS	-128.666413	408.550273	-.061715	-.315	.7582
RATIO2	-186566.9432	158549.4974	-.240943	-1.177	.2621
ADT	5.577413	1.621599	.725228	3.439	.0049
LOC	-2557.388868	83989.40333	-.006578	-.030	.9762
INDUST	-66430.18046	169925.2436	-.120826	-.391	.7027
COMM	71168.438798	169022.0166	.184749	.421	.6812
HWCOMM	-14663.98896	180380.0759	-.022374	-.081	.9365
RESID2	-263200.7588	185888.0269	-.582681	-1.416	.1822
(Constant)	85971.797848	189276.3969		.454	.6578

Residuals Statistics:

	Min	Max	Mean	Std Dev	N
*PRED	-209839.6563	461291.7188	98617.1901	163341.9274	21
*RESID	-151493.8281	221528.9688	.0000	110381.0875	21
*ZPRED	-1.8884	2.2203	.0000	1.0000	21
*ZRESID	-1.0631	1.5546	.0000	.7746	21

Total Cases = 29

Durbin-Watson Test = 2.52593

* * * * M U L T I P L E   R E G R E S S I O N * * * *

Equation Number 1   Dependent Variable..   COMPEN

Block Number 1. Method: Enter
ADT   COMM   COSTSQFT HWCOMM   INDUST   LOC   RESID2   ACCESS

Variable(s) Entered on Step Number

1.. ACCESS
2.. ADT
3.. COSTSQFT
4.. HWCOMM
5.. INDUST
6.. LOC
7.. RESID2
8.. COMM

Multiple R	.80736
R Square	.65183
Adjusted R Square	.41971
Standard Error	150175.78057

Analysis of Variance

	DF	Sum of Squares	Mean Square
Regression	8	506658213481.52900	63332276685.1912
Residual	12	270633180834.01900	22552765069.5016

F =   2.80818   Signif F = .0523

------------------ **Variables in the Equation** ------------------

Variable	B	SE B	Beta	T	Sig T
ADT	5.692447	1.971848	.740186	2.887	.0137
COMM	112455.57796	174129.7443	.291928	.646	.5306
COSTSQFT	2973.054219	13086.15552	.057208	.227	.8241
HWCOMM	-2034.362994	192256.4213	-.003104	-.011	.9917
INDUST	-49154.26173	185237.9091	-.089404	-.265	.7952
LOC	26570.833797	85126.09847	.068346	.312	.7603
RESID2	-190308.1930	202215.7329	-.421309	-.941	.3652
ACCESS	-135.018356	481.181521	-.064762	-.281	.7838
(Constant)	-78924.26441	193121.5965		-.409	.6900

Residuals Statistics:

	Min	Max	Mean	Std Dev	N
*PRED	-165589.5469	404803.8750	98617.1901	159163.1574	21
*RESID	-225616.6875	278016.8125	.0000	116325.6594	21
*ZPRED	-1.6600	1.9237	.0000	1.0000	21
*ZRESID	-1.5024	1.8513	.0000	.7746	21

Total Cases =   29

Durbin-Watson Test =   2.71110

* * * * M U L T I P L E   R E G R E S S I O N * * * *

Equation Number 1   Dependent Variable..   COMPEN

Block Number 1. Method: Enter
ADT   COMM   COSTSQFT   HWCOMM   INDUST   LOC   RESID2   RATIO2

Variable(s) Entered on Step Number

1.. RATIO2
2.. COSTSQFT
3.. HWCOMM
4.. ADT
5.. INDUST
6.. LOC
7.. RESID2
8.. COMM

Multiple R	.83302
R Square	.69392
Adjusted R Square	.48986
Standard Error	140805.64437

Analysis of Variance

	DF	Sum of Squares	Mean Square
Regression	8	539376640488.37600	67422080061.0470
Residual	12	237914753827.17270	19826229485.5977

F =   3.40065   Signif F = .0279

------------------ **Variables in the Equation** ------------------

Variable	B	SE B	Beta	T	Sig T
ADT	4.990445	1.804404	.648905	2.766	.0171
COMM	59339.856049	164812.3252	.154043	.360	.7251
COSTSQFT	6912.701624	11035.84141	.133016	.626	.5428
HWCOMM	398.405177	177665.0098	6.079E-04	.002	.9982
INDUST	-41746.20400	170484.8397	-.075930	-.245	.8107
LOC	-15426.41635	80900.27417	-.039680	-.191	.8520
RESID2	-232127.4504	192080.5786	-.513890	-1.208	.2501
RATIO2	-207718.0039	157478.6483	-.268258	-1.319	.2118
(Constant)	41007.866491	195773.8836		.209	.8376

Residuals Statistics:

	Min	Max	Mean	Std Dev	N
*PRED	-214421.2500	462055.6563	98617.1901	164221.8987	21
*RESID	-144239.0313	222761.4063	.0000	109067.5831	21
*ZPRED	-1.9062	2.2131	.0000	1.0000	21
*ZRESID	-1.0244	1.5820	.0000	.7746	21

Total Cases =   29

Durbin-Watson Test = 2.46258

* * * * **M U L T I P L E   R E G R E S S I O N** * * * *

Equation Number 1   Dependent Variable..   COMPEN

Block Number 1. Method: Enter
ADT   COMM   COSTSQFT HWCOMM   INDUST   LOC   RATIO1   RESID2

Variable(s) Entered on Step Number

1.. RESID2
2.. LOC
3.. HWCOMM
4.. INDUST
5.. COSTSQFT
6.. RATIO1
7.. ADT
8.. COMM

Multiple R	.80906
R Square	.65458
Adjusted R Square	.40337
Standard Error	155201.91300

Analysis of Variance

	DF	Sum of Squares	Mean Square
Regression	8	502115804821.30000	62764475602.6624
Residual	11	264963971794.89590	24087633799.5360

F =   2.60567   Signif F = .0717

------------------ **Variables in the Equation** ------------------

Variable	B	SE B	Beta	T	Sig T
ADT	5.125948	2.162950	.647795	2.370	.0372
COMM	118699.40945	179589.2306	.303049	.661	.5222
COSTSQFT	4427.449156	12469.27111	.082068	.355	.7293
HWCOMM	31953.485200	201597.8134	.048948	.159	.8769
INDUST	-12350.00919	196578.2045	-.022517	-.063	.9510
LOC	8596.951792	88326.47557	.021505	.097	.9242
RATIO1	-74520.49296	162577.6887	-.113162	-.458	.6556
RESID2	-174306.2320	211744.2307	-.356014	-.823	.4279
(Constant)	-40288.44144	217335.9167		-.185	.8563

Residuals Statistics:

	Min	Max	Mean	Std Dev	N
*PRED	-187100.8438	430364.8125	103548.0496	162564.2877	20
*RESID	-212096.7031	252455.8906	.0000	118090.9488	20
*ZPRED	-1.7879	2.0104	.0000	1.0000	20
*ZRESID	-1.3666	1.6266	.0000	.7609	20

Total Cases =   29

Durbin-Watson Test = 2.46397

* * * * M U L T I P L E   R E G R E S S I O N * * * *

Equation Number 1   Dependent Variable..   COMPEN

Block Number 1. Method: Enter   ADT   COMM   RESID2   INDUST

Variable(s) Entered on Step Number

1.. INDUST
2.. ADT
3.. COMM
4.. RESID2

Multiple R	.80162
R Square	.64260
Adjusted R Square	.55325
Standard Error	131767.94448

Analysis of Variance

	DF	Sum of Squares	Mean Square
Regression	4	499486735235.10900	124871683808.777
Residual	16	277804659080.43940	17362791192.5275

F = 7.19191   Signif F = .0016

------------------ **Variables in the Equation** ------------------

Variable	B	SE B	Beta	T	Sig T
ADT	5.642029	1.283793	.733630	4.395	.0005
COMM	114402.50506	87815.02247	.296982	1.303	.2111
RESID2	-200183.8091	105386.6283	-.443172	-1.900	.0757
INDUST	-51493.50949	108557.4179	-.093659	-.474	.6417
(Constant)	-58056.30373	77942.18283		-.745	.4672

End Block Number 1 All requested variables entered.

Residuals Statistics:

	Min	Max	Mean	Std Dev	N
*PRED	-171522.1250	403556.6563	98617.1901	158032.7079	21
*RESID	-225265.7188	279264.0313	.0000	117856.8324	21
*ZPRED	-1.7094	1.9296	.0000	1.0000	21
*ZRESID	-1.7096	2.1194	.0000	.8944	21

Total Cases = 29

Durbin-Watson Test = 2.53290

```
         * * * *   M U L T I P L E   R E G R E S S I O N   * * * *

Equation Number 1    Dependent Variable..   COMPEN

COSTSQFT ADT       MANUF     HWCOMM    COMM      SIZE      ACCESS    LOC
```

Variable(s) Entered on Step Number

```
   1..    LOC
   2..    ADT
   3..    COSTSQFT
   4..    HWCOMM
   5..    SIZE
   6..    COMM
   7..    MANUF
   8..    ACCESS

Multiple R           .98704
R Square             .97425
Adjusted R Square    .92276
Standard Error   6891.04964
```

Analysis of Variance

```
                    DF      Sum of Squares      Mean Square
Regression           8     7187951611.44117  898493951.43015
Residual             4      189946260.32801   47486565.08200

F =       18.92101        Signif F =  .0063
```

------------------ Variables in the Equation ------------------

```
Variable                B          SE B         Beta          T  Sig T

COSTSQFT     6458.538271 1099.512592      .878704      5.874  .0042
ADT             2.909851     .612195      .714586      4.753  .0090
MANUF       60842.172618 10796.05484      .921463      5.636  .0049
HWCOMM      22236.801201 7864.541033      .336780      2.827  .0475
COMM        30325.133842 7098.613800      .634584      4.272  .0129
SIZE            -.147856     .099541    -.344710     -1.485  .2116
ACCESS        189.788504   75.874901      .660789      2.501  .0667
LOC          5801.698305 7137.261530      .112401       .813  .4619
(Constant) -98431.72403 15431.18759                  -6.379  .0031
```

Residuals Statistics:

```
                Min         Max        Mean     Std Dev    N

*PRED      -2818.5432 72487.2031 26248.5065 24474.3941   13
*ZPRED        -1.1877     1.8893      .0000     1.0000   13
*SEPRED     3636.6909  6536.7314  5661.7112   942.7102   13
*ADJPRED  -26112.2578 93293.5625 27818.0941 31589.5138   13
*RESID     -7342.0664  9919.2383      .0000  3978.5494   13
*ZRESID       -1.0654     1.4394      .0000      .5774   13
*SRESID       -1.6599     1.7382     -.0645      .9593   13
*DRESID   -23173.0801 26783.1504 -1569.5876 13931.8134   13
*SDRESID      -2.5768     3.0436     -.0082     1.3533   13
*MAHAL         2.4191     9.8746     7.3846     2.4421   13
*COOK D         .0000     1.4598      .3301      .4597   13
*LEVER          .2016      .8229      .6154      .2035   13
Total Cases =       30
Durbin-Watson Test =   2.29853
```

* * * * M U L T I P L E   R E G R E S S I O N * * * *

Equation Number 1   Dependent Variable..   COMPEN

Block Number 1. Method: Enter
COSTSQFT ADT MANUF HWCOMM COMM SIZE ACCESS

Variable(s) Entered on Step Number

1.. ACCESS
2.. ADT
3.. COSTSQFT
4.. HWCOMM
5.. COMM
6.. MANUF
7.. SIZE

Multiple R	.98489
R Square	.97000
Adjusted R Square	.92800
Standard Error	6653.17552

Analysis of Variance

	DF	Sum of Squares	Mean Square
Regression	7	7156574149.10862	1022367735.58695
Residual	5	221323722.66057	44264744.53211

F = 23.09666   Signif F = .0016

------------------ **Variables in the Equation** ------------------

Variable	B	SE B	Beta	T	Sig T
COSTSQFT	6008.381562	917.080402	.817459	6.552	.0012
ADT	2.663509	.513563	.654090	5.186	.0035
MANUF	58912.413222	10168.25624	.892237	5.794	.0022
HWCOMM	24573.204061	7067.800599	.372165	3.477	.0177
COMM	31420.378478	6728.985410	.657503	4.669	.0055
SIZE	-.200409	.073076	-.467231	-2.742	.0407
ACCESS	231.807307	53.625279	.807087	4.323	.0076
(Constant)	-93528.48381	13713.11687		-6.820	.0010

Residuals Statistics:

	Min	Max	Mean	Std Dev	N
*PRED	-3327.1526	71874.5859	26248.5065	24420.9168	13
*ZPRED	-1.2111	1.8683	.0000	1.0000	13
*SEPRED	3235.2661	6262.1431	5140.9451	937.0537	13
*ADJPRED	-28189.8184	85494.8047	27476.7604	30404.3987	13
*RESID	-8764.5313	10393.1563	.0000	4294.6063	13
*ZRESID	-1.3173	1.5621	.0000	.6455	13
*SRESID	-1.9084	1.8766	-.0578	1.0041	13
*DRESID	-18393.4590	28860.7129	-1228.2539	12954.7673	13
*SDRESID	-3.2752	3.0871	-.0289	1.4948	13
*MAHAL	1.9145	9.7078	6.4615	2.4806	13
*COOK D	.0011	2.0263	.3250	.5590	13
*LEVER	.1595	.8090	.5385	.2067	13

Total Cases = 30
Durbin-Watson Test = 2.34225

*** * * * M U L T I P L E   R E G R E S S I O N * * * ***

Equation Number 1   Dependent Variable..   COMPEN

Block Number 1. Method: Enter
COSTSQFT ACCESS   ADT   LOC   MANUF   HWCOMM   COMM

Variable(s) Entered on Step Number
1.. COMM
2.. ADT
3.. COSTSQFT
4.. LOC
5.. HWCOMM
6.. ACCESS
7.. MANUF

Multiple R	.97982
R Square	.96005
Adjusted R Square	.90413
Standard Error	7677.47834

Analysis of Variance

	DF	Sum of Squares	Mean Square
Regression	7	7083179503.36192	1011882786.19456
Residual	5	294718368.40726	58943673.68145

F =   17.16694   Signif F = .0032

------------------ Variables in the Equation ------------------

Variable	B	SE B	Beta	T	Sig T
COSTSQFT	7437.255478	980.667821	1.011862	7.584	.0006
ACCESS	97.268738	48.273000	.338662	2.015	.1000
ADT	3.391335	.578605	.832826	5.861	.0020
LOC	12687.238245	6046.338623	.245799	2.098	.0899
MANUF	64749.022870	11665.71760	.980633	5.550	.0026
HWCOMM	17640.010285	8055.187355	.267160	2.190	.0801
COMM	28278.459800	7758.311680	.591756	3.645	.0148
(Constant)	-106063.8698	16211.18840		-6.543	.0012

Residuals Statistics:

	Min	Max	Mean	Std Dev	N
*PRED	-2088.1804	71957.2891	26248.5065	24295.3691	13
*ZPRED	-1.1663	1.8814	.0000	1.0000	13
*SEPRED	3962.6152	7263.9956	5959.3602	906.8133	13
*ADJPRED	-7103.3027	87645.1797	28190.3918	29217.3566	13
*RESID	-6286.0249	11018.9219	.0000	4955.7910	13
*ZRESID	-.8188	1.4352	.0000	.6455	13
*SRESID	-1.4239	1.7188	-.0695	1.0050	13
*DRESID	-19814.8535	19012.9961	-1941.8852	13209.3677	13
*SDRESID	-1.6519	2.4033	-.0217	1.1733	13
*MAHAL	2.2737	9.8192	6.4615	2.0120	13
*COOK D	.0018	.6157	.2324	.2360	13
*LEVER	.1895	.8183	.5385	.1677	13

Total Cases =   30
Durbin-Watson Test = 1.69906

Residuals Statistics:

	Min	Max	Mean	Std Dev	N
*PRED	-746.8718	70292.7656	26248.5065	24656.8233	13
*ZPRED	-1.0948	1.7863	.0000	1.0000	13
*SEPRED	2968.9949	4369.2271	3746.1138	495.4130	13
*ADJPRED	-14976.3926	71913.5391	27032.8793	27176.2627	13
*RESID	-5523.6558	6295.4121	.0000	2620.2841	13
*ZRESID	-1.2171	1.3871	.0000	.5774	13
*SRESID	-1.7934	1.8340	-.0410	.9023	13
*DRESID	-17474.9434	15647.2861	-784.3727	8549.8760	13
*SDRESID	-3.5085	3.9819	-.0026	1.6130	13
*MAHAL	4.2124	10.1987	7.3846	2.1626	13
*COOK D	.0008	1.5267	.2836	.5000	13
*LEVER	.3510	.8499	.6154	.1802	13

Total Cases = 30

Durbin-Watson Test = 1.95238

* * * * M U L T I P L E   R E G R E S S I O N * * * *

Equation Number 1   Dependent Variable..   COMPEN

Block Number 1. Method: Enter
COSTSQFT ADT MANUF HWCOMM COMM SIZE ACCESS
CUACCESS

Variable(s) Entered on Step Number

1.. CUACCESS
2.. ADT
3.. COSTSQFT
4.. HWCOMM
5.. MANUF
6.. COMM
7.. SIZE
8.. ACCESS

Multiple R	.99440
R Square	.98883
Adjusted R Square	.96650
Standard Error	4538.46524

Analysis of Variance

	DF	Sum of Squares	Mean Square
Regression	8	7295507204.79575	911938400.59947
Residual	4	82390666.97343	20597666.74336

F = 44.27387   Signif F = .0012

------------------ **Variables in the Equation** ------------------

Variable	B	SE B	Beta	T	Sig T
COSTSQFT	5988.937865	625.631407	.814813	9.573	.0007
ADT	3.032998	.378113	.744828	8.021	.0013
MANUF	68417.741440	7842.644946	1.036196	8.724	.0010
HWCOMM	30121.429488	5273.394416	.456193	5.712	.0046
COMM	34721.954938	4762.960673	.726592	7.290	.0019
SIZE	-.060230	.073472	-.140420	-.820	.4584
ACCESS	346.008282	57.198495	1.204702	6.049	.0038
CUACCESS	-.001833	7.0584E-04	-.673452	-2.597	.0602
(Constant)	-111364.5881	11604.70191		-9.597	.0007

Residuals Statistics:

	Min	Max	Mean	Std Dev	N
*PRED	-716.9644	70573.2188	26248.5065	24661.7243	13
*ZPRED	-1.0934	1.7973	.0000	1.0000	13
*SEPRED	3372.3564	4966.8208	4486.7873	521.2678	13
*ADJPRED	-14698.6250	76685.0234	27315.0424	27982.1647	13
*RESID	-5556.7686	6355.8071	.0000	2573.7474	13
*ZRESID	-1.0795	1.2347	.0000	.5000	13
*SRESID	-1.5913	1.6343	-.0447	.8001	13
*DRESID	-16909.7910	15369.5186	-1066.5359	8992.8725	13
*SDRESID	-3.2907	4.0297	.0178	1.5584	13
*MAHAL	4.2275	10.2493	8.3077	2.0260	13
*COOK D	.0035	1.0020	.2267	.3181	13
*LEVER	.3523	.8541	.6923	.1688	13

Total Cases = 30

Durbin-Watson Test = 2.05606

* * * * M U L T I P L E   R E G R E S S I O N * * * *

Equation Number 1   Dependent Variable..   COMPEN

Block Number 1. Method: Enter
COSTSQFT ADT MANUF HWCOMM COMM SIZE ACCESS LOC
CUACCESS

Variable(s) Entered on Step Number

1.. CUACCESS
2.. ADT
3.. COSTSQFT
4.. HWCOMM
5.. LOC
6.. MANUF
7.. COMM
8.. SIZE
9.. ACCESS

Multiple R	.99460
R Square	.98923
Adjusted R Square	.95690
Standard Error	5147.49482

Analysis of Variance

	DF	Sum of Squares	Mean Square
Regression	9	7298407762.97059	810934195.88562
Residual	3	79490108.79859	26496702.93286

F = 30.60510   Signif F = .0085

------------------ **Variables in the Equation** ------------------

Variable	B	SE B	Beta	T	Sig T
COSTSQFT	6135.449239	836.422207	.834747	7.335	.0052
ADT	3.093362	.466048	.759651	6.637	.0070
MANUF	68546.056288	8903.522235	1.038140	7.699	.0046
HWCOMM	29077.094245	6762.833277	.440377	4.300	.0231
COMM	34195.876891	5631.256684	.715584	6.073	.0090
SIZE	-.050550	.088318	-.117852	-.572	.6072
ACCESS	326.475001	87.716113	1.136692	3.722	.0338
LOC	1875.203319	5667.656111	.036330	.331	.7625
CUACCESS	-.001738	8.5105E-04	-.638351	-2.042	.1338
(Constant)	-112019.7828	13310.10675		-8.416	.0035

Residuals Statistics:

	Min	Max	Mean	Std Dev	N
*PRED	-359.7921	70153.6172	26248.5065	24647.0547	13
*ZPRED	-1.0796	1.7814	.0000	1.0000	13
*SEPRED	3534.5305	5216.0503	4723.8468	563.4121	13
*ADJPRED	-2676.1479	70533.0234	26104.4354	24992.1374	13
*RESID	-6646.2227	6082.0684	.0000	2710.6303	13
*ZRESID	-1.2260	1.1219	.0000	.5000	13
*SRESID	-1.6513	1.4796	.0061	.7017	13
*DRESID	-12058.6289	10578.8418	144.0712	5674.8647	13
*SDRESID	-4.4689	2.3238	-.1488	1.4662	13
*MAHAL	4.1778	10.1856	8.3077	2.0242	13
*COOK D	.0005	.2221	.0558	.0691	13
*LEVER	.3481	.8488	.6923	.1687	13

Total Cases = 30

Durbin-Watson Test = 1.92762

* * * * M U L T I P L E   R E G R E S S I O N * * * *

Equation Number 1   Dependent Variable..   COMPEN

Block Number 1. Method: Enter
COSTSQFT ACCESS ADT LOC MANUF HWCOMM COMM
CUACCESS SQACCESS

Variable(s) Entered on Step Number

1.. SQACCESS
2.. ADT
3.. COSTSQFT
4.. HWCOMM
5.. LOC
6.. COMM
7.. MANUF
8.. ACCESS
9.. CUACCESS

Multiple R	.99401
R Square	.98805
Adjusted R Square	.95220
Standard Error	5421.26069

Analysis of Variance

	DF	Sum of Squares	Mean Square
Regression	9	7289727669.27285	809969741.03032
Residual	3	88170202.49633	29390067.49878

F = 27.55930   Signif F = .0099

------------------ **Variables in the Equation** ------------------

Variable	B	SE B	Beta	T	Sig T
COSTSQFT	6322.245525	932.818603	.860161	6.778	.0066
ACCESS	322.755850	615.410412	1.123743	.524	.6362
ADT	3.236918	.494374	.794905	6.548	.0072
LOC	2946.824771	5706.601378	.057091	.516	.6412
MANUF	70637.357823	10680.45642	1.069813	6.614	.0070
HWCOMM	28990.736602	7455.630021	.439069	3.888	.0302
COMM	34276.224404	6573.737031	.717265	5.214	.0137
CUACCESS	-.002026	.007938	-.744345	-.255	.8150
SQACCESS	.013312	4.099123	.015968	.003	.9976
(Constant)	-115816.5977	35434.47516		-3.268	.0468

Residuals Statistics:

	Min	Max	Mean	Std Dev	N
*PRED	-694.9381	69491.5547	26248.5065	24633.8023	13
*ZPRED	-1.0938	1.7554	.0000	1.0000	13
*SEPRED	3170.0879	4553.2163	4052.0857	462.2588	13
*ADJPRED	-3569.6230	65504.2070	25758.2734	24343.9295	13
*RESID	-7042.2417	5858.5181	.0000	2828.5344	13
*ZRESID	-1.4374	1.1958	.0000	.5774	13
*SRESID	-1.9020	1.5684	.0246	.8082	13
*DRESID	-12329.4912	10078.2285	490.2331	5940.3654	13
*SDRESID	-5.3268	2.1891	-.1967	1.6849	13
*MAHAL	4.1013	9.4420	7.3846	1.8002	13
*COOK D	.0096	.3018	.0848	.0832	13
*LEVER	.3418	.7868	.6154	.1500	13

Total Cases = 30

Durbin-Watson Test = 1.68837

* * * * M U L T I P L E   R E G R E S S I O N * * * *

Equation Number 1   Dependent Variable..   COMPEN

Block Number 1. Method: Enter
COSTSQFT ACCESS   CUACCESS SQACCESS ADT   MANUF   HWCOMM   COMM

Variable(s) Entered on Step Number

1.. COMM
2.. ADT
3.. COSTSQFT
4.. HWCOMM
5.. CUACCESS
6.. MANUF
7.. ACCESS
8.. SQACCESS

Multiple R	.99347
R Square	.98699
Adjusted R Square	.96096
Standard Error	4899.16523

Analysis of Variance

	DF	Sum of Squares	Mean Square
Regression	8	7281890591.91856	910236323.98982
Residual	4	96007279.85062	24001819.96266

F =   37.92364   Signif F = .0016

------------------ **Variables in the Equation** ------------------

Variable	B	SE B	Beta	T	Sig T
COSTSQFT	6093.833360	742.185071	.829085	8.211	.0012
ACCESS	305.150467	555.289126	1.062446	.550	.6119
CUACCESS	-.002934	.006995	-1.077972	-.419	.6964
SQACCESS	.354315	3.655971	.425031	.097	.9275
ADT	3.158036	.424901	.775534	7.432	.0017
MANUF	70577.861565	9651.311575	1.068912	7.313	.0019
HWCOMM	30576.528891	6139.528980	.463086	4.980	.0076
COMM	34973.948133	5813.812738	.731866	6.016	.0038
(Constant)	-113203.2703	31693.68145		-3.572	.0233

* * * * M U L T I P L E   R E G R E S S I O N * * * *

Equation Number 1   Dependent Variable..   COMPEN

Block Number 1. Method: Enter
COSTSQFT ADT   MANUF   HWCOMM   COMM   RATIO1

Variable(s) Entered on Step Number

1.. RATIO1
2.. ADT
3.. COMM
4.. COSTSQFT
5.. HWCOMM
6.. MANUF

Multiple R	.92870
R Square	.86248
Adjusted R Square	.72497
Standard Error	13003.67028

Analysis of Variance

	DF	Sum of Squares	Mean Square
Regression	6	6363325227.53380	1060554204.58897
Residual	6	1014572644.23539	169095440.70590

F = 6.27193   Signif F = .0209

------------------ **Variables in the Equation** ------------------

Variable	B	SE B	Beta	T	Sig T
COSTSQFT	4893.260684	1559.892048	.665743	3.137	.0201
ADT	2.372710	1.026526	.582677	2.311	.0602
MANUF	42501.512454	20268.27673	.643691	2.097	.0808
HWCOMM	14407.623677	13272.84260	.218206	1.085	.3194
COMM	40215.371217	11552.20108	.841548	3.481	.0131
RATIO1	12120.612752	25890.88862	.095737	.468	.6562
(Constant)	-70234.70343	21594.29078		-3.252	.0174

Residuals Statistics:

	Min	Max	Mean	Std Dev	N
*PRED	-5474.5962	61482.7109	26248.5065	23027.7464	13
*ZPRED	-1.3776	1.5301	.0000	1.0000	13
*SEPRED	6512.3384	12144.6533	9389.7064	1767.8253	13
*ADJPRED	-18257.6738	73579.0234	26426.2853	24952.4585	13
*RESID	-21579.8555	15697.6475	.0000	9194.9834	13
*ZRESID	-1.6595	1.2072	.0000	.7071	13
*SRESID	-2.0731	1.4087	-.0085	1.0059	13
*DRESID	-37963.8242	33388.6602	-177.7788	20356.8716	13
*SDRESID	-3.5530	1.5719	-.1237	1.3496	13
*MAHAL	2.0866	9.5439	5.5385	2.3070	13
*COOK D	.0016	.8840	.1898	.2866	13
*LEVER	.1739	.7953	.4615	.1922	13

Total Cases = 30

Durbin-Watson Test = 1.80841

* * * * M U L T I P L E   R E G R E S S I O N * * * *

Equation Number 1   Dependent Variable..   COMPEN

Block Number 1. Method: Enter
COSTSQFT ADT   MANUF   HWCOMM   COMM

Variable(s) Entered on Step Number

1.. COMM
2.. ADT
3.. COSTSQFT
4.. HWCOMM
5.. MANUF

Multiple R	.92599
R Square	.85746
Adjusted R Square	.75565
Standard Error	12256.95770

Analysis of Variance

	DF	Sum of Squares	Mean Square
Regression	5	6326266787.23040	1265253357.44608
Residual	7	1051631084.53878	150233012.07697

F = 8.42194   Signif F = .0071

------------------ **Variables in the Equation** ------------------

Variable	B	SE B	Beta	T	Sig T
COSTSQFT	5311.830596	1204.815415	.722691	4.409	.0031
ADT	2.599040	.853548	.638258	3.045	.0187
MANUF	47276.228520	16509.29436	.716005	2.864	.0242
HWCOMM	15254.437040	12393.94563	.231031	1.231	.2581
COMM	40236.733126	10888.75158	.841995	3.695	.0077
(Constant)	-65105.33734	17539.54398		-3.712	.0075

Residuals Statistics:

	Min	Max	Mean	Std Dev	N
*PRED	-7603.8823	61624.3203	26248.5065	22960.5945	13
*ZPRED	-1.4744	1.5407	.0000	1.0000	13
*SEPRED	5826.5781	10387.4863	8232.7866	1299.8078	13
*ADJPRED	-17841.3789	73771.4063	25299.0737	23112.7200	13
*RESID	-21721.4648	16392.4004	.0000	9361.4061	13
*ZRESID	-1.7722	1.3374	.0000	.7638	13
*SRESID	-2.2129	1.5470	.0212	1.0172	13
*DRESID	-33868.5547	34015.9492	949.4329	17554.1844	13
*SDRESID	-3.7377	1.7655	-.0652	1.3724	13
*MAHAL	1.7886	7.6955	4.6154	1.6542	13
*COOK D	.0026	.9219	.1573	.2656	13
*LEVER	.1491	.6413	.3846	.1379	13

Total Cases =   30

Durbin-Watson Test =   1.54836

*** * * * M U L T I P L E   R E G R E S S I O N * * * ***

Equation Number 1   Dependent Variable..   COMPEN

Block Number 1. Method: Enter
COSTSQFT ADT   MANUF   HWCOMM   COMM   RATIO2

Variable(s) Entered on Step Number

1.. RATIO2
2.. MANUF
3.. HWCOMM
4.. COSTSQFT
5.. ADT
6.. COMM

Multiple R	.92662
R Square	.85862
Adjusted R Square	.71724
Standard Error	13185.08477

Analysis of Variance

	DF	Sum of Squares	Mean Square
Regression	6	6334819109.96929	1055803184.99488
Residual	6	1043078761.79989	173846460.29998

F = 6.07319   Signif F = .0226

------------------ Variables in the Equation ------------------

Variable	B	SE B	Beta	T	Sig T
COSTSQFT	5111.762611	1579.046107	.695471	3.237	.0177
ADT	2.543224	.952042	.624552	2.671	.0370
MANUF	47327.729021	17760.93669	.716785	2.665	.0373
HWCOMM	15642.608461	13446.82053	.236910	1.163	.2889
COMM	41307.570186	12669.25681	.864403	3.260	.0172
RATIO2	5015.159222	22611.30411	.044958	.222	.8318
(Constant)	-66378.56045	19721.61478		-3.366	.0151

Residuals Statistics:

	Min	Max	Mean	Std Dev	N
*PRED	-7802.5322	61250.1289	26248.5065	22976.1092	13
*ZPRED	-1.4820	1.5234	.0000	1.0000	13
*SEPRED	6442.7002	12591.3584	9496.8742	1924.5596	13
*ADJPRED	-18483.6504	74059.9063	25183.8394	23500.8494	13
*RESID	-21347.2754	16047.1289	.0000	9323.2628	13
*ZRESID	-1.6190	1.2171	.0000	.7071	13
*SRESID	-2.0480	1.4797	.0210	.9665	13
*DRESID	-34157.0508	38092.7813	1064.6672	18710.0739	13
*SDRESID	-3.4079	1.6951	-.0530	1.2806	13
*MAHAL	1.9421	10.0205	5.5385	2.5686	13
*COOK D	.0025	.8796	.1432	.2436	13
*LEVER	.1618	.8350	.4615	.2141	13

Total Cases = 30

Durbin-Watson Test = 1.55546

Residuals Statistics:

	Min	Max	Mean	Std Dev	N
*PRED	-1101.7897	72535.6250	26248.5065	22278.5664	13
*ZPRED	-1.2277	2.0777	.0000	1.0000	13
*SEPRED	9859.5566	15609.1445	13129.3928	1684.7705	13
*ADJPRED	-19286.1641	86982.4297	25977.0689	29929.6505	13
*RESID	-22829.6602	18479.9414	.0000	10885.3252	13
*ZRESID	-1.3538	1.0959	.0000	.6455	13
*SRESID	-1.8203	1.7754	.0027	.9690	13
*DRESID	-41275.1523	48502.3633	271.4376	26064.8776	13
*SDRESID	-2.8034	2.6119	-.0190	1.2905	13
*MAHAL	3.1790	9.3582	6.4615	1.8144	13
*COOK D	.0004	.6401	.1674	.2152	13
*LEVER	.2649	.7798	.5385	.1512	13

Total Cases = 30

Durbin-Watson Test = 2.65002

* * * * M U L T I P L E   R E G R E S S I O N * * * *

Equation Number 1   Dependent Variable..   COMPEN

Block Number 1. Method: Enter
COSTSQFT ACCESS MANUF HWCOMM COMM CUACCESS SQACCESS

Variable(s) Entered on Step Number

1.. SQACCESS
2.. COSTSQFT
3.. HWCOMM
4.. MANUF
5.. COMM
6.. ACCESS
7.. CUACCESS

Multiple R	.89849
R Square	.80728
Adjusted R Square	.53747
Standard Error	16863.47322

Analysis of Variance

	DF	Sum of Squares	Mean Square
Regression	7	5956014226.31324	850859175.18761
Residual	5	1421883645.45595	284376729.09119

F = 2.99201   Signif F = .1229

------------------ **Variables in the Equation** ------------------

Variable	B	SE B	Beta	T	Sig T
COSTSQFT	3092.931477	2143.574063	.420803	1.443	.2086
ACCESS	-1956.458971	1598.835419	-6.811829	-1.224	.2756
MANUF	13924.964497	20377.35166	.210896	.683	.5248
HWCOMM	19712.880570	20525.31060	.298554	.960	.3810
COMM	18790.409359	18555.25461	.393208	1.013	.3577
CUACCESS	-.030452	.020428	-11.187294	-1.491	.1962
SQACCESS	14.855749	10.642360	17.820770	1.396	.2216
(Constant)	52963.293219	77325.21227		.685	.5238

* * * * M U L T I P L E   R E G R E S S I O N * * * *

Equation Number 1   Dependent Variable..   COMPEN

Block Number 1.   Method: Enter
COSTSQFT ADT   MANUF   HWCOMM   COMM   ACCESS   CUACCESS

Variable(s) Entered on Step Number

1.. CUACCESS
2.. ADT
3.. COSTSQFT
4.. HWCOMM
5.. MANUF
6.. COMM
7.. ACCESS

Multiple R	.99346
R Square	.98696
Adjusted R Square	.96870
Standard Error	4387.08816

Analysis of Variance

	DF	Sum of Squares	Mean Square
Regression	7	7281665159.23859	1040237879.89123
Residual	5	96232712.53059	19246542.50612

F = 54.04804   Signif F = .0002

------------------ **Variables in the Equation** ------------------

Variable	B	SE B	Beta	T	Sig T
COSTSQFT	6128.580506	581.915580	.833812	10.532	.0001
ADT	3.180013	.321775	.780931	9.883	.0002
MANUF	71146.140721	6864.531747	1.077518	10.364	.0001
HWCOMM	30816.412608	5031.199199	.466719	6.125	.0017
COMM	35245.312610	4562.548754	.737544	7.725	.0006
ACCESS	358.656369	53.241197	1.248739	6.736	.0011
CUACCESS	-.002258	4.6292E-04	-.829612	-4.878	.0046
(Constant)	-116088.4048	9736.962746		-11.922	.0001

Residuals Statistics:

	Min	Max	Mean	Std Dev	N
*PRED	-791.6478	69518.3047	26248.5065	24633.4210	13
*ZPRED	-1.0977	1.7565	.0000	1.0000	13
*SEPRED	2747.3772	4069.8022	3419.3289	406.0800	13
*ADJPRED	-3351.8005	65801.1328	25913.8573	24310.6172	13
*RESID	-6951.3442	5884.2983	.0000	2831.8532	13
*ZRESID	-1.5845	1.3413	.0000	.6455	13
*SRESID	-2.0324	1.7548	.0216	.8642	13
*DRESID	-11436.4912	10071.4980	334.6492	5229.9519	13
*SDRESID	-4.3593	2.5322	-.1016	1.4935	13
*MAHAL	3.7831	9.4039	6.4615	1.7388	13
*COOK D	.0095	.3331	.0785	.1046	13
*LEVER	.3153	.7837	.5385	.1449	13

Total Cases = 30
Durbin-Watson Test = 1.66656

* * * * M U L T I P L E   R E G R E S S I O N * * * *

Equation Number 1   Dependent Variable..   COMPEN

Block Number 1.   Method: Enter   COSTSQFT ACCESS   CUACCESS
SQACCESS

Variable(s) Entered on Step Number
1.. SQACCESS
2.. COSTSQFT
3.. ACCESS
4.. CUACCESS

Multiple R	.87036
R Square	.75753
Adjusted R Square	.63629
Standard Error	14953.85922

Analysis of Variance

	DF	Sum of Squares	Mean Square
Regression	4	5588954628.37817	1397238657.09454
Residual	8	1788943243.39101	223617905.42388

F =   6.24833   Signif F = .0139

------------------ **Variables in the Equation** ------------------

Variable	B	SE B	Beta	T	Sig T
COSTSQFT	3691.734522	1580.761807	.502272	2.335	.0478
ACCESS	-2737.634829	1252.983749	-9.531660	-2.185	.0604
CUACCESS	-.039108	.016580	-14.367211	-2.359	.0461
SQACCESS	19.758783	8.503818	23.702388	2.324	.0487
(Constant)	95684.460518	55128.17524		1.736	.1208

Residuals Statistics:

	Min	Max	Mean	Std Dev	N
*PRED	-5833.9253	73880.5625	26248.5065	21581.1543	13
*ZPRED	-1.4866	2.2071	.0000	1.0000	13
*SEPRED	6372.1802	12532.6836	9146.8912	1592.5998	13
*ADJPRED	-20895.2988	82754.9609	26153.4006	26381.7295	13
*RESID	-23867.6016	19185.2949	.0000	12209.7749	13
*ZRESID	-1.5961	1.2830	.0000	.8165	13
*SRESID	-2.1385	2.0735	-.0002	1.1013	13
*DRESID	-42848.1172	50111.5000	95.1059	22928.3226	13
*SDRESID	-3.0565	2.8517	.0051	1.3965	13
*MAHAL	1.2559	7.5057	3.6923	1.6651	13
*COOK D	.0005	1.3861	.2101	.4029	13
*LEVER	.1047	.6255	.3077	.1388	13

Total Cases =   30

Durbin-Watson Test = 2.45067

*** * * * M U L T I P L E   R E G R E S S I O N * * * ***

Equation Number 1   Dependent Variable..   COMPEN

Block Number 1. Method: Enter   ADT   COMM   RESID2

Variable(s) Entered on Step Number

1.. RESID2
2.. ADT
3.. COMM

Multiple R	.79848
R Square	.63757
Adjusted R Square	.57362
Standard Error	128729.38286

Analysis of Variance

	DF	Sum of Squares	Mean Square
Regression	3	495580076131.59800	165193358710.533
Residual	17	281711318183.95010	16571254010.8206

F =   9.96867   Signif F = .0005

------------------ **Variables in the Equation** ------------------

Variable	B	SE B	Beta	T	Sig T
ADT	5.560832	1.242990	.723072	4.474	.0003
COMM	140557.80256	66769.11617	.364880	2.105	.0505
RESID2	-172177.2197	85281.24051	-.381170	-2.019	.0596
(Constant)	-82273.10381	57536.25415		-1.430	.1709

Residuals Statistics:

	Min	Max	Mean	Std Dev	N
*PRED	-168980.3438	400498.3125	98617.1901	157413.4804	21
*RESID	-246777.4375	282322.4063	.0000	118682.6268	21
*ZPRED	-1.7000	1.9178	.0000	1.0000	21
*ZRESID	-1.9170	2.1931	.0000	.9220	21

Total Cases =   29

Durbin-Watson Test =   2.48435

*** * * * M U L T I P L E   R E G R E S S I O N * * * ***

Equation Number 1   Dependent Variable..   COMPEN

Block Number 1. Method: Enter
ADT   COMM   RESID2   SIZE   APPB4   RATIO2

Variable(s) Entered on Step Number
1..   RATIO2
2..   SIZE
3..   COMM
4..   ADT
5..   RESID2
6..   APPB4

Multiple R	.87532
R Square	.76619
Adjusted R Square	.66598
Standard Error	113936.25859

Analysis of Variance

	DF	Sum of Squares	Mean Square
Regression	6	595550800014.22200	99258466669.0370
Residual	14	181740594301.32620	12981471021.5233

F =   7.64616   Signif F = .0009

------------------ Variables in the Equation ------------------

Variable	B	SE B	Beta	T	Sig T
ADT	3.712238	1.389413	.482700	2.672	.0182
COMM	70002.019903	67236.42424	.181721	1.041	.3155
RESID2	-185436.1918	91391.32303	-.410523	-2.029	.0619
SIZE	-.371121	.164007	-.930165	-2.263	.0401
APPB4	.131977	.057940	1.016812	2.278	.0390
RATIO2	-62987.16518	129478.8082	-.081345	-.486	.6342
(Constant)	-13906.70619	94801.35106		-.147	.8855

Residuals Statistics:

	Min	Max	Mean	Std Dev	N
*PRED	-174177.5938	558748.8750	98617.1901	172561.6991	21
*RESID	-229525.2031	195614.0781	.0000	95325.9131	21
*ZPRED	-1.5809	2.6665	.0000	1.0000	21
*ZRESID	-2.0145	1.7169	.0000	.8367	21

Total Cases =   29

Durbin-Watson Test = 2.30883

* * * * M U L T I P L E   R E G R E S S I O N * * * *

Equation Number 1   Dependent Variable..   COMPEN

Block Number 1. Method: Enter
ADT   COMM   RESID2   SIZE   APPB4   LOC   RATIO1

Variable(s) Entered on Step Number
1.. RATIO1
2.. COMM
3.. LOC
4.. ADT
5.. SIZE
6.. RESID2
7.. APPB4

Multiple R	.91866
R Square	.84393
Adjusted R Square	.75289
Standard Error	99881.43232

Analysis of Variance

	DF	Sum of Squares	Mean Square
Regression	7	647364170346.92000	92480595763.8458
Residual	12	119715606269.27510	9976300522.43959

F = 9.27003   Signif F = .0005

------------------ **Variables in the Equation** ------------------

Variable	B	SE B	Beta	T	Sig T
ADT	2.441822	1.409290	.308587	1.733	.1088
COMM	83850.963978	60143.38353	.214078	1.394	.1885
RESID2	-149240.8189	87221.84667	-.304819	-1.711	.1128
SIZE	-2.324709	.772689	-1.088828	-3.009	.0109
APPB4	.325742	.085522	1.398145	3.809	.0025
LOC	29312.766518	57908.21727	.073326	.506	.6219
RATIO1	-80483.39559	122713.3159	-.122217	-.656	.5243
(Constant)	43067.482920	134586.2115		.320	.7545

Residuals Statistics:

	Min	Max	Mean	Std Dev	N
*PRED	-132914.4375	627153.1875	103548.0496	184585.4773	20
*RESID	-137964.8906	186226.5156	.0000	79377.7134	20
*ZPRED	-1.2810	2.8367	.0000	1.0000	20
*ZRESID	-1.3813	1.8645	.0000	.7947	20

Total Cases = 29

Durbin-Watson Test = 2.04848

```
* * * *   M U L T I P L E   R E G R E S S I O N   * * * *


Equation Number 1    Dependent Variable..   COMPEN

Block Number  1.  Method:  Enter
   ADT       COMM      RESID2   SIZE      APPB4    LOC


Variable(s) Entered on Step Number
   1..     LOC
   2..     RESID2
   3..     APPB4
   4..     ADT
   5..     COMM
   6..     SIZE


Multiple R            .87354
R Square              .76308
Adjusted R Square     .66154
Standard Error 114691.60924

Analysis of Variance
                    DF      Sum of Squares      Mean Square
Regression           6  593133081089.64000 98855513514.9401
Residual            14  184158313225.90780 13154165230.4220

F =        7.51515       Signif F =  .0009


------------------ Variables in the Equation ------------------

Variable              B          SE B         Beta          T  Sig T

ADT            3.410259      1.532833      .443434      2.225  .0430
COMM       86081.059239   67978.15606      .223461      1.266  .2261
RESID2     -154523.3131   89725.93435     -.342088     -1.722  .1070
SIZE           -.410713       .157160    -1.029396     -2.613  .0204
APPB4           .145266       .054217     1.119195      2.679  .0180
LOC        -14094.11501   63192.44032     -.036253      -.223  .8267
(Constant) -44818.16839   62598.48034                   -.716  .4858


Residuals Statistics:

                Min          Max         Mean      Std Dev    N

*PRED    -160292.0000 561780.8125 98617.1901 172211.0741   21
*RESID   -232819.8906 205532.8750      .0000  95957.8848   21
*ZPRED        -1.5034      2.6895      .0000      1.0000   21
*ZRESID       -2.0300      1.7920      .0000       .8367   21

Total Cases =        29

Durbin-Watson Test =   2.37946
```

* * * *   M U L T I P L E   R E G R E S S I O N   * * * *

Equation Number 1   Dependent Variable..   COMPEN

Block Number 1. Method: Enter   ADT   COMM   RESID2   APPB4

Variable(s) Entered on Step Number

1.. APPB4
2.. COMM
3.. ADT
4.. RESID2

Multiple R	.80263
R Square	.64422
Adjusted R Square	.55527
Standard Error	131469.09772

Analysis of Variance

	DF	Sum of Squares	Mean Square
Regression	4	500745415850.34100	125186353962.585
Residual	16	276545978465.20740	17284123654.0755

F =   7.24285   Signif F = .0016

------------------ **Variables in the Equation** ------------------

Variable	B	SE B	Beta	T	Sig T
ADT	5.264267	1.380503	.684510	3.813	.0015
COMM	132950.93931	69595.40421	.345133	1.910	.0742
RESID2	-187012.1083	91225.89531	-.414012	-2.050	.0571
APPB4	.012811	.023435	.098704	.547	.5921
(Constant)	-77798.87712	59328.03519		-1.311	.2083

Residuals Statistics:

	Min	Max	Mean	Std Dev	N
*PRED	-183454.8281	414998.6250	98617.1901	158231.6997	21
*RESID	-231726.7500	267822.0625	.0000	117589.5358	21
*ZPRED	-1.7827	1.9995	.0000	1.0000	21
*ZRESID	-1.7626	2.0371	.0000	.8944	21

Total Cases =   29

Durbin-Watson Test = 2.24136

* * * * M U L T I P L E   R E G R E S S I O N * * * *

Equation Number 1   Dependent Variable..   COMPEN

Block Number 1. Method: Enter   ADT   RESID2

Variable(s) Entered on Step Number
1..   RESID2
2..   ADT

Multiple R   .73695
R Square   .54310
Adjusted R Square   .49233
Standard Error 140465.13362

Analysis of Variance

	DF	Sum of Squares	Mean Square
Regression	2	422143226593.42750	211071613296.714
Residual	18	355148167722.12070	19730453762.3400

F =   10.69776   Signif F = .0009

------------------ **Variables in the Equation** ------------------

Variable	B	SE B	Beta	T	Sig T
ADT	5.805928	1.350345	.754942	4.300	.0004
RESID2	-266076.4863	79312.76312	-.589047	-3.355	.0035
(Constant)	186.550220	45985.50828		.004	.9968

End Block Number   1   All requested variables entered.

Residuals Statistics:

	Min	Max	Mean	Std Dev	N
*PRED	-176652.8281	412407.4375	98617.1901	145283.0387	21
*RESID	-346638.9063	325337.3438	.0000	133256.9262	21
*ZPRED	-1.8947	2.1599	.0000	1.0000	21
*ZRESID	-2.4678	2.3161	.0000	.9487	21

Total Cases =   29

Durbin-Watson Test =   2.52651

* * * * M U L T I P L E   R E G R E S S I O N * * * *

Equation Number 1   Dependent Variable..   COMPEN

Block Number 1. Method: Enter
ADT   COMM   RESID2   SIZE   APPB4   ACCESS   HWCOMM   INDUST

Variable(s) Entered on Step Number

1.. INDUST
2.. ADT
3.. HWCOMM
4.. SIZE
5.. RESID2
6.. ACCESS
7.. COMM
8.. APPB4

Multiple R	.87876
R Square	.77222
Adjusted R Square	.62036
Standard Error	121468.54098

Analysis of Variance

	DF	Sum of Squares	Mean Square
Regression	8	600236116936.58800	75029514617.0735
Residual	12	177055277378.96030	14754606448.2467

F =   5.08516   Signif F = .0061

------------------ **Variables in the Equation** ------------------

Variable	B	SE B	Beta	T	Sig T
ADT	3.369512	1.517415	.438136	2.221	.0464
COMM	119965.82880	134884.2766	.311424	.889	.3913
RESID2	-141317.6615	142699.9746	-.312853	-.990	.3416
SIZE	-.380845	.165231	-.954537	-2.305	.0398
APPB4	.148755	.057917	1.146075	2.568	.0246
ACCESS	-292.594940	458.368637	-.140343	-.638	.5352
HWCOMM	31475.145501	149458.7895	.048024	.211	.8367
INDUST	1411.254781	142329.6302	.002567	.010	.9923
(Constant)	-39439.42929	129357.5035		-.305	.7657

Residuals Statistics:

	Min	Max	Mean	Std Dev	N
*PRED	-171679.8750	583706.5625	98617.1901	173239.1579	21
*RESID	-218714.5313	222956.0156	.0000	94089.1273	21
*ZPRED	-1.5603	2.8001	.0000	1.0000	21
*ZRESID	-1.8006	1.8355	.0000	.7746	21

Total Cases =   29

Durbin-Watson Test = 2.41852

****** MULTIPLE REGRESSION ******

Equation Number 1   Dependent Variable..   COMPEN
Block Number 1. Method: Enter   ADT   COMM   COSTSQFT RESID2

Variable(s) Entered on Step Number

1.. RESID2
2.. COSTSQFT
3.. ADT
4.. COMM

Multiple R	.80276
R Square	.64443
Adjusted R Square	.55554
Standard Error	131429.77119

Analysis of Variance

	DF	Sum of Squares	Mean Square
Regression	4	500910838227.60600	125227709556.901
Residual	16	276380556087.94230	17273784755.4964

F = 7.24958   Signif F = .0016

------------------ Variables in the Equation ------------------

Variable	B	SE B	Beta	T	Sig T
ADT	5.206412	1.420409	.676987	3.665	.0021
COMM	128520.75812	71530.53293	.333632	1.797	.0913
COSTSQFT	5520.883537	9938.198963	.106234	.556	.5862
RESID2	-151931.7213	94389.59353	-.336350	-1.610	.1270
(Constant)	-113357.2323	81127.74139		-1.397	.1814

Residuals Statistics:

	Min	Max	Mean	Std Dev	N
*PRED	-167021.3281	408203.9063	98617.1901	158257.8336	21
*RESID	-241757.2344	281255.1875	.0000	117554.3611	21
*ZPRED	-1.6785	1.9562	.0000	1.0000	21
*ZRESID	-1.8394	2.1400	.0000	.8944	21

Total Cases = 29

Durbin-Watson Test = 2.55341

* * * * M U L T I P L E   R E G R E S S I O N * * * *

Equation Number 1   Dependent Variable..   COMPEN

Block Number 1.   Method: Enter   ADT   COMM   RESID2
SQACCESS

Variable(s) Entered on Step Number

1.. SQACCESS
2.. ADT
3.. COMM
4.. RESID2

Multiple R	.80252
R Square	.64405
Adjusted R Square	.55506
Standard Error	131501.03059

Analysis of Variance

	DF	Sum of Squares	Mean Square
Regression	4	500611057580.38800	125152764395.097
Residual	16	276680336735.16030	17292521045.9475

F =   7.23739   Signif F = .0016

------------------ **Variables in the Equation** ------------------

Variable	B	SE B	Beta	T	Sig T
ADT	5.557094	1.269771	.722586	4.376	.0005
COMM	158263.65138	75694.84347	.410843	2.091	.0529
RESID2	-154195.6771	93278.16482	-.341362	-1.653	.1178
SQACCESS	-.515116	.955011	-.090609	-.539	.5970
(Constant)	-79380.19384	59019.25930		-1.345	.1974

Residuals Statistics:

	Min	Max	Mean	Std Dev	N
*PRED	-159745.7188	414858.7188	98617.1901	158210.4702	21
*RESID	-245139.2969	267961.9688	.0000	117618.0974	21
*ZPRED	-1.6330	1.9989	.0000	1.0000	21
*ZRESID	-1.8642	2.0377	.0000	.8944	21

Total Cases =   29

Durbin-Watson Test = 2.72317

* * * * M U L T I P L E   R E G R E S S I O N * * * *

Equation Number 1   Dependent Variable..   COMPEN

Block Number 1. Method: Enter   ADT   COMM   RESID2
CUACCESS

Variable(s) Entered on Step Number

1.. CUACCESS
2.. ADT
3.. COMM
4.. RESID2

Multiple R	.80342
R Square	.64549
Adjusted R Square	.55686
Standard Error	131234.12542

Analysis of Variance

	DF	Sum of Squares	Mean Square
Regression	4	501733063535.60900	125433265883.902
Residual	16	275558330779.93980	17222395673.7462

F = 7.28315   Signif F = .0015

------------------ **Variables in the Equation** ------------------

Variable	B	SE B	Beta	T	Sig T
ADT	5.573868	1.267363	.724767	4.398	.0004
COMM	155678.63952	72617.20837	.404133	2.144	.0478
RESID2	-154077.4214	92063.22090	-.341101	-1.674	.1136
CUACCESS	-.001656	.002771	-.097084	-.598	.5584
(Constant)	-81804.05761	58661.01063		-1.395	.1822

Residuals Statistics:

	Min	Max	Mean	Std Dev	N
*PRED	-155794.5156	414804.3750	98617.1901	158387.6674	21
*RESID	-246924.1563	268016.3438	.0000	117379.3702	21
*ZPRED	-1.6063	1.9963	.0000	1.0000	21
*ZRESID	-1.8816	2.0423	.0000	.8944	21

Total Cases = 29

Durbin-Watson Test = 2.74369

*** * * * M U L T I P L E   R E G R E S S I O N * * * ***

Equation Number 1   Dependent Variable..   COMPEN
Block Number 1. Method: Enter
ADT   COMM   RESID2   CUACCESS ACCESS

Variable(s) Entered on Step Number
1.. ACCESS
2.. ADT
3.. COMM
4.. RESID2
5.. CUACCESS

Multiple R	.80503
R Square	.64808
Adjusted R Square	.53077
Standard Error	135042.77353

Analysis of Variance

	DF	Sum of Squares	Mean Square
Regression	5	503743134064.28200	100748626812.856
Residual	15	273548260251.26590	18236550683.4177

F = 5.52454   Signif F = .0044

------------------ **Variables in the Equation** ------------------

Variable	B	SE B	Beta	T	Sig T
ADT	5.620774	1.311774	.730866	4.285	.0007
COMM	140398.25997	87761.82979	.364466	1.600	.1305
RESID2	-159387.4152	96075.71307	-.352856	-1.659	.1179
CUACCESS	-.003940	.007447	-.230988	-.529	.6045
ACCESS	323.951035	975.764634	.155383	.332	.7445
(Constant)	-105133.5232	92637.09933		-1.135	.2742

Residuals Statistics:

	Min	Max	Mean	Std Dev	N
*PRED	-142837.5000	411190.5625	98617.1901	158704.6209	21
*RESID	-254683.3281	271630.1250	.0000	116950.4725	21
*ZPRED	-1.5214	1.9695	.0000	1.0000	21
*ZRESID	-1.8859	2.0114	.0000	.8660	21

Total Cases = 29

Durbin-Watson Test = 2.71563

* * * * M U L T I P L E   R E G R E S S I O N * * * *

Equation Number 1   Dependent Variable..   COMPEN
Block Number 1. Method: Enter   ADT   COMM   RESID2   SIZE

Variable(s) Entered on Step Number
1.. SIZE
2.. COMM
3.. ADT
4.. RESID2

Multiple R	.80045
R Square	.64072
Adjusted R Square	.55089
Standard Error	132114.63377

Analysis of Variance

	DF	Sum of Squares	Mean Square
Regression	4	498022971012.60400	124505742753.151
Residual	16	279268423302.94400	17454276456.4340

F = 7.13325   Signif F = .0017

------------------ **Variables in the Equation** ------------------

Variable	B	SE B	Beta	T	Sig T
ADT	5.643267	1.294568	.733791	4.359	.0005
COMM	142141.02471	68655.52527	.368990	2.070	.0550
RESID2	-161286.5027	92238.16003	-.357060	-1.749	.0995
SIZE	-.025089	.067062	-.062882	-.374	.7132
(Constant)	-83529.25473	59144.69545		-1.412	.1770

Residuals Statistics:

	Min	Max	Mean	Std Dev	N
*PRED	-158342.0781	400020.0938	98617.1901	157800.9777	21
*RESID	-251050.9844	282800.5938	.0000	118166.9208	21
*ZPRED	-1.6284	1.9100	.0000	1.0000	21
*ZRESID	-1.9003	2.1406	.0000	.8944	21

Total Cases = 29

Durbin-Watson Test = 2.62977

*** * * * M U L T I P L E   R E G R E S S I O N * * * ***

Equation Number 1 Dependent Variable.. COMPEN

Block Number 1. Method: Enter ADT COMM RATIO2

Variable(s) Entered on Step Number
1.. RATIO2
2.. COMM
3.. ADT

Multiple R	.74294
R Square	.55196
Adjusted R Square	.47290
Standard Error	143127.75498

Analysis of Variance

	DF	Sum of Squares	Mean Square
Regression	3	429036972155.34350	143012324051.781
Residual	17	348254422160.20470	20485554244.7179

F = 6.98113 Signif F = .0029

------------------ Variables in the Equation ------------------

Variable	B	SE B	Beta	T	Sig T
ADT	4.478216	1.296539	.582300	3.454	.0030
COMM	207931.94002	64837.36797	.539779	3.207	.0052
RATIO2	-29036.66577	131231.8378	-.037500	-.221	.8275
(Constant)	-112305.5081	93733.87790		-1.198	.2473

Residuals Statistics:

	Min	Max	Mean	Std Dev	N
*PRED	-120845.4219	367295.9063	98617.1901	146464.4961	21
*RESID	-131371.1406	315524.8125	.0000	131957.2700	21
*ZPRED	-1.4984	1.8344	.0000	1.0000	21
*ZRESID	-.9179	2.2045	.0000	.9220	21

Total Cases = 29

Durbin-Watson Test = 2.16881

* * * *   M U L T I P L E   R E G R E S S I O N   * * * *

Equation Number 1   Dependent Variable..   COMPEN

Block Number 1. Method: Enter   ADT   COMM   RATIO1

Variable(s) Entered on Step Number

1.. RATIO1
2.. COMM
3.. ADT

Multiple R	.75690
R Square	.57289
Adjusted R Square	.49281
Standard Error	143096.64267

Analysis of Variance

	DF	Sum of Squares	Mean Square
Regression	3	439453390314.40150	146484463438.134
Residual	16	327626386301.79400	20476649143.8621

F = 7.15373   Signif F = .0029

------------------ **Variables in the Equation** ------------------

Variable	B	SE B	Beta	T	Sig T
ADT	5.084003	1.529470	.642494	3.324	.0043
COMM	200795.02978	64470.14328	.512646	3.115	.0067
RATIO1	37560.615652	126617.0075	.057037	.297	.7706
(Constant)	-159920.8691	134118.0211		-1.192	.2505

Residuals Statistics:

	Min	Max	Mean	Std Dev	N
*PRED	-116742.4297	376576.1563	103548.0496	152082.6282	20
*RESID	-172835.4531	320798.3125	.0000	131314.4852	20
*ZPRED	-1.4485	1.7953	.0000	1.0000	20
*ZRESID	-1.2078	2.2418	.0000	.9177	20

Total Cases =   29

Durbin-Watson Test = 2.41515