PARK PLAZA: THE VALUE

OF PUBLIC CLAIMS

by

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This thesis examines the value of the local government's financial claims on redeveloped real estate. The thesis estimates the value of claims that the City of Boston would hold on six alternative redevelopment schemes proposed for the Park Plaza urban renewal area.

The value of the local government's claim on redevelopment, designated the Residual Market Value, is the net present value of the cash flows accruing to the local government as a direct result of redevelopment. The real estate taxes collected by the city constitute the direct cash inflows, while the public capital contributions towards creation of the project constitute the cash outflow.

The thesis first develops a model to determine the value of newly constructed real estate as the present value of the cash flows of the investment. The model recognizes that actual redevelopment will be done by a private firm, determining the cash flow that must be allocated to the private developer to compensate for risk of the project. The model then computes the value of the residual cash flows that can be appropriated by local government without destroying private feasibility. The model makes reference to modern financial theory to account for uncertainty in the valuation of future cash flows.

The thesis then uses data provided by the Boston Redevelopment Authority to compute the Residual Market Value of public claims on each of the six redevelopment alternatives. Since the six alternatives cover a range of redevelopment densities and scales, the computation of the Residual Market Value for each provides a monetary standard to be compared to the other public costs and benefits of development.

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CHAPTER 1

INTRODUCTION

The Boston Redevelopment Authority has proposed six alternative schemes for the redevelopment of the Park Plaza renewal area. These schemes would create between two and six million square feet of office, retail, residential, hotel, and parking space on the ten acre site. There has been great controversy over the relative weight of the many costs and benefits that will accrue to the City of Boston and its citizenry as a result of such a major real estate development.

This thesis attempts to determine the value of the local government's financial claims on the redeveloped real estate. The value of such claims, designated Residual Market Value, is the net present value of the cash flows accruing to the City of Boston as a direct result of the redevelopment. The real estate taxes collected by the City constitute the direct cash inflows, while the construction costs of infrastructure necessary to support the new development and other public capital contributions to the project constitute the cash outflows.

This thesis first develops a model to compute the present value of public claims on redevelopment. This model recognizes that the actual process of redevelopment will be pursued by a private development firm. The model therefore accepts as a constraint that the value of the cash flows appropriated by the private developer must exceed the costs that the developer must bear to create the project. Once a development meets this private feasibility test, the remainder of cash flows can be appropriated by the local government through the use of the property tax. The model starts with competitive market prices of inputs and outputs of the redevelopment process. It then determines the present value of the purchase of the inputs and the sale of the outputs, recognizing the uncertainty of future cash flows. After allowing adequate cash flow to maintain private feasibility, the model determines the present value to the local government on the remainder of the cash flows.

The thesis then uses data provided by the Boston Redevelopment Authority to compute the Residual Market Value of public claims on each of the six redevelopment alternatives. Computation of the Residual Market Value of the six alternatives, each of which represents development at a different scale and density, provides a measure of the monetary value of redevelopment to be weighed against the other public costs and benefits.

There are two sets of basic objectives underlying this work. On one hand, the thesis attempts to work fully through a problem, dealing with all encountered adversity, and to come up with a useable answer. That is the practical objective. On the other hand, the thesis attempts to deal with a number of interesting theoretical issues that have not received wide coverage in the literature. That is the more profound objective.

The practical objective is by far the more exacting because it requires toleration of inadequacy beyond one's control. In order to get an answer, no matter how good the model, one needs data. In this case, the data available from the Boston Redevelopment Authority left much to be desired, yet it was beyond the scope of this work to replace that data. The thesis uses that data, but with reservations noted.

In many respects that data was necessarily limited just because of the lack of specification of the alternatives at this point in time. The project has not yet been designed, nor has any developer agreed that the Boston Redevelopment Authority's data is reasonable. As a result, the thesis develops a model that specifies the expected pattern of cash flows in terms of just a few basic input variables. This model specifying the pattern of cash flows of a real estate development investment is useful beyond the bounds of this work.

The theoretical issues encountered are those most closely related to capital budgeting under uncertainty. The thesis first selects a methodology for the valuation of future uncertain cash flows. While such techniques have been widely discussed in relation to private market investment, this thesis applies modern financial theory to local public finance. Specifically, the thesis applies the Capital Asset Pricing Model to local governmental entities to determine the appropriate "social cost of capital" to be used in valuing uncertain cash flows.

The first section of the work reviews the context of public decision affecting redevelopment at Park Plaza. The next section, comprised of Chapters 3 to 7, develops the model to compute Residual Market Value. Chapter 3 presents a preliminary definition of Residual Market Value. Chapter 4 first develops a model of the pattern of investment cash flows, based on twelve basic variables. The model is then extended to provide the present value of each component of the cash flow as a function of the relevant market prices and the appropriate cost of capital. Chapter 5 presents the financial theory assumptions underlying the selection of the structure of discount rates to be used. It is in this Chapter that the methodology for dealing with uncertainty is presented. Chapter 6 presents the model for determining the value of tax revenues from the parcels that are not redeveloped. Chapter 7 summarizes the model for computing Residual Market Value.

The third section of the work presents the data to be used in the model. The three chapters in this section present the architectural, financial, and taxation program data.

The last section presents the computation of Residual Market Value, checks the sensitivity of the model to key data, and presents conclusions.

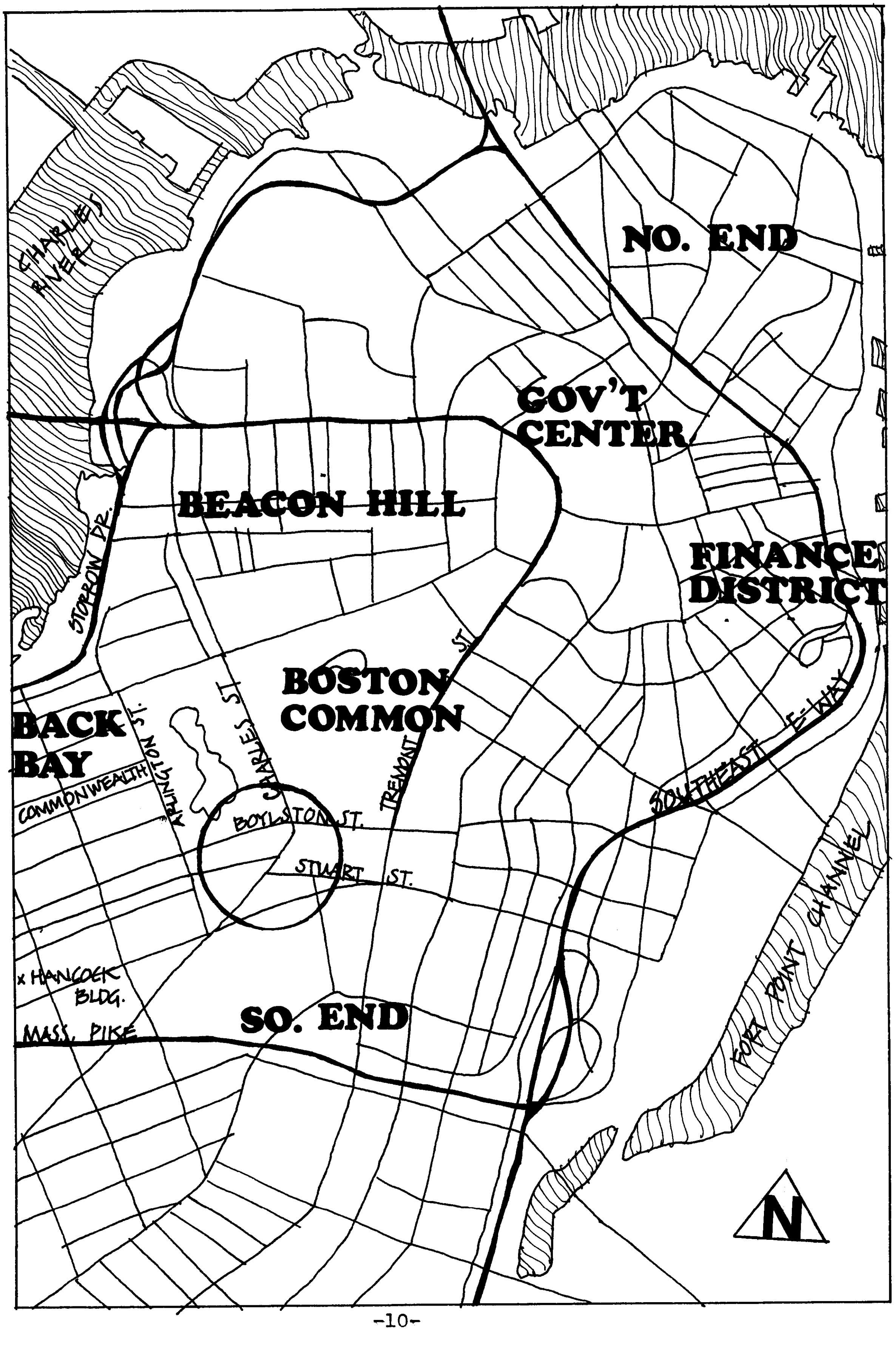
CHAPTER 2

PARK PLAZA: THE CONTEXT OF PUBLIC DECISION

2.1 The Situation

For nearly five years, the Boston Redevelopment Authority, the State Department of Community Affairs, the Boston Urban Associates (Mort Zuckerman's development firm), the Park Plaza Civic Advisory Council, consultants, architects and politicians, have been trying to decide what ought to happen to a piece of land in downtown Boston. This 10 acre site is known as Park Plaza. The area was originally identified for urban renewal in 1970, when the Boston Redevelopment Authority (BRA) announced that it would accept proposals from private developers to redevelop the site. From five competing proposals, the BRA selected Boston Urban Associates' (BUA), which had proposed a 266 million dollar (1970 prices) scheme to build over five million square feet of office, retail, residential, hotel, entertainment, and public open space. The project was viewed by the BRA as an integral part of the Boston high-spine development concept: an effort to redevelop continuously a strip of land running from the Prudential Center on the west to the downtown financial district on the east with high-rise mixed use buildings. As the downtown area map indicates, Park Plaza would be the central link in the scheme, enjoying full frontage on the Boston Garden and Common.

Park Plaza rapidly became Boston's most publicized redevelopment project. It was outstanding in several respects. The mixture of building uses and the total size of the project, along with total integration of design and development made the project spectacular. Politically, the project was unprecedented because it did not require any federal urban


CHARLES RIVER
NO. END
GOV'T CENTER
BEACON HILL
FINANCE DISTRICT
STORROW DR.
BOSTON COMMON
BACK BAY
ARLINGTON ST.
CHARLES ST
TREMONT ST
COMMONWEALTH
BOYLSTON ST.
STUART ST.
SOUTHEAST E-WAY
FORT POINT CHANNEL
x HANCOCK BLDG.
MASS. PIKE
SO. END
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renewal subsidies to write down the cost of the land. Park Plaza was to be the first example of "private urban renewal" in Boston. As the developer described the project, "[It] represents the most dramatic design in the whole country in the last 34 years. The only comparable project is Rockefeller Center, which was [also] done with private capital."[1]

But while the developer did not require any federal subsidies to reduce the land cost, he did require the use of the BRA's power of eminent domain to help him acquire the large number of small parcels within the project area with reasonable speed, and to protect him from holdouts who could otherwise extract inflated prices for the last parcels necessary to complete assembly of the site. The BRA was authorized to utilize its eminent domain powers on behalf of a private renewal developer by state law, which limited such use to projects that involved the renewal of "blighted" areas. The law also required the BRA to get approval of the urban renewal plan from the State Department of Community Affairs (DCA).[2] The history of that approval process merits a comprehensive study itself. The process has been on-going for nearly five years, and has touched on almost every economic, political, social, environmental, legal, and moral issue conceivably relevant to urban redevelopment. The process cost one Commissioner of Community Affairs his job, brought the Mayor of Boston and the Governor of Massachusetts to political confrontation, discouraged the developer to the point where he no longer participates in the process, and has delayed the project so substantially that it may not make sense any more.[3]

Throughout the entire process, the most fundamental issue has been the size of the project. BUA has consistently taken the position that the large scale project would be necessary to create the quality mixed use environment essential to the marketing of the space. BUA also held that the high density of development was necessary to distribute the fixed land costs to enough square feet of rentable space to achieve financial feasibility. On the other hand, there were serious objections to the environmental impacts that would result from high density and large scale development. Particular attention was focused on the natural environment, as fears were expressed that high-rise construction to the south of the Common and Garden would cast large shadows and seriously jeopardize the quality of the adjacent public open space. There were also fears that such a concentration of new construction, and the resulting concentration of people, would seriously overburden the city's infrastructure. Since most of the retail shoppers were expected to drive in from the suburbs, as were many of the office workers, fears were expressed about the resulting level of air pollution. The project would also be served by the already overburdened Green Line of the subway system, and some suggested that the marginal loading on the system would create total chaos. These objections all focused on the size of the project, and suggested reducing the size or total rejection of the project.

[It should be pointed out that the approval process itself has generated a number of additional issues. Primarily, they are the result of the loss of credibility among the adversaries in the process. Much of the community now regularly rejects all BRA analysis as biased for BUA. Many object to the proposed revelopment because it appears as if the BRA is using its authority to benefit the developer at the expense of the less politically potent members of the community. While these political issues are certainly interesting, they are beyond the scope of this analysis, which will instead attempt to focus on the underlying economic issues that originally motivated the public discussion.]

After having resolved some of the basic political issues surrounding the urban renewal plan, the latest chapter of the approval process began in March, 1974. At that point, the fourth submission of the urban renewal plan to the DCA received a conditional approval from the second Commissioner to have reviewed it. The final approval of the plan would depend on the completion of an Environmental Impact Report consistent with the Massachusetts Environmental Policy Act. In the process of preparing the Environmental Impact Report, the BRA was instructed to seek the advice of the Park Plaza community, and the BRA and the DCA proceeded to fund the establishment of a Civic Advisory Council (CAC). Primary responsibility for organizing the Environmental Impact Report (EIR) was given to an outside consultant, The Saratoga Associates. The Saratoga Associates worked with the BRA technical staff and the CAC towards completion of the Report, which should be done by August 1, 1975.[4]

In a conscientious effort to address the basic economic and environmental issues, the EIR went beyond the testing of the single development proposal advanced by the BUA. Instead, the EIR attempted to model the environmental impacts as a function of the basic development program variables: development density, structural configuration, and distribution of built space among alternative building uses. By building such a model, Saratoga and the BRA hoped to be able to identify clear constraints on the scale, density, and type of development. They also felt that they would be able to protect the project from the ultimate disaster: that the BUA proposal would be found to be environmentally unacceptable and would lead to total rejection of the urban renewal plan. The BRA felt that the use of a model would open the door for a compromise plan, perhaps at a lower density, or using up less land. During the period, the developer maintained his position that he needed the maximum density and scale to make the project work.

In its original conception, the Saratoga approach was comprised of two sections: an Environmental Base Analysis, and a Development Program Interpretation.[5] Briefly, the Environmental Base analysis involved the generation of a large matrix that related specific development activities (excavation, use of space, acquisition of land, etc.) to specific parameters that described attributes of the environment. The Saratoga work took a very broad view of the environment, including in their description not only the natural environment, but also the built environment, the economic environment, and the social-political environment. The matrix was supposed to show how each specific development activity would impact on environmental parameters. The Development Program Interpretation attempted to limit the range of potential development schemes that were to be tested to those that were "feasible." Schemes generated by the

Development Program Interpretation process would be tested against the environmental base model. The resulting changes in environmental parameters would be checked against some predetermined threshholds, to see how significantly each development scheme violated environmental constraints.

Unfortunately, while the Saratoga methodology is not difficult to understand on the conceptual level, it has already proven to be extremely difficult to implement. The Development Program Interpretation has been abandoned altogether. Instead, the BRA has used its own judgment to derive six alternative development schemes.[6] While the Environmental Base Analysis and testing have not been completed, the CAC has raised many objections to the actual implemented methodology.[7] Many members of the CAC have already voiced their opinions that the BRA-Saratoga work will not differentiate adequately the small development schemes from the larger ones.

2.2 Cost-Benefit Analysis

One thing is clear: prior to resubmitting the urban renewal plan to the DCA for final approval the BRA will have to decide on one of the alternative development plans. Presumably, the decision will be made "in the public interest," and will depend on how the BRA weighs, with CAC advice, the benefits from development against the costs. The actual decision will likely be very hard to make, both because of the difficult measurement problems in assessing the costs and benefits, and because of the interrelationship between economic gain and political power.

In order to clarify the BRA's problem, it will be helpful to review some basic propositions of welfare economics that have generally been identified as "cost-benefit analysis." The fundamental rationale for governmental intervention into economic activity is that collective action to reallocate resources can result in an increase in "social welfare" that could not have been achieved by the unhampered operation of the private market alone. Cost-benefit analysis attempts to identify those situations where governmental intervention will result in an increase in social welfare. The need for governmental intervention arises when, for one reason or another, the private market does not value goods at the same price that consumers would be willing to pay, should they have the opportunity.

When a private sector producer is considering production of a good, he compares the cost of the inputs to the price he can get for the output. For his purposes, the only relevant prices are those prevalent in the marketplace. As long as the market value of the output exceeds the market value of the inputs, he will produce the good. It doesn't matter to him at all if the market prices don't reflect the true value of the inputs or outputs. For example, when an industrial firm considers a production process that pollutes the air, it will not include the cost of using up that environmental resource in its calculation.

On the other hand, when the public evaluates the production of a good, the public decision making authority must take a broader view of the cost of inputs and value of outputs. Specifically, the public decision making authority must look for those inputs and outputs that have been mispriced by the market. While the private firm attempts to maximize the net market value (the difference between market value of inputs and outputs), the corresponding public objective is to maximize the net social welfare (the difference between the aggregate consumption value of inputs and outputs).[8]

There are basic characteristics of some goods that cause their market price to differ from the price that consumers would be willing to pay. For purposes of this study, these goods will be referred to as public goods. Steiner identifies three broad classes of public goods:[9]

1. Public goods that result from the non-marketable services of particular goods. Private production may often use resources that private producers do not consider valuable, or generate by-products that are unmarketable. The key to these goods is the concept of appropriability. It is difficult to imagine reasonable markets to transfer the value of goods produced from the consumer to the producer. The classical example is national defense; it is inconceivable that the good would be, or could be, denied to those who would choose not to pay for it. As a result, we have elected the other course; to provide defense as a collective public good and extract payment from all through the police powers of the state.
2. Public goods that result from market imperfections. Any of the traditional sources of market failure may

cause an inefficient allocation of resources--a difference between the opportunity cost of resources and their market values. Market failure is generally attributed to imperfect information, factor immobility, transaction costs, or monopoly power.

3. Public goods that result from collective concern for the quality of society. In some cases, society as a whole decides that certain goods are more valuable to a member of the group than he could afford to pay. In short, we use public goods as a mechanism for the redistribution of wealth among the members of society.

It should be clear from the nature of the public discussion about Park Plaza that there are both substantial public inputs and outputs. As noted above, the developer has tended to focus on the public outputs: the upgrading of the Park Plaza area, the resulting increase in property values around the site, the stimulation of general downtown economic activity, increased employment in the construction and service industries, and the attraction of industry from out of town. The opponents of the project have tended to focus on the public inputs: the adverse environmental impacts, the municipal services, the strain on the public infrastructure, and the need for capital improvements to support the project.

If the BRA were to develop and own the project itself, the equation for net public benefit would be completed with the addition of the non-public costs and benefits: the market cost of constructing the development and the market value of the net revenues to be generated by the project. The basic welfare economics formulation would have the BRA choose that development alternative that maximized the difference between the cost (both public and private) of the inputs and the value (both public and private) of the outputs from the project.

In fact, the BRA must rely on BUA, the private developer, to assume the cost of creating the development in return for the present value of the net revenues. In as much as BUA is a profit maximizing firm, it will only proceed if the market value of the revenues exceeds the market cost of the factors to create the development. In addition, the BRA has the capacity to tax away from the developer any excess economic profits, or subsidize the developer should the costs exceed the benefits. In contract terms, the developer acts as an agent for the city. The developer acquires those resources that are purchaseable in the marketplace, and sells those outputs that are marketable. In return for performing these services for the public secotr, the private developer receives a return commensurate to the risk incurred on his invested capital. In order for the public to get the developer to act, the value of marketable outputs must exceed the market cost of the inputs. But most importantly, the remainder of the net market value created by development is recovered by the public sector (through taxation) to be weighed against the other public inputs and outputs.

2.3 Public Assistance

Actually, the BRA has at its disposal a variety of mechanisms to adjust the balance between the market values of inputs and outputs to be borne by the private developer; to establish private feasibility.

Traditionally, urban renewal relied on the "writing down" of land prices by the federal government in order to reduce the costs to the private developer. [The federal government would purchase the land through eminent domain, and then sell it at a loss.] From the local point of view this was a very effective strategy because the federal government paid for most of the difference between the land acquisition and disposition prices. Some of the strategies below also involve local action which creates external subsidies to the renewal process. Others involve direct costs to the locality, either in the form of capital expenditures or foregone future revenues. Still others involve policy decisions which require public goods to be input into the redevelopment project.

1. The use of a development company organized pursuant to Section 121 of the General Laws of Massachusetts. When the developer organizes the development entity in this form, the firm becomes limited to a nominal dividend return of 6% on invested equity, but the local government provides two substantial forms of assistance to the developer:

    a. The developer and the BRA can negotiate a long term real estate tax agreement which fixes property taxes as percentage of the gross rental income of the development. Normally, property taxes on real estate are computed by applying the annual tax rate to the assessed valuation of the property. Currently, Boston's property tax rate is almost 20%, i.e., the annual tax bill is about 20% of the official assessed value. While this tax burden would seem intolerably excessive, the reality is that few properties have an assessed valuation that resembles the true market value. The system therefore places a heavier burden on new developments; often so heavy a burden that new private development becomes infeasible. In an effort to encourage new downtown development, and particularly the Prudential Center, the State allowed the municipality the option to negotiate 40 year tax agreements. Not only does the negotiated rate produce a lower tax burden in the early years of the life of the development, it greatly reduces the uncertainty about future property taxes. Otherwise, the property tax burden could change as a result of increasing tax rates or increasing assessments.[10]

b. The use of eminent domain to acquire land for development. As noted, state law allows the use of eminent domain for the acquisition of blighted land as a public purpose use of the power. The use of this power really amounts to a transfer of value to the developer from the current land owners. The eminent domain procedure insures that land owners do not receive the marginal value of their land to the new redeveloped use. The BRA will acquire the parcels at the market value based on their current use. The price paid for the land will not reflect any increase in value to each parcel as a result of their inclusion into a larger agglomeration. While the courts may award land owners some additional value, partially reflecting the post-taking value

value of the land, there are additional advantages to the developer. While there is uncertainty as to the outcome of contested takings in terms of the final settlement price, the developer has the effective use of the land at the point of the taking. This can substantially accelerate the development schedule over the usual alternative, where the entire process waits for final conclusion of the negotiation with the owners of holdout parcels. Given the history of eminent domain awards, and the required appraisals for the taking procedure, the developer can generally estimate the size of the awards on contested parcels.[11]

c. The nominal limitation of return to equity to 6% does not affect the real return on equity. In fact, the return limitation does not consider a number of the cash flows to the equity investors. In some cases, this limitation may amount to effective rent control, limiting the amount that the developer can charge for space to a function of the cost of the project and the operating expenses. The use of a limited dividend development company therefore amounts to a transfer from the developer to the project tenants. (This should not be surprising since the original use of the limited dividend company was in the development of subsidized housing.) In the case of Park Plaza, this limitation has no effective meaning.[12]

2. The BRA can change the zoning of land to allow increased density of development. By using land more intensely, the developer reduces the unit cost of rentable space. As pointed out above, the actual cost to the municipality of this strategy have become the focus of the political controversy.

3. The city can make capital contributions to the project. There are a number of alternative forms of contribution that have been discussed by the BRA with respect to Park Plaza:

   a. The city has offered to contribute the land now used for city streets to the developer at little or no cost. (In the larger scale designs, several street parcels would be converted to building use.)

   b. The BRA has offered to assume the cost of new streets in the project, as well as utility extensions, water and sewer systems, and other pieces of the project infrastructure.

   c. The BRA has already contributed a substantial portion of the developer's front end costs, or "pre-development expenses." Most of this has been in the form of planning for the project that has been done by the BRA staff or BRA paid consultants, and includes the entire cost of the environmental impact analysis process.[13]

4. The city could consider providing financing for part of the development cost through municipal revenue bonds. Funds are borrowed by the municipality against the security of promised revenue from the development. Since the holders of such bonds

are exempt from federal income tax on the interest income, the required yield is lower than on equivalent taxable securities. The difference in the costs of funds obtained through the use of revenue bonds amounts to a federal subsidy to the project. The BRA has discussed legislation by the state that would allow the use of revenue bonds to finance the residential and parking garage portions of Park Plaza. At this point, revenue bonds could not be used.

In summary, the BRA's decision problem can be formulated conceptually as a constrained optimization. The objective function consists of maximizing the net social welfare value from redevelopment of the site. This net value is the difference between the sum of social opportunity and market costs of inputs and the sum of the social and market value of the outputs. The decision variables available to the BRA consist of the strategies identified above: determination of the basic development program and determination of the degree and nature of public involvement. Finally, the determination of the decision variables must be subjected to the constraint of private feasibility: the value of marketable private outputs must exceed the cost of private inputs.

This thesis attempts to estimate the marketable value of private outputs from development, and the market cost of the inputs. The net difference between these costs and values can be thought of as the maximum price that a private firm would be willing to pay for the opportunity to develop the Park Plaza site. This value will be referred to as the residual market value of the development. The residual market value of the development is also the maximum amount that the public sector can extract from the private developer to be weighed against the net public cost of the development. Presuming that the BRA sees no social purpose in transferring wealth to the private developer, it should adjust its decision variables so as to fully recover the residual market value.

The first section of the work will present a model for computing the residual market value of a development alternative as a function of the BRA decision variables. This section will also review the available market data and establish the basic assumptions about the prices of marketable inputs and outputs of the project.

The second section will compute the residual market value for alternative development schemes. Specifically, the six alternatives developed by the BRA will be examined. This section will also compare the use of alternative subsidy mechanisms by the BRA, and compute the marginal rate of substitution of one mechanism for another at the point of private feasibility. The last part of this section will check the sensitivity of the computed residual market value to the market price assumptions of the first section. This sensitivity analysis is critical because of the basic inadequacy of the BRA generated market data. The sensitivity analysis will note explicitely the relationship between a change in a market assumption and the resulting change in the residual market value.

In concluding this section, it is important to clarify the objectives of this thesis. The thesis does not attempt to select the best development alternative for Park Plaza, nor does it attempt to specify the mechanisms that the BRA should utilize to transfer value to or from the developer. These decisions depend on an assessment of the public costs associated with each set of alternative choices; and that assessment is beyond the scope of this work. This thesis attempts only to provide data on one variable in the more complicated equation that the BRA must consider in its evaluation of alternative courses of action.

Nor does this thesis depend on a specification of the BRA decision making methodology. It should be clear from the very conceptual description of the BRA's problem, and from the experience of the Saratoga Associates, that quantification of the public costs and benefits will be an extremely difficult task. One might make an argument that such quantification efforts would clearly be fruitless, and that the evaluation of the relative costs and benefits should be left to the shrifting of a political process. In any case, whether the BRA attempts to quantify a constrained optimization problem, attempts to constrain feasible alternatives using the Saratoga approach, or attempts to choose by the seat of their pants, it will clearly have to weigh the share of the market value of development that the public can capture as a public benefit. Regardless of the measurement problems that afflict the estimation of other public costs and benefits, the measurement of the residual market value, because of its very nature, becomes a feasible project. This exercise, though, can not insure that the BRA will make an optimal decision, or even that it will make a good decision.

Chapter 2 - Footnotes

1. Boston Globe (June 21, 1972), p.13.

2. General Laws of State of Massachusetts, Chapter 121B.

3. Conversations with Justin Gray and Ellen Feingold during January and February of 1975. During that time, both subjects and the author were employed by the Park Plaza CAC as staff members to Justin Gray Associates.

4. Just Gray Associates, "Background Information," Memo to Press, (April 30, 1975).

5. The Saratoga Associates, "Working Papers for Park Plaza Environmental Impact Report," (January, 1975).

6. Boston Redevelopment Authority Urban Design Staff, Defining The Alternatives, BRA Working Paper (February 4, 1975).

7. Justin Gray Associates, "Critiques of TSA Working Papers," (January, 1975).

8. For review of Public Cost-Benefit Analysis theory and techniques, see:

    1) Haveman, R. and Margolis, J. Editors, Public Expenditures and Policy Analysis (Rand McNally College Publishing Co., 1970).

    2) Hinrichs, H. and Taylor, G., Program Budgeting and Benefit-Cost Analysis, (Goodyear Publishing Co., Inc., 1969).

    3) Mishan, E.J., Cost-Benefit Analysis, (Praeger Publishers, 1971).

9. Haveman (1970), pp: 26-27.

10. General Laws of State of Massachusetts, Chapter 121A.

11. BRA, Park Plaza: Urban Design Objectives, Financial and Market Feasibility (January 9, 1975), p. 38.

12. The limitation on return on the nominal equity investment in the project applies only to the nominal equity that represents 10% of the total project cost. In the case of most subsidized housing, the mortgage covered at least 90% of the project cost, resulting in an effective limitation on the cash distribution to the 10% equity. In the case of Park Plaza, there is no expectation that

mortgage funds would account for more than 75% to 80% of the project cost, requiring a nominal equity investment of 20% to 25%. Since the cash flow return to equity in excess of 10% of the project cost is unlimited, there is no effective limitation on the cash flow at all.

13. BRA, (January 9, 1975), p. 35.

CHAPTER 3

RESIDUAL MARKET VALUE: PRELIMINARY DEFINITION

The purpose of this study is to estimate the "Residual Market Value" of development alternatives for the Park Plaza redevelopment area. Residual Market Value (RMV) has been loosely defined in the introductory discussion as the difference between the market value of the outputs from the development project and the market cost of the inputs. This definition is clear in the context of a single period, tax free, certain world. At this point, a more precise and operational definition is essential to extend the analysis to cover these complications.

In a certain world with no taxes, the RMV of an all equity financed development alternative is the net present value of the cash flows that represent the purchase and sale of products in the marketplace. Using conventional notation,

$$\text{(1)} \qquad RMV = \sum_{t=0}^{N} [(R_t - E_t)/(1 + k)^t]$$

where R_t is the cash revenue in period t, E_t is the expenditure in period t, k is the required return on equity funds, and N is the number of periods in the economic life of the project. Throughout this work, an alternative notation to that of Eq. (1) will be employed.

$$\text{(2)} \qquad RMV = PV_{k,N}[R_t - E_t]$$

In the use of the present value operator, the first subscript indicates the interest rate (or vector of one period interest rates) to be used in discounting, and the second subscript the time horizon over which cash flows should be discounted. In some cases, both these pieces of information will be carried in one subscript.

The actual values for R_t and E_t will be a function of the design of the development, and of prevailing prices in the market. In the early years of the project, E_t will primarily be comprised of construction expenditures, which will be a function of the architectural design, the size, the scale, and the quality of the development. After construction is completed, E_t will represent the operating expenses, which will also be a function of the systems designed into the buildings. The revenues generated in rent will depend on the number, amount, and type of building space products produced. Those basic design characteristics of each development alternative that determine the cash flows over the life of the project will be described as the "architectural program."

Once the architectural program defining a development alternative is selected, the pattern of pre-tax, pre-financing cash flows is also determined (by reference to market prices). These cash flows can then be discounted to calculate the RMV. In this simplified world, the municipality can appropriate the RMV from the private firm by appropriating part of the cash flow from any period. Provided that the municipality uses the same cost of capital as does the private developer, the pattern of appropriated cash flows can satisfy either of two constraints. Let T_t be the "tax" appropriated in period t. Then, in order to insure that the private firm will engage in the development project, the public must choose the set of T_t's so that the remaining cash flows to equity have a non-negative net present value. The value of the project to the private firm can be written as

$$(3) \qquad PVE = 0 = PV_{k,N}[R_t - E_t - T_t]$$

$$= PV_{k,N}[R_t - E_t] - PV_{k,N}[T_t]$$

$$(4) \qquad = RMV - PV_{k,N}[T_t]$$

which provides the alternative formulation. The city can select any pattern of tax payments with present value equal to RMV.

Under these simplified assumptions, the present value of each appropriated tax dollar to the municipality is equal to the reduction in the present value of the project to the private firm as a result of the loss of that dollar. Restated, this implies that the RMV can be computed by either:

a. Discounting the pre-tax cash flows as established by the architectural program

b. Discounting the tax payments received by the municipality (and set so that PVE = 0)

Unfortunately, the introduction of federal income taxes demonstrates that these two methods don't in general give the same result. Assume for the moment a simplified version of the federal tax system. Income taxes are collected in each period when the net cash flow is greater than zero, and are equal to some percentage of the cash flow. In periods when the net cash flow is negative, no taxes are paid or refunded. Also assume that the specific project under consideration requires a substantial cash outflow at time zero to build the building (instantaneously) and that rental income exceeds operating expenses in all periods thereafter.

Under the federal income tax system, payment of local taxes is deductible from taxable income. Under these assumptions, rule (a) above computes the RMV by discounting the cash flows prior to payment of local tax, but after the payment of federal income tax.

(5) $$RMV = -E_0 + PV_{k,N}[(1-s)(R_t - E_t)]$$

where s is the federal income tax rate. The expression can be rewritten,

(6) $$RMV = (1-s)PV_{k,N}[R_t - E_t] - E_0$$

On the other hand, rule (b) computes the RMV as the net present value of the tax revenues collected by the local government from the development. Assuming that a lump sum payment is collected at the time of construction in addition to payments received over the life of the project, the

(7) $$RMV = T_o + PV_{k,N}[T_t].$$

To find feasible values for T_o and T_t, we need to write an expression for the value of the equity, equate the net present value of the equity to 0, and solve in terms of T_0 and T_t.

The present value of the equity can be written as

(8) $$PVE = 0 = -E_o - T_o + PV_{k,N}[(1-s)(R_t - E_t - T_t)]$$

$$T_o + (1-s)PV_{k,N}[T_t] = PV_{k,N}[(1-s)(R_t - E_t) - E_o$$

(9) $$T_o + PV_{k,N}[T_t] = (1-s)PV_{k,N}[R_t - E_t] - E_o + (s)PV_{k,N}[T_t]$$

Substituting Eq. (9) into Eq. (7),

(10) $$RMV = (1-s)PV_{k,N}[R_t - E_t] - E_o + (s)PV_{k,N}[T_t]$$

If we designate the RMV as calculated by rule (a) as RMV_a, and that calculated by rule (b) as RMV_b, we can return to Eq. (6) to show that

(11) $$RMV_b = RMV_a + (s)PV_{k,N}[T_t]$$

Clearly, the difference between the two approaches is the present value of the tax savings to the private firm as a result of the deductibility of local tax payments. Rule (a) does not account for the subsidy provided by the federal government. For each dollar of RMV_a appropriated by the local governmental unit during the operation of the project (for t greater than 0) the federal government provides the private firm with an additional s dollars. In order to capture the full value available, rule (a) has to be amended to include the additional cash flows available to the local government simply as a result of their staking a claim on the underlying cash flows of the project.

It is convenient to summarize this point in terms of more familiar, but analogous, financial issue. It is reasonable to think of the local governmental claim on the cash flows generated by the project as a special type of debt. While the local government may or may not make an actual cash contribution to the project, for federal tax purposes, the "interest" on the loan is deductible. In as much as the local government is not taxed by the federal government on its "investment income," the use of this source of finance invokes the same federal subsidy as does the use of market acquired debt. The key concept is that the transfer of a dollar of net cash flow is worth more to the transferee than it cost the transferor to give it up. Just as the federal government pays part of the cost of the private firm's use of market debt, it pays part of the cost of appropriation by the city. While the above discussion confined itself to a world of certainty, the results are identical to those showing the tax value of the "debt" financing even under conditions of uncertainty.[1] We will return to this point in more detail below, particularly when it comes to the determination of the appropriate discount rates to use on various claims on the project.

In order to capture the effects of "leverage" on the value of the project, the study will calculate the RMV as the present value of the cash flows to the municipality. In the context of the general financial analysis, this approach corresponds to evaluating each claim on an asset in terms of the present value of the cash flows allocated to it.

Chapter 3 - Footnotes

1. Miller, M. and Modigliani, F., "The Cost of Capital, Corporate Finance, and the Theory of Investment," American Economic Review (June 1958).

CHAPTER 4

THE VALUE OF CASH FLOWS GENERATED BY NEW DEVELOPMENT

Returning to the discussion in the first section, there are constraints on the "tax program" (the pattern of T_t) that the city can apply to the Park Plaza project. Under Section 121, taxes collected by the city during the operation of the project must be a fixed percentage of the gross rent collected for the year. During the construction period (prior to occupancy) taxes are assessed in proportion to construction completion, achieving the level expected at occupancy when construction is completed. Therefore, the entire tax program can be described in terms of one variable, the percentage of gross rent appropriated by the city. It was also pointed out that the city could make capital contributions to the project, that is, pay for part of the original construction cost. While this contribution could be made at any point during the construction period, we will assume that public capital contributions are made in proportion to private construction expenditures. Again, this allows the use of capital contributions to be described in terms of one variable, the percentage of the total construction cost to be contributed by the public.

The RMV is the net present value of the capital contributions and the tax payments. The feasible programs of capital contributions and tax payments are determined by the private feasibility constraint. In the case of a leveraged real estate development, both the net present value of the debt and equity must be non-negative. As will be seen, the after federal tax value of the equity can be expressed in terms of the architectural program (which defines the pre-tax and pre-financing cash flows), the financial program (which defines the structure of private claims on the cash flows), the federal tax structure (which defines the federal government's claims on the cash flows) and the local tax program. The value of the debt is determined by the architectural and financial programs. This section first generates an expression for the value of the equity based on the architectural, financial, federal tax, and local tax programs. It then solves the private feasibility constraints in terms of the local tax program, to identify the combinations of capital contributions and tax collections that achieve feasibility. The net present value of such programs is then calculated (i.e., the RMV).

The value of the equity will be computed as the present value of the after tax cash flows to the equity position over the period that the project is held, plus the present value of the after tax cash flow from the sale of the project.

4.1 Operating Cash Flows

The cash operating income, before taxes and financing, in each period is the difference between the rent collected and operating expenses.

$$O_t = R_t - E_t \tag{1}$$

where O_t is the operating cash flow in period t, R_t is the rent collected in period t, and E_t is the cash operating expense in period t.

In addition, in each period there will be a cash transfer to the two other sources of financing for the project, the market debt position and the local government. Let K_t be the total cash payment on the debt to the private lender in period t, and T_t be the property tax payment to the city in period t. Then, the pre-federal tax cash flow in period t,

$$(2) \qquad C_t = O_t - K_t - T_t$$

For federal tax purposes, some cash flows are not deductible from gross income, while other non-cash expenses are deductible. Specifically, depreciation is a non-cash expense deductible from taxable income, while that portion of debt payments that represents the return of principal, as opposed to the payment of interest, is not deductible. Let D_t be the depreciation as computed for tax purposes in period t, and I_t be that portion of the transfers to the debt position that represents the payment of interest for federal tax purposes. Then, the taxable income (from the federal government's perspective) is

$$(3) \qquad F_t = O_t - T_t - I_t - D_t$$

where F_t is taxable income in period t.

The federal government collects taxes in each period by applying the investor's marginal tax rate to the taxable income. Let g_e be the marginal tax rate of the equity investor, and G_t be the federal tax bill in period t.

$$(4) \qquad \begin{aligned} G_t &= g_e(F_t) \\ &= g_e(O_t - T_t - I_t - D_t) \end{aligned}$$

A note on the sign of F_t and G_t is in order here. There is no reason why F_t should be positive in every period, and in many types of tax shelter real estate, a substantial portion of the value comes from tax savings that occur because D_t (a non-cash expense) is so large.[1] Throughout this paper, it will be assumed that should F_t be negative, the investor will have other taxable income against which to apply the net loss from the project. This is not an unrealistic assumption, particularly since the predictability of such net loss years has led to substantial legal planning to insure that the tax losses are allocated to an investor who can take advantage of them. An analysis of the alternative structures that are used to achieve the desired distribution of tax benefits is beyond the scope of this work, but can be found elsewhere.[2] It is sufficient for our purposes to note that in periods when F_t is negative, G_t will be assumed to be negative also and will represent a federal tax subsidy to the equity position as opposed to a tax collection.

The after tax cash flow to the equity, call it Y_t, is simply the difference between pre-tax cash flows and tax payments.

$$
\begin{aligned}
(5) \qquad Y_t &= C_t - G_t \\
&= O_t - T_t - K_t - g_e(O_t - T_t - I_t - D_t) \\
&= O_t(1-g_e) - T_t(1-g_e) + D_t(g_e) + I_t(g_e) - K_t
\end{aligned}
$$

Y_t now represents the after tax cash flows accrueing to the equity as a result of the revenues generated by the operation of the project. The cash flows from the operation of the project must be adjusted to include the cash flows required to create the project.

4.2 Cost-Benefit Analysis

Let A_t be the construction expenditure in period t. A_t is distinguished from E_t in that A_t is not deductible for tax purposes. In other words, A_t represents the cash expenditures on capital assets in period t, while E_t represents the cash expenses. During the actual construction and development of a real estate project, a substantial portion of the expenditures will be considered as capital for tax purposes, but there will also be some deductible expenses. We will return to this distinction below, at the point of allocating actual construction estimates between A_t and E_t.

As a basic identity, the construction expenditure (A_t) represents a cash outflow to the equity to the extent that the expenditure is not paid for by the locality, through a capital contribution, or the debt, through the advance of loan funds. Letting U_t be the capital contribution from the municipality in period t, and M_t be the advance of mortgage funds in period t, we have the cash flow from equity required during construction,

$$Y_t = -A_t + U_t + M_t \tag{6}$$

Eq. (5) and Eq. (6) can now be added and reorganized:

$$\begin{aligned} Y_t = {} & -A_t + O_t \\ & +M_t - K_t \\ & +U_t - T_t \\ & -g_e(O_t - I_t - T_t - D_t) \end{aligned} \tag{7}$$

It is interesting to note the structure of Eq. (7). The first line indicates the cash flow in each period to the untaxed all-equity-financed project. The second line indicates the pre-tax cash flows that result from the use of market debt. The third line indicates the pre-tax cash flows that result from local government's appropriation of cash flows. The last line indicates the cash flow in each period taken by the federal government in income taxes.

The net present value of the equity can now be expressed as the present value of Y_t plus the present value of the sale of the project (the salvage value). Without specifying the time horizons or appropriate discount rates, the present value to the equity position of the flow of Y_t's is the sum of the present value of the components of Y_t.

$$
\begin{aligned}
(8) \qquad \mathrm{PVE} &= PV_e[Y_t] \\
&= PV_e[O_t - A_t] \\
&\quad + PV_e[M_t - K_t] \\
&\quad + PV_e[U_t - T_t] \\
&\quad - PV_e[g_e(O_t - I_t - T_t - D_t)] \\
&\quad + PV_e[S]
\end{aligned}
$$

where S is the after tax cash flow to the equity at the time of the sale. It is clear that at private feasibility, PVE = 0, and that Eq. (8) could be easily rearranged to solve for the $PV_e[T_t]$ as a function of $PV_e[U_t]$ and the other variables. Up to this point, all that has been said would be applicable to any leveraged investment project on which there are two classes of debt. In short, before solving for the feasible combinations of U_t and T_t, there is a wealth of additional information specifying the patterns of cash flows of the project that can be input into the formulation. This information results from specification of the architectural, financial, and tax programs.

As indicated at the outset of this section, the pattern of capital contributions U_t and real estate taxes over the life of the project could be expressed as percentages of construction expenditures and rental income respectively. Let $\overline{U}$ be the percentage of capital expenditure in each period paid for by the municipality. Then

$$U_t = \overline{U}\,(A_t). \tag{9}$$

Let $\overline{T}$ be the percentage of gross rental income appropriated by the local government in property taxes. Then

$$T_t = \overline{T}(R_t). \tag{10}$$

4.3 Market Debt

We will assume here that the project employs market debt as it is conventionally used in real estate development. There are generally two types of debt used during the course of a real estate development: a construction loan and a permanent mortgage. The construction loan on a rental development is a short term extension of credit to pay for a portion of the construction cost. Although the loan is secured by the real estate and attached improvements, the real security against which such loans are advanced is the permanent take-out (the purchase of the short term paper by the long term lender.) The long term lender is lending instead against the net cash flows generated by the development. Very briefly, the practice of separating the debt over time is usually explained in terms of the desire of institutional lenders to assume the different risk associated with the two types of loans, and the relative attractiveness of the different maturities.[3]

The construction loan is generally advanced in proportion to completion of construction. While the construction lender would always like to have reserved enough funds to be in a position to complete construction should the contractor not be able, the contractor is equally interested in having the construction lender advance extra funds to cover the contractor's own working capital requirements. Often, the construction lender will hold a "retainage" on the contractor, hold back a certain percentage of the funds estimated to be required until the job is complete. While interest is nominally computed and paid by the borrower on a periodic basis, the construction lender is not averse to lending the funds out of which interest is paid. Therefore, in cash terms, it is best to think of the construction loan as advances against a single balloon repayment. For tax purposes, though, interest expense accrues each period. When the development is occupied to a pre-specified level, or when the construction is complete, the construction lender is paid out by the long term lender.

We will assume here that in each period during construction funds are advanced in proportion to the expenditures during the period plus an additional advance to cover accrued interest. Let $\overline{m}$ be the proportion of capital expenditure funded by the construction lender. Then,

$$M_t = \overline{m}\,(A_t) + I_t \tag{11}$$

To the first approximation, the interest accrued at the end of each period is the construction interest rate times the outstanding balance advanced at the end of the period. (This approximation gets better when the size of a period in the analysis approaches one month, which is generally the period between construction advances.) Let i_c be the market rate of interest on the construction loan. Then, the interest due at the end of period

$$I_1 = i_c(\bar{m}A_1) \tag{12}$$

$$I_2 = i_c[\bar{m}A_1(1 + i_c) + \bar{m}A_2]$$

$$I_t = i_c(\bar{m}) \sum_{x=1}^{t} A_x(1 + i_c)^{t-x} \tag{13}$$

At the refinancing date, say t*, the cash repayment to the construction lender, K_{t*} is

$$K_{t*} = \bar{m} \sum_{x=1}^{t*} A_x(1 + i_c)^{t*-x} \tag{14}$$

While the construction lender was assumed here to have advanced against construction activity, the permanent lender will be assumed to advance funds against the cash flows over the project life. Specifically, it will be assumed that the long term lender will purchase some percentage of the net operating cash flow after local real estate taxes. Put another way, the long term lender will capitalize part of the cash flow available after the payment of local taxes (which have credit priority). We will further assume that the long term lender makes a level payment mortgage with no balloon payment. In terms of the variables, the lender will compute the present value of a level stream of payments such that

$$K = \bar{k}(O' - T') \tag{15}$$

where O' and T' represent the expected operating income and tax payments for substantial occupancy of the project. (Up to this point no assumptions about O_t have been made, particularly with respect to changing price levels. To the extent that inflation increases the operating margin over time, the project would have an increasing debt capacity. One could imagine a formulation in which the debt level is continuously adjusted to some debt limit function of the cash flow. That formulation would not appear to fit comfortably in this situation, primarily because of the transaction costs associated with raising the marginal real estate debt. Without any comprehensive data, I think it would be fair to say that commercial real estate does get refinanced to take advantage of inflated cash flows, but the time between such refinancings is large. We will return to this point when we consider the value of selling or otherwise disposing of the project.) In any case, we will assume here that the long term lender looks to the projected cash flow at reasonably current prices when establishing a debt limit.

Having established the cash flow against which the construction lender will finance, determination of the term of the mortgage and the market rate of interest allow computation of the long term mortgage advance. Assuming that the long term mortgage is provided at the same time that the construction loan is paid off, the amount of the loan can be designated as M_{t*}.

$$M_{t*} = PV_{i_p,n}[\overline{k}(O' - T')] \tag{16}$$

where i_p is the market interest rate on long term debt, and n is the number of periods in the mortgage.

[Depending on the values of $\overline{m}$ and $\overline{k}$, it would not be unreasonable to expect M_{t*} to exceed K_{t*} by some amount equivalent to a retainage as mentioned above.]

In the appendix, it is demonstrated with simple algebra that the interest portion of each payment of a level payment mortgage can be written as:

$$I_t = K - M_{t*}(K/M_{t*} - i_p)(1 + i_p)^{t-1} \tag{17}$$

To summarize conceptually the last few pages on the use of debt, the use of several assumptions about the financial program has enabled substitution for U_t, T_t, M_t, K_t, and I_t in terms of O_t, R_t, and A_t.

4.4 Depreciation

The last flow from Eq. (8) to be considered is depreciation. All types of investment real estate are eligible for some form of accelerated depreciation. The allowable depreciation in each period, D_t, is a function of the depreciation method selected, the depreciable life of the asset, and the depreciable basis. The depreciable basis of an asset is in general the cost to the owner. In the case of the leveraged project, the amount of the loan is includible in the basis of the owner carrying the liability. Like much of the rest of the tax laws, depreciation is not a particularly economic concept. While the actual investment in a depreciable asset occurs over time, tax depreciation does not begin

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until the asset is completed and put into use. Thereafter, additional contributions, if necessary, add to the depreciable basis.

As indicated above, the total investment in capital assets at any point in time is the accumulation of the A_t up to that point. At substantial completion, call it time t^d, the total investment in capital assets is

$$A = \sum_{x=1}^{t^d} A_x \tag{18}$$

There are two adjustments that must be made in determining the depreciable basis. First, that portion of capital contribution made by the municipality is not owned by the private firm (or else it would have been taxable income) and is therefore not depreciable. The total capital expenditure must therefore be reduced by the total public capital contribution. Second, land is a non-depreciable capital asset for tax purposes since there is no clear limitation to its useful life. Therefore, that portion of A that is allocable to the purchase of land must be deducted to determine the depreciable basis. The total depreciable basis can then be written as

$$B = A - U - L \tag{19}$$

where B is the total depreciable basis, U is the total public capital contribution, and L is the total cost of land.

The tax laws allow for the depreciation of the components of a building separately, as opposed to depreciating the building as a whole.

The advantage of component depreciation is that some parts of the building have a shorter useful life and provide deductions in earlier periods. In the case of a staged multi-use development, depreciation by component is a necessity. Buildings used for residential use can be depreciated faster than commercial buildings. Also, some parts of the development may be substantially completed, and hence depreciable, before others. For example, if an office tower were scheduled for earliest construction it would be depreciable when completed even though an adjacent residential structure in the project were not complete.

In order to capture these effects, the total depreciable basis will be allocated to components. Each component will then be depreciated at the appropriate point in time, with the appropriate method, and over the right service life. From the appendix, the allowable depreciation in each period for each component can be expressed in terms of its depreciable basis B^j (where $\Sigma B^j = B$), date of substantial completion t^d, service life N_j, and q, the rate of acceleration of declining balance depreciation (i.e., q = 2 for double declining balance depreciation).

$$D_t^j = B^j (q/N_j)(1 - q/N_j)^{t-t^d} \tag{20}$$

Total depreciation in period t from the entire development is then

$$D_t = \sum_j D_t^j \tag{21}$$

4.5 Pattern of Operating Cash Flows

Returning to the pattern of operating income over time, we will here assume that both expected operating revenues and operating expenses will grow over time at a constant rate from their respective expected values at the point of substantial occupancy. This assumption is based on the proposition that after a development has been rented up, the vacancy level will remain fairly constant, as will the package of goods and services in the operating budget, and that changes in nominal income over time primarily reflect changes in price levels.

Again using the prime notation to designate cash flows at the point of substantial occupancy,

$$R_t = R'(1 + z_r)^{t-t'} \tag{22}$$

$$E_t = E'(1 + z_e)^{t-t'} \tag{23}$$

where t' is the date of substantial occupancy, z_r is the growth rate of rental income, and z_e is the growth rate of operating expenses. Prior to substantial occupancy, R_t and E_t will depend on the occupancy level. The total rental income will increase as the building is rented up until it reaches R' at t'. We will here assume that occupancy grows linearly over time and that rental income prior to substantial occupancy will be proportionate to t. There are several arguments against this assumption. Actual rent up will be somewhat seasonal. Residential occupancy will increase more rapidly in the summer and fall than in the rest of the year. Commercial occupancy will be almost stable in the first quarter (after Christmas rush). It is also likely that if occupancy begins before construction is complete, then rent up will be slower before construction is complete than after completion. But these effects involve a level of detail of assumptions that is inappropriate given the overall lack of definition of the project at this stage. Let t'' be the point of initial occupancy, then R_t between t" and t' is

$$R_t = (t - t'') R'/(t' - t'') \tag{24}$$

A certain portion of the operating budget at substantial occupancy will be fixed costs that will have to be incurred at initial occupancy. The rest of the operating budget will be assumed to be variable costs that grow in proportion to the occupancy level. Therefore, during rent up,

$$E_t = E' + (t - t'')(E' - E'')/(t' - t'') \tag{25}$$

where E" is the non-variable operating expense incurred at initial occupancy.

There will also be expenses incurred prior to occupancy. These expenses correspond to the developer's deductible overhead, the ordinary business expenses incurred by the private firm during the development of the project that do not have to be capitalized for tax purposes. (For example, the development firm's rent, telephone bill, salaries, etc.) Again, this work has not said too much about the actual legal form of the private firm engaging in this project, and it should be clear that some expenses will not be deductible depending on who incurs them. For example, if the project is developed by one group that hires an outside contractor to do the construction, payments by the development group to the contractor to cover his ordinary expenses will not be deductible by the development group, but must be capitalized (then depreciated.) We will assume here that there is no identity of interest between the developer and the contractor, and that all payments to the contractor will be capital (i.e., an A_t). All deductible expenses during the construction and development period will therefore be assumed to have been incurred by the development firm. Deductible expenses will be incurred evenly from the start of the development process (t=0), until substantial completion at t^d. During this period

$$E_t = E^o \tag{26}$$

where E^o is the deductible per-period overhead development expense.

4.6 Pattern of Capital Expenditures

We now come to the pattern of capital expenditures. As indicated in the section on depreciation, there are two components to capital expenditures, those on land, and those on building construction. The acquisition of land is a clearly identifiable event, even in the crude description that we have of development alternatives. The cash outflow for land acquisition can also be directly identified, and expressed as L at t^L.

In discussing construction expenditures, it is best to think again in terms of the components of a development alternative. A component can be loosely defined as a discrete building or architectural element devoted to a single predominant use. The most important characteristic of a component for our purposes is that it is physically constructed in a continuous and steady fashion. The time of completion of a component j has already been designated as t_j^d, at which point depreciation begins. Let t_j^c be the start of construction of component j. Note that there may be several periods between land acquisition and the actual start of construction. In a phased development, the delay between t^L and t_j^c can be several years. From Eq. (19), the total cash outflow from the equity position during that period is B_j, while the total construction expenditure (including the public capital contribution) is A_j-L. As was assumed above, public capital contribution will be in direct proportion to private expenditure, and private expenditure will be in proportion to total capital expenditure.

Again assuming linearity, construction expenditure in each period during construction will be equal. On most building construction projects, there is a period in the middle of the construction process over which expenditures are nearly level. While there is also generally a short period at both the start and finish of the process in which expenditures are slower, this can be approximated simply in the linear model by shortening the construction period at both ends. Then, the capital expenditure per period during construction is,

$$(27) \qquad A_t = (A_j - L)/(t_j^d - t_j^c)$$

for component j.

The corresponding pattern of public capital contributions during construction is simply the public's proportionate share,

$$(28) \qquad U_t = \overline{U}(A_j - L)/(t_j^d - t_j^c).$$

Having established the pattern of A_t, we can return to the construction loan, and substitute the results. From Eq. (13), the construction interest in period t is

(29) $$I_t = i_c(\overline{m}) \sum_{x=1}^{t} A_x(1 + i_c)^{t-x}$$

Considering only the construction capital expenditures (i.e., excluding land) A_x's are all equal. For equal A_x's, the appendix demonstrates that

(30) $$I_t = \overline{m}(A_x)[1 + i_c)^t - 1]$$

Substituting for A_x, during the construction period the construction interest allocable to construction expenditures is,

(31) $$I_t^c = \overline{m}(A_j - L)/(t_j^d - t_j^c)[(1 + i_c)^{t-t_c} - 1]$$

The construction interest allocable to the advance to purchase land is simply compounded from the time of the land purchase, t^L,

(32) $$I_t^L = \overline{m}(L)(i_c)(1 + i_c)^{t-t^L}$$

After construction is complete, the construction loan may not be immediately refinanced by the permanent take out. While advances will stop, interest will continue to accrue. We therefore need an expression for the interest in the periods between t^d, the completion of construction, and t^*, the date of the permanent refinancing. At the end of construction, the outstanding balance on the construction loan is computed by dividing the interest payment by the interest rate. Thereafter, interest accrues simply compounded. For t between t^d and t^*,

(33) $$I_t^c = \overline{m}[(A_j - L)/(t^d - t^c)][(1 + i_c)^{t^d-t^c}-1](1 + i_c)^{t-t^d+1}$$

4.7 Summary of Operating Cash Flows

We can now summarize the assumptions and substitutions. Repeating Eq. (7), the net cash flow after tax to the equity position in period t is

$$Y_t = -A_t + O_t + M_t - K_t + U_t - T_t$$

$$- g_e(O_t - I_t - T_t - D_t)$$

A_t - Capital Expenditures

Land Acquisition

$Y_t = -L$ for $t = t^L$

Construction Expenditures

$Y_t = -(A-L)/(t^d - t^c)$ for $t^c \leq t \leq t^d$

O_t = Operating Income

Rent up revenues

$Y_t = R'(t-t'')/(t'-t'')$ for $t'' \leq t \leq t'$

Rent after substantial occupancy

$Y_t = R'(1 + z_r)^{t-t'}$ for $t \geq t'$

Development Expenses

$Y_t = E^o$ for $t \leq t'$

Rent up Expenses

$Y_t = -E'' - (t-t'')[(E' - E'')/(t'-t'')$ for $t'' \leq t \leq t'$

Expenses after substantial occupancy

$Y_t = -E'(1 + z_e)^{t-t'}$ for $t > t'$

M_t - Private Debt Advances

Construction Loan Advances

To cover Land Acquisition

$Y_t = \overline{m}(L)$ for $t = t^L$

To cover Interest on Land Acquisition

$$Y_t = \overline{m}(L)(i_c)(1 + i_c)^{t-t^L} \qquad \text{for } t^L \leq t \leq t^*$$

To cover Capital Construction Advances

$$Y_t = \overline{m}(A-L)/t^d-t^c) \qquad \text{for } t^c \leq t \leq t^d$$

To cover Interest on Construction Advances

$$Y_t = \overline{m}(A-L)/(t^d-t^c)[(1 + i_c)^{t-t^c}-1] \qquad \text{for } t^c \leq t \leq t^d$$

$$= \overline{m}(A-L)/(t^d-t^c)[(1 + i_c)^{t^d-t^c}-1](1 + i_c)^{t-t^d+1}$$

$$\text{for } t^d \leq t \leq t^*$$

Permanent Loan Advance

$$Y_t = PV_{i_p,n}[\overline{k}(R'(1 - \overline{T}) - E')] \qquad \text{for } t = t^*$$

K_t - Repayments on Private Debt

Repayment of Construction Loan

To cover repayment of Land Loan and Interest

$$Y_t = -\overline{m}(L)(1 + i_c)^{t^*-t^L+1} \qquad \text{for } t = t^*$$

To cover repayment of Construction Advances and Interest

$$Y_t = -\overline{m}[(A-L)/(t^d-t^c)][(1 + i_c)^{t^*-t^c}-(1 + i_c)^{t^*-t^d}]$$

$$\cdot[(1 + i_c)^2/i_c] \qquad \text{for } t = t^*$$

Repayment of Permanent Loan

$$Y_t = -\overline{k}(R'(1 - \overline{T}) - E') \qquad \text{for } t^* \leq t \leq t^*+n$$

U_t - Public Capital Contributions

For Land Acquisition

$$Y_t = \overline{U}(L) \qquad \text{for } t = t^L$$

For Construction Expenditures

$$Y_t = \overline{U}(A\text{-}L)/t^d - t^c) \qquad \text{for } t^c \leq t \leq t^d$$

T_t - Local Taxes

During Rent up

$$Y_t = -\overline{T}(R')(t-t'')/(t'-t'') \qquad \text{for } t'' \leq t \leq t'$$

After substantial occupancy

$$Y_t = -\overline{T}(R')(1 + z_r)^{t-t'} \qquad \text{for } t > t'$$

I_t - Interest on Long Term Debt

$$Y_t = K - M_{t*}(K/M_{t*} - i_p)(1 + i_p)^{t-t*} \qquad \text{for } t* \leq t \leq t*+n$$

D_t - Depreciation

$$Y_t = B(q/N)(1 - q/N)^{t-t^d} \qquad \text{for } t^d \leq t \leq t^d+N$$

$$= [A(1-\overline{U})-L](q/N)(1 - q/N)^{t-t^d}$$

To complete the summary, the following is a listing of the variables that determine the pattern of Y_t above.

Architectural Program

A = Total Capital Construction Cost

L = Total Land Cost

R'= Rental Income at substantial occupancy

z_r= Growth rate of rental income after occupancy

E'= Operating Expense at substantial occupancy

E''= Operating Expense at initial occupancy

E^o= Development Expense per period

z_e= Growth rate of expenses after occupancy

t^L = time of land purchase

t^c = start of construction

t^d = substantial completion

t'' = initial occupancy

t' = substantial occupancy

Financial Program

$\overline{m}$ = percentage of capital expenditure funded with construction debt

i_c = market rate of interest on construction debt

t^* = date of repayment of construction loan

$\overline{k}$ = percentage of after local tax cash flow allocated to long term debt

i_p = market rate of interest on long term debt

n = term of long term debt

Federal Income Tax Program

g_e = Marginal tax rate of equity firm

q = Rate of accelerated depreciation

N = Depreciation Life of Building

Local Tax Program

$\overline{U}$ = Percentage of Capital expenditure Funded by Local Capital Contributions

$\overline{T}$ = Percentage of Rental Income Appropriated for Local Taxes

4.8 Cash Flow From Project Disposition

In addition to the cash flows to the equity position over the life of the development project, we must consider the cash flows that result from the sale of the development. At the time of the sale, the project owners must repay the outstanding balance on the mortgage. In addition, there may be federal income taxes due. Let t be the time of sale of the project, SP the total cash sales price, and K_t the repayment of the outstanding balance of principal on the permanent mortgage at the time of the sale. Then, the pre-federal income tax cash realized at the sale, SC, is

(34) $$SC = SP - K_t$$

The computation of the federal tax due on the sale of depreciated property is complicated somewhat by the "recapture" provisions. Before presenting the algebra, an explanation may be helpful. In general, when a capital asset is sold at a gain, the resulting income is taxed as capital gain income. The gain is computed as the difference between the sales price and the adjusted basis of the property. The adjusted basis at the time of sale is the original tax basis for depreciation purposes less the accumulated tax depreciation taken over the life of the asset. In the case of property that has been depreciated using an accelerated method, some of the gain from the sale may be taxed as ordinary income. Basically, the federal government taxes as ordinary income some of the difference between the actual adjusted basis (using an accelerated depreciation method) and the adjusted basis had straight line depreciation been used. The amount of this difference that is taxed as ordinary income is called the applicable percentage, and varies (decreases) as the project gets older. The intention of the recapture provisions is to prevent the tax conversion of ordinary income into capital gains; i.e., the taking of deductions for depreciation against ordinary income and then the payment of tax on the sale (when it turns out that the asset has not in fact depreciated in real terms) at capital gains rates.

Let B_t^{acc} be the adjusted basis at time t using accelerated depreciation, B_t^{sl} be the adjusted basis at time t using straight line depreciation. Then, the taxable income on the sale of a capital asset not using accelerated depreciation is, using the notation for taxable income from above,

$$(35) \qquad F_t = SP - B_t - L$$

Note that since land is not a depreciable capital asset, it is included in the adjusted basis at the time of the sale at its original purchase price.

In the case of accelerated depreciated property, it is perhaps simplest to think of the total tax due as capital gains tax on the difference between the actual adjusted basis and the sales price, plus a recapture premium bringing up to ordinary income tax rates some portion of the gain.

Let F_t^{cg} = the gain subject to capital gains treatment. Then

$$(36) \qquad F_t^{cg} = SP - B_t^{acc} - L$$

Let F_t^{rcp} = the gain subject to the premium bringing it up to full ordinary income taxation. Then

$$(37) \qquad F_t^{rcp} = (app)[B_t^{sl} - B_t^{acc}]$$

where app is the applicable percentage, and is determined with respect to the life of the building (as specified in the appendix).

Recalling that G_t is the federal tax due at t, and that g_e is the marginal tax rate of the equity holders, and assuming that capital gains are taxed at half the rate as is ordinary income,

$$(38) \qquad G_t = (g_e/2)[F_t^{cg}] + (g_e - g_e/2)[F_t^{rcp}]$$

$$= (g_e/2)[SP - B_t^{acc} - L + app(B_t^{sl} - B_t^{acc})]$$

The after tax cash flow from the sale is therefore, say S,

$$(39) \qquad S = SC - G_t$$

$$= SP(1 - g_e/2)$$

$$- K_t$$

$$+ [B_t^{acc} + L - app(B_t^{sl} - B_t^{acc})](g_e/2)$$

From the appendix,

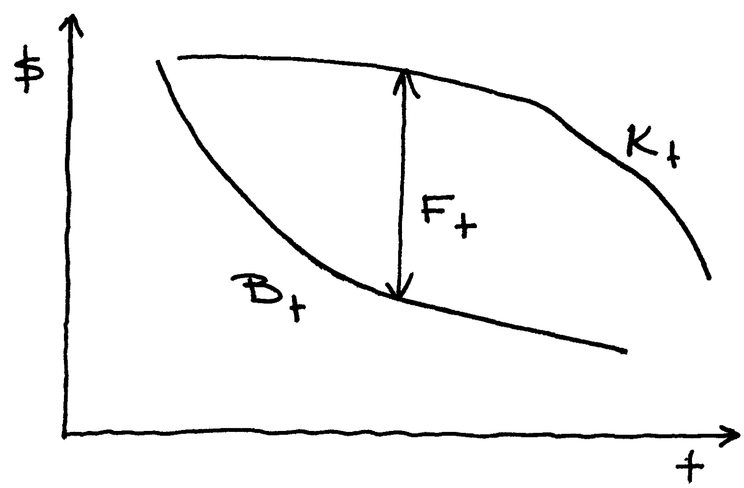
$$K_t = PV_{i_p,n}[\overline{k}(R'(1 - \overline{T}) - E')][1 - (SW_{i_p,t})/(SW_{i_p,n})]$$

where $SW_{i,t} = \sum_{x=0}^{t-1} (1 + i)^x$

$$B_t^{sl} = B(1 - t/N)$$

$$B_t^{acc} = B(1 - q/N)^t$$

What's most important from this discussion can be best seen by presenting a rough graph indicating the amount of taxable income that results from selling the building at different points in time. From the basic construction of a level payment mortgage, the outstanding balance on the loan falls very slowly at the start, accelerating over the life of the loan. On the other hand, the depreciable basis falls very quickly at the start, leveling out in later years. If we assume that the equity in the project is given away, i.e., the project is sold at the outstanding balance on the mortgage, there will still be a substantial tax due on the sale. In other words, during perhaps the first half of the life of a project there may be a significant tax disincentive to selling.



On the other hand, there can come a time when the project produces taxable income in the absence of cash flow even if it is not sold. To see this, imagine a situation where the cash income of the project covers the operating expenses, the real estate taxes, and the debt service. In other words, assume no net cash flow to the equity. During as much as the last half of the life of the project, the deduction for depreciation will be exceeded by the imputed taxable income resulting from the repayment of principal (i.e., a cash outflow that is not deductible.) In such a case, it may be advantageous for the owners of the project to sell the project and pay a one time capital gains tax rather than continuing to pay out cash. This case often occurs in the projections of limited dividend housing developments, where the cash flow to equity is regulated to be so low. These projections often assume that the project will be given away after twenty or twenty-five years, just to avoid such a situation.

Clearly, there are a great range of plausible assumptions that could be made about the disposition of the development after this many years. If cash flow does in fact continue to grow, then refinancing, to increase the tax advantages of leverage, may make the most sense. If cash flow is shrinking, then an early bail out may be right. The best course of action in the future will obviously depend on the actual outcome at the point of decision, and the revised expectations about the remainder of the economic life of the project as a result of those outcomes. In each case, the decision that has to be made is how to maximize the federal tax subsidy to the project, or minimize the present value of the taxes due.

Rather than assuming a specific disposition strategy, this work will assume that the project is held until the end of its economic life--to the point where the building can no longer be expected to produce positive cash flow. Were it not for federal taxes, this would be equivalent to computing the value of the shares of a firm as the present value of all future dividends. There are several points to be made about this approach. First, it is the most conservative. At each future point in time, the owners of the development have their choice between keeping the development under their ownership, or selling it. The only reason they would sell is if the price offered exceeded the present value of the cash flows expected. Therefore, standing at this point in time, we would expect some disposition prior to the end of the economic life to indicate that value of the project was maximized, and exceeded the value of holding out to the end. Second, while this is the most conservative assumption, there is great forgiveness of it since the present value of anything thirty years from now is so small. Any increase in value as computed today resulting from the disposition or refinancing that far out in the future can not be expected to make a substantial contribution. Third, in reality, the disposition value of the project in the far future will likely reflect the redevelopment value of the land under the development. Clearly this potential land value must be exogenous to this model. The real uncertainty about the residual value of the land goes together with the uncertainty as to when another redevelopment of the land will become feasible. In short, the difficulty and the lack of return involved in making any reasonable assumption about the disposition value leads to two very simple propositions. The development will be assumed to stay under single ownership for the full economic life. The value of the land underneath the project will be assumed to grow at the same rate as do other prices, to roughly reflect the impact of inflation on the residual value. The sale of the land at that point will be presumed to result in capital gains. The after-tax cash flow at the end of the economic life is S,

$$S = (L)[(1 + z_e)^t][1 - g_e/2] + (L)(g_e/2) \tag{40}$$

4.9 Present Value of Cash Flows

The net present value of the equity is then the discounted value of the Y_t's plus the discounted value of the final disposition of the project. The appendix computes the discounted value of each component of cash flow identified in the summary above, based on a flat term structure. To simplify things, the following notation will be used:

$$RW_{i,t} = \sum_{x=1}^{t} [1/(1 + i)^x]$$

= the present value of one dollar per period from x=1 to x=t, discounted at i per period

$$SW_{i,t} = \sum_{x=0}^{t-1} (1 + i)^x$$

= the future value of one dollar per period from x=0 to x=t-1, discounted at i

$$PW_{i,t} = 1/(1 + i)^t$$

= the present value of one dollar after t periods

$$QW_{i,t} = \sum_{x=1}^{t} [x/(1 + i)^x]$$

= the present value of one dollar at period one, two dollars at period two, etc., discounted at i per period

The interest rate i will be used in each of the expressions below, and should be understood to represent the appropriate discount rate, which will be specified in the following section.

Capital Expenditures

Land Acquisition

$$PV = (L)[PW_{i,t^L}]$$

Construction Expenditures

$$PV = [(A-L)/(t^d-t^c)][RW_{i,t^d-t^c}][PW_{i,t^c}]$$

Operating Income

Rent up Revenues

$$PV = [R'/(t'-t'')][QW_{i,t'-t''}][PW_{i,t''}]$$

Continuing Rents

$$PV = (R')[RW_{z_{r,i},t-t'}][PW_{i,t'}] \qquad z_{r,i} = \frac{i-z_r}{1+z_r}$$

Development Expenses

$$PV = (E^o)[RW_{i,t'}]$$

Rent up Expenses

$$PV = (E'')[RW_{i,t'-t''}][PW_{i,t''}]$$

$$+ [(E'-E'')/(t'-t'')][QW_{i,t'-t''}][PW_{i,t''}]$$

Continuing Expenses

$$PV = (E')[RW_{z_{e,i},t-t'}][PW_{i,t'}] \qquad z_{e,i} = \frac{i-z_e}{1+z_e}$$

Private Debt Advances

Construction Loan Advances

To Cover Land Acquisition

$$PV = [\bar{m}(L)][PW_{i,tL}]$$

To Cover Capital Construction Advances

$$PV = [\bar{m}(A-L)(t^d-t^c)][RW_{i,t^d-t^c}][PW_{i,t^c}]$$

Interest on Land Acquisition

$$PV = [\bar{m}(L)i_c][RW_{i_{ci},t^*-t^L}][PW_{i,t^L}] \quad i_{ci} = \frac{i-i_c}{1+i_c}$$

Interest on Construction Advances

$$PV = [\bar{m}(A-L)/(t^d-t^c)][(RW_{i_{ci},t^d-t^c})-(RW_{i,t^d-t^c})](PW_{i,t^c})$$

$$+[\bar{m}(A-L)/(t^d-t^c)][(1+i_c)^{t^d-t^c}-1][RW_{i_{ci},t^*-t^d}]$$

$$\cdot[PW_{i,t^d}][1+i_c]$$

Permanent Loan Advance

$$PV = [\bar{k}(R'(1-\bar{T})-E')][RW_{i_p,n}][PW_{i,t^*}]$$

Repayment of Private debt

Construction Loan

$$PV = [\bar{m}(L)(1+i_c)^{t^*-t^L+1}][PW_{i,t^*}]$$

$$+ [\bar{m}(A-L)/(t^d-t^c)][(1+i_c)^{t^*-t^c}-(1+i_c)^{t^*-t^d}]$$

$$\cdot[(1+i_c)^2/i_c][PW_{i,t^*}]$$

Permanent Loan

$$PV = [\bar{k}(R'(1-\bar{T})-E')][RW_{i,t-t^*}][PW_{i,t^*}]$$

Public Capital Contributions

$$PV = [\bar{U}(L)][PW_{i,t^L}]$$

$$+ [\bar{U}(A-L)/(t^d-t^c)][RW_{i,t^d-t^c}][PW_{i,t^c}]$$

Local Taxes

$$PV = [\bar{T}(R')/(t'-t'')][QW_{i,t'-t''}][PW_{i,t''}]$$

$$+ [\bar{T}(R')][RW_{z_{r,i},t-t'}][PW_{i,t'}]$$

Interest on Long Term Debt

$$PV = [\bar{k}(R'(1-\bar{T})-E')][RW_{i_p,n}][PW_{i,t*}]$$

$$\cdot[(RW_{i,t-t*})/(RW_{i_p,n}) - (RW_{i_{pi},t-t*})/[(1 + i_p)(SW_{i_p,n})]]$$

Depreciation

$$PV = [A(1-\bar{U})-L][(q/N)/(1-q/N)][RW_{Q,t-t^d}][PW_{i,t^d}]$$

$$Q = \frac{i + q/N}{1 - q/N}$$

Sale

$$PV = [(L)[(1 + z_e)^t(1 - g_e/2) + g_e/2]][PW_{i,t}]$$

Note that in the preceding equations, t represents the specific time of sale or other disposition of the project.

Inspection of each of the terms in the private feasibility equation indicates that the public policy variables, $\bar{U}$ and $\bar{T}$, appear only in linear fashion. After substitution for the variables in the architectural, financial, and federal tax programs, and equating the PVE to zero, the private feasibility constraint will reduce to a simple linear relationship between $\bar{U}$ and $\bar{T}$ of the following form,

(41) $$\bar{U} = x_1(\bar{T}) + x_2$$

This simple linear relationship can then be substituted back into the expressions for the net present value of U_t and T_t given in the summary above, and discounted at the appropriate rate for such public investment to arrive at the Residual Market Value (RMV) as defined above.

Chapter 4 - Footnotes

1. U.S. Department of Housing and Urban Development, Study On Tax Considerations in Multi-Family Housing Investments, (1973), pp. 13, 68.

2. For Example:

   a) Federal Tax Institute of New England, "What Every Tax Advisor Should Know About Tax Shelters," Outlines of Fiftieth Forum (April 27, 1974).

   b) Berman, S., and Kaster, L., Subsidized Housing, Tax and Profit Opportunities in Selling and Buying (Practising Law Institute, 1971).

3. Maisel, S., Financing Real Estate, (McGraw-Hill Book Company, 1965).

CHAPTER 5

FINANCIAL ASSUMPTIONS FOR VALUATION OF CASH FLOWS FROM NEW DEVELOPMENT

5.1 Valuation of Uncertain Cash Flows

The work in the previous section did not specify the appropriate interest rate to be used to discount each of the components in the cash flow equation (Eq. (7)). Clearly, in a riskless world, all flows would be discounted at the same riskless rate. But in an uncertain world, the present value of a stream of cash flows depends on some assessment of the associated risk. There are several basic approaches to dealing with uncertainty in capital budgeting, including the use of risk adjusted discount rates, certainty equivalents to future cash flows, probabilistic computations with or without utility adjustments, or outcome simulation. A comprehensive analysis of the alternative mechanisms for dealing with uncertainty in capital budgeting is clearly beyond the scope of this thesis. We will assume here that the risk associated with the project cash flows will be reflected through the discount rates used. Without attempting to make a strong theoretical defense of this assumption, there are several points to be made on its behalf. Most importantly, this is the technique most widely used in the real estate industry. The use of risk adjusted discount rates in the valuation of real estate projects (as well as specific claims on projects) is generally accepted by real estate traders. The sale of equity claims on real estate projects (particularly when widely distributed) is usually predicated on a valuation arrived at by discounting pro forma after tax cash flows at a risk adjusted interest rate.[1] What's important about the fact that the use of risk adjusted rates is common in the marketplace is not that it implies any theoretical superiority, but that it provides at least a limited source of information about the expected returns on this type of risky asset.

The use of the discount rate to reflect the risk of expected cash flows is also attractive because of the consistency with the Capital Asset Pricing Model. Again, this is not the place for an evaluation of the Capital Asset Pricing Model (CAPM), which is available elsewhere.[2] Briefly, the CAPM relates the required (expected) return on an asset to its systematic risk, or non-diversifiable risk. The essence of the equilibrium model is presented in the equation of the risk-return relationship. In its usual form, the expected return on asset i in a single period, $E[R_i]$ will satisfy

$$E[R_i] = R_f + b_i(E[R_m] - R_f)$$

where R_m is the return on the portfolio of all assets available at equilibrium in the market, R_f is the return on the riskiness asset, and b_i is the market sensitivity of asset i, or the slope of the regression line relating the return on asset i and the return on the market portfolio. The CAPM defines the market sensitivity as

$$b_i = \text{cov}(R_i, R_m)/\text{var}(R_m).$$

What is important to note is that the CAPM results imply that the market rewards the bearing of risk in linear relationship and that the risk that is rewarded is the variability in returns that can not be difersified by addition of other assets to the portfolio, not the variability of returns with respect to the expectation for the asset itself. Although the CAPM was originally derived for a one period situation, it has been extended to the multi-period, continuous time environment. Derivation of the model in general depends on a standard set of perfect market assumptions.[3]

The fundamental implication of the CAPM to capital budgeting is that the expected return on a project should adequately compensate for its systematic risk. Although most of the derivation and testing of the CAPM was oriented towards securities markets, extension of the basic propositions to individual projects was suggested by Myers.[4] Bower and Lessard also have presented an operational approach to risk screening in the capital budgeting process that included comparison of expected returns to the project's systematic risk.[5] (This latter article also points out the significant difficulty in deriving a theoretically sound risk screening rule, and in estimating the systematic risk of a project.)

Even without assuming the CAPM, modern financial theory has recognized the need to reflect the increased risk of equity claims on assets due to the use of leverage. Again, without a rigorous defense, this work will assume the basic propositions relating required returns on various claims on an asset to the capital structure as advanced by Modigliani and Miller (MM)[6]. For our purposes, the MM results can be summarized briefly: that the total value of a leveraged enterprise is equal to the value of the unleveraged enterprise plus the present value of the federal tax subsidy resulting from the deductibility of interest payments. Although the original MM work was in a no bankruptcy environment, Merton has shown that the results hold in the case of potential bankruptcy also.[7] Hamada has substituted the MM results into the CAPM structure to indicate the relationship between the capital structure of an enterprise and the systematic risk of the different claims.[8]

5.2 Structures of Discount Rates

With these assumptions in hand we can now return to Eq. (8) and indicate the appropriate type of discount rate to be used in valuation of each component of the after tax cash flows. Repeating Eq. (8),

$$
\begin{aligned}
PVE = {} & PV[O_t - A_t] + PV[S] \\
& + PV[M_t - K_t] \\
& + PV[U_t - T_t] \\
& - PV[g_e(O_t - I_t - T_t - D_t)]
\end{aligned}
$$

Remember that the first line of the equation represents the net value of the unleveraged, untaxed project cash flows. The second line represents the net value of the cash flows to and from the source of private financing. The third line represents the net value of the cash flows claimed by the local government, and the last line the net value of the cash flows claimed by the federal government. Also remember that the cash flows are to be valued from the point of financial view of the equity investors.

In the context of the CAPM, the first line of the equation should be discounted at that rate appropriate to the degree of systematic risk associated with an unleveraged project of this type. Note carefully that these unleveraged and untaxed cash flows <u>are not</u> to be discounted at the required return for equity on the leveraged investment. In the MM context, the unleveraged cash flows should be discounted at the rate appropriate for the unleveraged investment.

From MM, the net value to the equity position from the use of private market debt is zero, i.e.,

$$PV[M_t - K_t] = 0$$

in the equation for the net value of the equity.

To select discount rates for line three, we must restate the definitions of the local government's claim on the project in terms of the uncertain variables. Using the notation $\tilde{x}$ to indicate a stochastic variable, the cash flows to the local government are:

Public Capital Contribution - $\tilde{U}_t$

$$\tilde{U}_t = \overline{U}(\tilde{A}_t)$$

Local Taxes - $\tilde{T}_t$

$$\tilde{T}_t = \overline{T}(\tilde{R}_t)$$

Clearly, the cash flows to the local government are perfectly correlated with some component of the project's pre-tax, pre-financing cash flows. Although the required payments to the local government do not constitute a direct partnership interest in the pre-financing, pre-tax cash flows (only because the local government does not contribute proportionately to the actual project operating expenses), these payments will have systematic risk quite similar to that of the unleveraged project itself. We will therefore use the same discount rate to compute the net present value of the payments appropriated by the local government (the value as perceived by the equity holders that forego that cash income) as is used to discount the tax free pre-financing cash flows.

To the extent that federal tax laws remain unchanged and investors' marginal tax rates stay constant, the cash flows claimed by the federal government are also linked directly to the underlying cash flows of the project. There are two components to the federal government's claims. The first component is a share of the after local tax operating income, O_t-T_t. Again, from the equity's perspective, the required payment to the federal government is correlated with this net cash flow which is the difference, as assumed above, between two flows with similar systematic risk. It will therefore be assumed that this component of the payments to the federal government will be discounted at the same rate. On the other hand, the federal tax bill will be reduced by deductions for interest accrued and depreciation taken. Both these deductions follow fixed patterns over time as indicated in the previous section. As long as the project does not go bankrupt, the actual deduction in each period will be equal to the expected deduction. From the private mortgage interest rate, it is clear how the private debt market has valued the interest payments. From the MM assumption, we know that the equity holders place the same value (exclusive of taxes) on these transfer payments to the private debt holders. We will therefore assume that the equity holder values the prospective deductions for interest payments at the "quasi-riskless" rate: the private debt rate. Note that in the MM environment the value of fixed debt payments decreases (relative to the payment) as the use of debt increases. This will also be true of the valuation of the tax deduction for interest payments. This basically reflects the fact that increased leverage increases the probability of bankruptcy (that the value of the project will fall below the outstanding balance of the market debt). As the probability of bankruptcy increases, so does the probability that the benefits from the tax deductions will not accrue to the equity, i.e., those deductions from years after the bankruptcy will not be available. Therefore it seems appropriate to use a higher discount rate to compute the value of the interest deductions as leverage increases. Which is the result implied in using the private market rate of interest as a discount rate.

The same reasoning implies the use of the market interest rate to compute the present value of the depreciation deductions, which is a similarly riskless set of cash flows in the absence of bankruptcy.

We can now summarize these assumptions by rewriting Eq. (8),

$$\begin{aligned} PVE = {} & PV_k[O_t - A_t + S] \\ & + PV_k[U_t - T_t] \\ & - PV_k[g_e(O_t - T_t)] \\ & + PV_i[g_e(I_t + D_t)] \end{aligned}$$

where

k = the required return on tax free cash flows on the unleveraged project.

i = the required return on the debt of the leveraged project.

[For a more detailed discussion of the issues in selecting multiple discount rates in capital budgeting, the reader is referred to the literature on lease financing. The strong effects that the federal tax structure has on off-balance-sheet financing as opposed to ownership is a central topic of that literature, which deals with an essentially analogous set of financial issues. For a summary see Bower.[9]]

5.3 Social Cost of Capital

We turn now to the social cost of capital. We have indicated above that the private sector values the cash flows paid over and received from the local government at the project's unleveraged overall discount rate, k. We must now determine the appropriate discount rate for the local government to use in computing the RMV of these cash flows. There is a broad literature supporting several alternative attitudes about the appropriate rate to use in discounting future public benefits from publicly supported projects. Most of that literature views the problem from the perspective of the federal government, and was in fact written with evaluation of federal programs in mind.[10] Basically, all authors agree that the appropriate way to determine the social discount rate is with respect to the opportunity cost (i.e., foregone return elsewhere) of capital invested in the project. This is consistent with the fundamentals of cost-benefit analysis outlined in the introduction, and views capital as an input into the project like any other. Unfortunately, opinions diverge when it comes to identifying the right opportunity cost, primarily because of the great variety of returns available on different assets in the marketplace. Particular attention has been focussed, of course, on the relevance of risk to the opportunity cost of social capital. Some authors have tended to view risk as irrelevant. Arrow, for example, operates on an assumption that individual projects do not have significant systematic risk, and that the federal government acts as a complete diversifying intermediary of risk, which therefore is irrelevant to the analysis of federal projects.[11] Other authors do admit risk aversion as a social cost on the federal level.[12] Clearly, the CAPM framework implies directly the relevance of risk to the opportunity cost of capital. In restated form, the CAPM relates expected return on capital to the marginal contribution that the particular asset makes to the non-diversifyable total risk to be borne by society. To maintain efficiency, social investment must receive the required return for the creation of this marginal risk.

In any case, the above alternative attitudes do not address themselves to the problem as perceived by local government. Local government must take a local, not global, view of the world. In the first place, local government just does not have the capacity to aggregate risks to the point of irrelevance (presuming even that there is not systematic risk to projects). And second, it is not clear that it is appropriate for local governments to make decisions not in the best interests of the local citizenry, even if it is in the national interest; nor is it clear that any local government will make such a decision. Simply, local government may not find much solace in the proposition that risk is irrelevant on a national scale (as proposed by some) if it is assuming substantial risk on behalf of local citizens.

We will here take a stronger position: that under the CAPM the local government must view the opportunity cost of investment on behalf of its constituents as the foregone return on an investment with equivalent systematic risk. Basically, this point of view assumes that the capital markets are reasonably perfect; that the imperfection that encouraged governmental action on the project was not in the capital market. Put another way, we are assuming that the market place has priced risk correctly, and that risk bearing must be purchased like any other input. In this case, the local government is intermediating investment on behalf of the local population, which holds the residual claim on the "value of the city"--the net of services provide the shareholders and the taxes paid. In maximizing local residents' welfare, the local government must simply insure that the marginal risk that they are asked to bear as a result of governmental intervention is compensated for by an adequate expected return.

The implication of this assumption is that the local government should use the same discount rate to compute the value of its claims on the project as does the private market to compute the value of the payments, i.e., at discount rate k.

To summarize this section, presuming stability of rates over time (i.e., a flat term structure) there are two relevant rates for valuation of the equity, debt, and local government claims on the development project:

k = the required return on federal tax free cash flows of the unleveraged project overall

i = the required return on the debt of the leveraged project.

Chapter 5 - Footnotes

1. Conversations with Andre Schwartz, Lehman Brothers, New York.

2. See, for example:

   a) Jensen, M.C., "Capital Markets: Theory and Evidence," Bell Journal of Economics and Management Science, (Autumn, 1972).

   b) Black, F., Jensen, M., and Scholes, M., "The Capital Asset Pricing Model: Some Empirical Tests," in Jensen, M.C., Studies in the Theory of Capital Markets, (Praeger, 1972).

3. For a review of standard assumptions see:

   Merton, R.C., "An Intertemporal Capital Asset Pricing Model," Econometrica (1973).

4. Myers, S.C., "Procedures for Capital Budgeting Under Uncertainty," Industrial Management Review, (Spring, 1968).

5. Bower, R.S., and Lessard, D.R., "An Operational Approach to Risk Screening," Journal of Finance.

6. Miller and Modigliani (1958).

7. Merton, R.C., "On the Pricing of Corporate Debt: The Risk Structure of Interest Rates," Journal of Finance (May 1974)

8. Hamada, R., "The Effect of the Firm's Capital Structure on the Systematic Risk of Common Stocks, Journal of Finance, (May, 1972).

9. Bower, R.S., "Issues in Lease Financing," Amos Tuck School of Business Administration Working Paper (1973).

10. See treatment of uncertainty in:

    a) Haveman and Margolis (1970)

    b) Hinrichs and Taylor (1969)

11. Arrow, K.J., and Kurz, M., Public Investment, The Rate of Return, And Optimal Fiscal Policy, (Johns Hopkins Press, 1970), p. 7.

12. Hirshleifer, J., and Shapiro, D., "The Treatment of Risk and Uncertainty," in Haveman and Margolis (1970).

CHAPTER 6

VALUE OF TAX REVENUES FROM PARCELS NOT REDEVELOPED

In addition to the tax revenues from new development, the local government will receive continued tax revenues from land parcels not redeveloped. Even in the case of a total redevelopment, which will be staged over time, the city will receive tax revenues from existing land uses prior to their actual demolition for redevelopment. To compute the full Residual Market Value, the present value of the tax revenues to be received from land not redeveloped must be included, and the present value of tax revenues from existing uses prior to redevelopment must be included. There are several interesting problems involved in estimating the present value of these cash flows. Although the actual cash flows from the current period are a matter of public record (at the assessor's office), there is no long term contract between the city and property owner to specify the pattern of future cash flows. The uncertainty as to future cash flow comes from two sources: the uncertainty as to the future property tax rate, and the uncertainty as to the future assessed value of the property. This latter uncertainty is particularly troublesome because of the heavy impact that redevelopment of some parcels may have on the value of the others.

The BRA estimates the current market value of all the land in the Park Plaza project area under its current use at roughly $18,000,000, or about two thirds of the expected acquisition cost. The current assessed valuation is about half the market value, or one third of the expected acquisition cost, or roughly $9,000,000. The current tax rate in Boston is about $200 per year per $1000 of assessed value. The current annual tax bill is therefore 10% of market value, or 6.6% of the acquisition price.[1]

The city can clearly increase the future tax rate as required to support city services. Tax rates in the city have increased on a nominal basis consistently, to a great degree to cover inflation in the cost of city services. Future tax rate increases would reflect not only the changing price level but any policy decision to change the level of city services. A comprehensive analysis of the expected pattern of future tax rates is beyond the scope of this work.[2] We will assume here that future tax rates are based on a fixed level of services, and therefore increasing to reflect inflation. On the other hand, under the current administration of the local property tax, it should not be expected that a specific property would be reassessed at any higher value over time. This reflects the presumption that parcels that are not redeveloped now will be kept under their current use over the life of the new project. The result is the expectation that the property tax bill for each property will grow over time at the same rate that the price level is changing. Or, that property taxes are constant in real dollars over time.

We will also assume that the proportionality of tax bill to taxable assessment to purchase price to market value holds over the entire site, i.e., for each individual parcel. Then, using the above notation, the present value of the tax revenues from any parcel prior to its taking for redevelopment can be expressed as:

$$PV = (L)(6.6\%)(RW_{z_L, t_L})$$

where

$$z_L = (i - z_e)/(1 + z_e)$$

i = the discount rate used on future tax revenues

z_e = the expected rate of inflation

Note that for parcels not acquired, t^L will be the end of the economic life of the project.

It is important to note the difference between the type of claim that the local government has on new development and the type of claim that it has on existing parcels that will not be redeveloped. As pointed out, the local government's claim on new development closely resembles a partnership equity interest. On the other hand, the contract with holders of un-redeveloped properties gives the local government the most senior debt position--the local government has a claim on nearly riskless flows. As a result, the appropriate rate for valuation of the tax revenues must be below the interest rate on market debt. In MM terms, the first dollar of debt advanced on a project should expect to earn the riskless return.

From the market point of view, the local government is a financial intermediary whose project's (assets) primarily include senior claims on the local real estate. Municipal general obligation bonds are marketable claims on the city's claims on the local real property. The required return on general obligation municipal bonds reflects both the degree of "public leverage" (the amount of debt in the city's capital structure), and the systematic risk associated with future value of the city's real property assets. In a market context, the value of the municipality's liabilities directly reflects the value of its assets. If we assume for the moment homogeneity of the assets, both with respect to systematic risk, and with respect to project leverage (the ratio of the value of the property to the value of the municipal claim on it), then the required return on municipal general obligation bonds would be the same as the expected return on the city's claims on the real property.

In the Boston metropolitan area, cities rely on the property tax for about 65% of their total revenue.[3] Only a marginal amount of this revenue comes from the relatively new use of Section 121 tax agreements. The rest comes from the city's priority claim on the value of the property. Another 24% of the area's cities' revenue comes from transfers from the state or federal government. Clearly, then, a substantial portion of the local government's long term assets consists of claims identical to the claim that the local government holds on the value of the un-redeveloped portions of this project. Since the property tax, in conventional form, is roughly a proportionate tax on the value of the property, it is fair to assume that the public local debt is secured by a similar portion of the value of each parcel of land in the city. We will further assume that the systematic risk associated with the future value of property that remains un-redeveloped within the project area is similar to the systematic risk of real property assets throughout the city. In an intuitive sense this is equivalent to the proposition that the uncertainty about the future value of real property that is site specific can be diversified away, while the uncertainty that is city wide can only partially be diversified. For example, the risk that the value of property in the central city will fall with a migration of economic activity to the suburbs can clearly be diversified by the construction of a portfolio containing both urban and suburban property. On the other hand, the uncertainty about future values as a function of their relationship to the general performance of the economy, may not be diversifiable by including other parcels in the city into a portfolio.

We will therefore assume that future tax revenues to be collected by the city from parcels not redeveloped should be discounted at the city's general obligation bond long term interest rate, (i_b).

Chapter 6 - Footnotes

1. Ganz, A., Menconeri, P., et al., "Park Plaza: Public Costs and Tax Revenue Benefits to the City of Boston," BRA Research Dept. Paper (July, 1973), pp. II-1.

2. The matter is further complicated by a recent decision of the Massachusetts Supreme Court requiring all properties to be assessed at 100% of value. This would require, if upheld, a reassessment of all properties, and a re-setting of the property tax rate.

3. Holland, D., Oldman, O., and McCarthy, T., "State and Local Finance," Boston Development Strategy Working Paper, (December, 1971), p. 8.

CHAPTER 7

SUMMARY OF MODEL TO COMPUTE RESIDUAL MARKET VALUE

Using the expressions generated in the previous chapters, we now summarize the entire model, and derive an explicit expression for the Residual Market Value of a development alternative. From Chapter 5, the value of the equity claims on new development is

$$
\begin{aligned}
(1) \qquad PVE = \; & PV_k[O_t - A_t + S] \\
& + PV_k[U_t - T_t] \\
& - PV_k[g_e(O_t - T_t)] \\
& + PV_i[g_e(I_t + D_t)]
\end{aligned}
$$

From the work in Chapter 4, we can make a substitution into Eq. (1) of an explicit expression for the present value of each component of the cash flow to equity. These expressions appear in the summary to Chapter 4. A quick review of that summary should indicate that direct substitution of those expressions into Eq. (1) would yield a result most difficult to work with. In order to facilitate further manipulation of Eq. (1), the expressions from Chapter 4 will be used in a more simplified form.

7.1 Short Form Statement of Present Value of Cash Flow Components

Each of the expressions for the present value of a component of the cash flow can be organized as a separable function of two sets of variables:

1. Those variables that represent the basic market prices of inputs and outputs (other than capital.) This includes the price of land, capital construction costs, rental income, and the cost of development and operating expenses [L, A, R', E', E'', E^o].

2. The costs of capital, the changes in price level, the financial program, and the t's that describe the development schedule. Most of these variables are not simply separable in the present value expressions. In fact, most of these variables are soundly consolidated as arguments for the PW, RW, QW, and SW operators.

In order to write a usable expression for RMV in terms of the six commodity market prices, we will work in terms of a single function of all the variables in group two. For example, from Chapter 4, the present value of the rental income after substantial occupancy is

(2) $$PV = R'[RW_{z_r,i,t-t'}][PW_{i,t'}]$$

In this section we will substitute and rewrite Eq. (2) as

(3) $$PV = R'[F(CR)]$$

$$F(CR) = [RW_{z_{r,i}t-t'}][PW_{i,t}]$$

In each case, the present value of a component of cash can be expressed as the product of a "Basic Market Price" (Group 1 Variable) and a "financial Factor," (Function of Group 2 Variables).

The financial factors convert the basic market prices directly into present values. Using the example above, the present value of the rental income after substantial occupancy is directly proportionate to the expected rental income at substantial occupancy. The financial factor simply indicates the present value of that flow per dollar of rental income.

We therefore make the following substitutions in the present value expressions:

Operating Income - 0_t

<u>Rent-up Revenues (RR)</u>

$$PV = [R'/t'-t''][QW_{k,t'-t''}][PW_{k,t''}]$$

$$= R'[F(RR)]$$

<u>Continuing Rents (CR)</u>

$$PV = (R')[RW_{z_{rk},} {}_{t-t'}]$$

$$= R'[F(CR)]$$

<u>Development Expenses (DE)</u>

$$PV = (E^o)RW_{k,t'}$$

$$= E^o[F(DE)]$$

<u>Rent-up Expenses (RE)</u>

$$PV = E''[RW_{k,t'-t''}][PW_{k,t''}] + [(E'-E'')/(t'=t'')][QW_{k,t'-t''}][PW_{k,t''}]$$

$$= E''[F(RE)] + E'[F(RR)]$$

Continuing Expenses (CE)

$$PV = E'[RW_{z_{ek}, t-t'}][PW_{k,t'}]$$

$$= E'[F(CE)]$$

Capital Expenditures - A_t

Land Acquisition (LA)

$$PV = L[PW_{k,t^L}]$$

$$= L[F(LA)]$$

Construction Expenditures (CX)

$$PV = [(A-L)/(t^d-t^c)][RW_{k,t^d-t^c}][PW_{k,t^c}]$$

$$= (A-L)[P(CX)]$$

Sale - S

Final Disposition (FD)

$$PV = L[(1+z_e)^t(1-g_e/2) + g_e/2][PW_{k,t}]$$

$$= L[F(FD)]$$

On Construction Advances (IC)

$$PV = (A-L)[\overline{m}/(t^d-t^c)][PW_{k,t^c}][(t^d-t^c-RW_{i,t^d-t^c}) + ((1+i_c)^{t^d-t^c} - 1)(1+i_c)(t^*-t^d)]$$

$$= (A-L)[F(IC)]$$

On Permanent Mortgage (IP)

$$PV = [R'(1-\overline{T})-E'](\overline{k})[RW_{i_p,n}][PW_{k,t*}][1-n/(1+i_p)[SW_{i_p,n}]]$$

$$= [R'(1-\overline{T})-E'][F(IP)]$$

Depreciation - D_t

$$PV = [A(1-J)-L][(q/N)/(1-q/N)][RW_{Q,N}][PW_{k,t}d]$$

$$= [A(1-\overline{U})-L][F(DP)]$$

7.2 Summary Statement of PVE

Restating Eq. (1) using these substitutions:

$$\begin{aligned} PVE = {} & R'[F(RR) + F(CR)][1-g_e] \\ & -[E^o[F(DE)] + E''[F(RE)]][1-g_e] \\ & -E'[F(RR) + F(CE)][1-g_e] \\ & - L[F(LA)] - (A-L)[F(CX)] \\ & + L[F(FD)] \\ & + \overline{U}[L[F(LA)] - (A-L)[F(CX)]] \\ & - \overline{T}[R'][F(RR) + F(CR)][1-g_e] \\ & + g_e[L[F(IL)] + (A-L)[F(IC)] \\ & + g_e[R'(1-\overline{T}) - E'][F(IP)] \\ & + g_e[A'(1-\overline{U}) - L][F(DP)] \end{aligned}$$

Rearranging in terms of the basic market prices:

$$
\begin{aligned}
(5) \qquad PVE = {} & R'[[F(RR) + F(CR)](1-g_e) + [F(IP)]g_e] \\
& - E'[[F(RR) + F(CE)](1-g_e) + [F(IP)]g_e] \\
& - E^{o}[F(DE)](1-g_e) \\
& - E''[F(RE)](1-g_e) \\
& -L[F(LA) - F(FD) - F(IL)(g_e)] \\
& -(A-L)[F(CX) - [F(IC) - F(DP)]g_e] \\
& + \overline{U}[L[F(LA)] + (A-L)[F(CX)] - A[F(DP)]g_e] \\
& - \overline{T}[R'][[F(RR) + F(CR)](1-g_e) + [F(IP)]g_e]
\end{aligned}
$$

The first six lines of Eq. (5) present the value of the equity if there were no local governmental claims on (or contributions to) the project. The last two lines present the net value to the equity (after federal tax) of those local public claims. Call the value of equity prior to local government claims the Net Market Value (NMV). Then

$$
\begin{aligned}
(6) \qquad PVE = {} & NMV \\
& + \overline{U}[L[F(LA)] + (A-L)[F(CX)]-A[F(DP)]g_e] \\
& - \overline{T}[R'][[F(RR) + F(RR)](1-g_e) + F(IP)g_e]
\end{aligned}
$$

By setting the PVE to zero, Eq. (6) yields the feasible combinations of $\overline{U}$ and $\overline{T}$.

$$
(7) \qquad \overline{U} = \frac{\overline{T}[R'][[F(RR) + F(CR)](1-g_e) + F(IP)g_e] - NMV}{L[F(LA) - F(CX)] + A[F(CX) - F(DP)g_e]}
$$

While Eq. (7) specifies the relationship between feasible combinations of $\overline{U}$ and $\overline{T}$, the actual values for either $\overline{U}$ or $\overline{T}$ must be determined outside of the model. Chapter 10 deals with the selection of the combination of $\bar{U}$ and $\bar{T}$. That chapter will show that RMV is an increasing function of both $\bar{U}$ and $\bar{T}$. Therefore RMV can be maximized (by the selection of $\bar{U}$ and $\bar{T}$) to the extent that neither of these two variables is unconstrained from above. The appropriate combination is then determined by the upper limit constraints put on $\bar{U}$ and $\bar{T}$. Chapter 10 will specify these limits on the variables that determine the local government's claims on the project. Let $\bar{U}^*$ and $\bar{T}^*$ be the feasible combination satisfying Eq. (7) as determined in Chapter 10.

7.3 Summary Statement of RMV

By definition, the Residual Market Value (of new development) is the present value of the cash flow to the local government. From Chapter 3,

$$(8) \qquad \begin{aligned} RMV = {} & \bar{T}^* \, [PV_k[R_t]] \\ & - \bar{U}^* \, [PV_k[A_t]] \end{aligned}$$

From Chapter 4, and the substitutions above,

$$(9) \qquad \begin{aligned} RMV = {} & \bar{T}^* \, [R'][F(RR) + F(CR)] \\ & - \bar{U}^* \, [L[F(LA)] + (A-L)[F(CX)]] \end{aligned}$$

where the first line is the present value of the tax revenues, and the second line is the present value of public capital contributions.

By adding Eq. (9) to Eq. (6), with PVE = 0, we get alternative definition for RMV.

$$(10) \qquad RMV = NMV + \bar{T}^{*}[R'][g_e][F(RR) + F(CR) - F(IP)] - \bar{U}^{*}[A][g_e][F(DP)]$$

Eq. (10) indicates that RMV is equal to the net market value of the equity were there no local public claims, plus the federal tax subsidy rewarding the use of the local government as a source of finance for the project. The second line of Eq. (10) represents the tax savings resulting from the deduction of local taxes, less the reduction in deductions for interest on long term debt. [The greater the amount of "local government financing" the lower the amount of market debt supportable.] The third line represents the present value of tax savings lost because of reduced depreciation deductions reflecting the reduced basis as the local government provides a greater portion of the capital costs.

This thesis will compute the RMV of each development alternative by evaluating Eq. (10) using data specified in the next section.

To complete computation of RMV, the value of revenues from parcels not redeveloped must be added. From Chapter 6, for unredeveloped parcels

$$RMV = (L)(6.6\%)(RW_{z_L}, t_L)$$

Total RMV is the sum of RMV from new development and unredeveloped parcels.

CHAPTER 8

SPECIFICATION OF THE ARCHITECTURAL PROGRAM

This section reviews the assumption and methods underlying the BRA data. As noted in the introduction, this thesis will work in the context of the BRA data. Primarily, the BRA data will be used to specify the architectural program. The detailed specification of the data defining each of the development alternatives will be presented in Appendix II. The review of the BRA data will include a summary of the assumptions and a critique indicating where the BRA approach may be weak.

8.1 Source of Data

The data required to specify the architectural program will come primarily from three BRA documents: Park Plaza: Urban Design Objectives, Financial and Market Feasibility[1] (January 9, 1975); Park Plaza: Defining the Alternatives[2] (February 4, 1975); and Park Plaza: Development Staging Plan[3] (March, 1975). Each of these documents has been prepared with substantial judgment by the BRA staff. The first represents a summary of the market and economic data that is regularly collected by the BRA staff relative to the city's real estate markets. The underlying data can be found in a number of other BRA publications,[4] and other attempts to apply the data to Park Plaza can be found in the analyses produced by Gladstone Associates, Economic Consultants, for the Boston Urban Associates.[5] Note that the Gladstone market studies rely substantially on original demographic, economic, and real estate market data produced by either the BRA or the U.S. Census. The latter two documents represent the BRA staff's efforts to construct reasonable development schemes in terms of a development schedule. It is important to remember that the mixture of uses represents the judgment of the BRA as to what would be optimal at each level of density, but does not represent either the financially or architecturally optimal scheme. In other words, the construction of the alternative schemes has already involved some subjective weighting of the non-market inputs and outputs against the market inputs and outputs; neither the market value or the non-market public value of the development has been explicitely maximized.

The specification of the development alternatives in Appendix II will be done in terms of development components. As defined above, a development component is a separately constructed building element devoted to a primary space use. For example, an office building tower would be a single development component. A single structure that contains substantial portions of both office space and residential space would be considered two development components. A development alternative that contained provision for office space in two different structures to be built in two different construction phases would also be considered to have two development components of offices.

For each development alternative, the Appendix II specifies:

The development components of which the scheme consists.

A Schematic site Plan of the Alternative.

For each component:

A = Total Capital Construction Cost

L = Total Land Cost Allocable

R'= Rental Income at Substantial Occupancy

E'= Operating Expense at Substantial Occupancy

E'' = Operating Expense at Initial Occupancy

E° = Development Expense Per Period

t^{L} = Time of Land Purchase

t^{c} = Start of Construction

t^{d} = Substantial Completion of Construction

t'' = Initial Occupancy

t' = Substantial Occupancy

8.2 Development Alternatives

The alternative schemes as created by the BRA are heavily motivated by the BRA's urban design objectives. Fundamental to an understanding of the BRA's approach is an understanding of the BRA's "parcelization," or subdivision, of the project area. From the January 9th report:

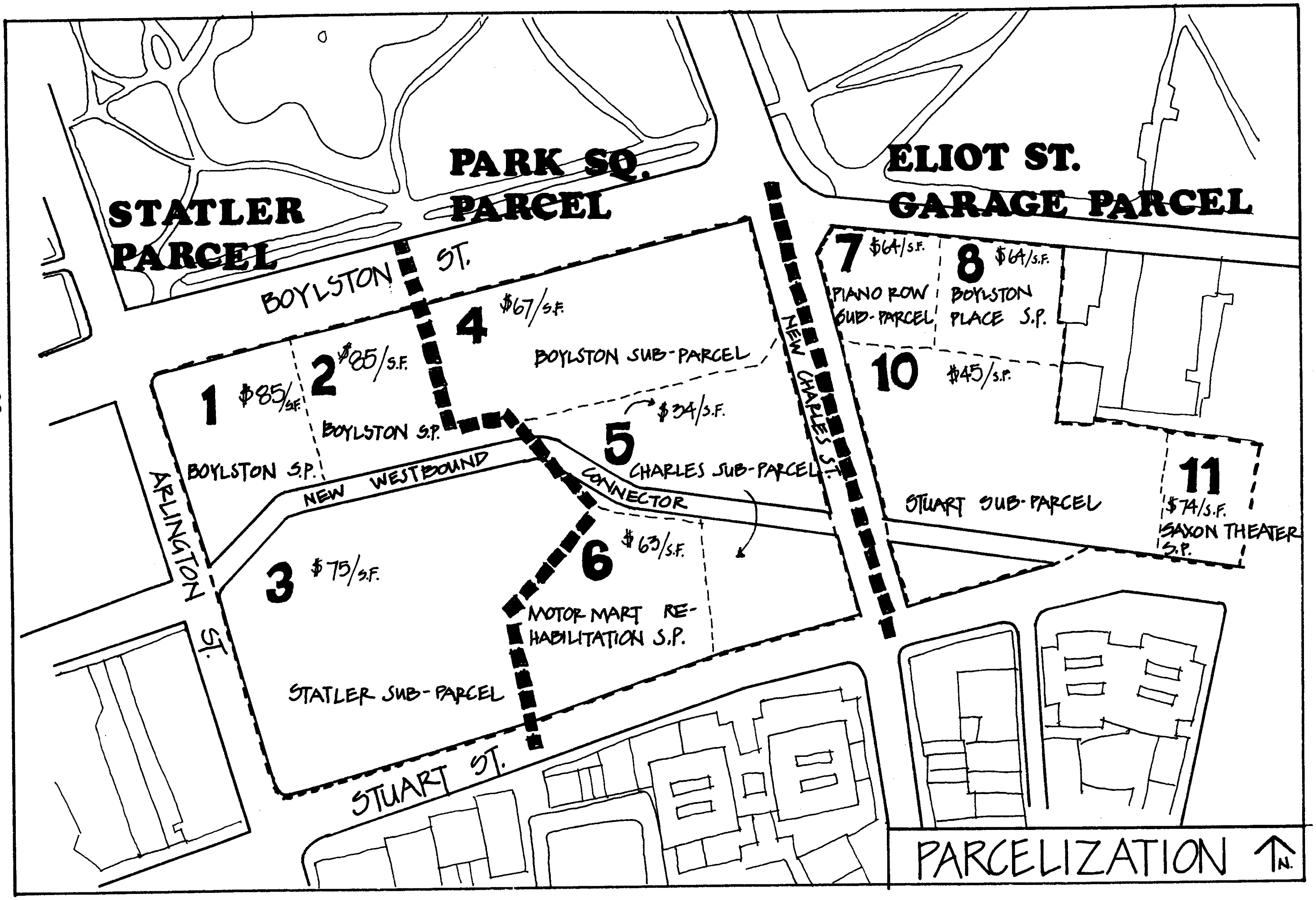
> Although in the formulation of the urban renewal plan it was stated that the project area must be treated as one integrated building complex, it has always been understood that development by necessity would occur incrementally. Both financing practice and market limitations call for a sequence of phased development actions over several years. This study assumed that each of these phases or parcels should be economically self-sustaining. Consequently, parcels must be defined in such a way that they are both small enough to insure a successful development which is an independent economic unit and still substantial enough to allow significant improvements to achieve an attractive and marketable environment. The individual parcels must also fit into a properly conceived physical linkage with adjacent parcels.[6]

As a result, the BRA identified three basic parcels. These parcels have come to be known by their current use, and as identified on the map, are:

Park Square Parcel

Eliot Street Garage Parcel

Statler Hilton Parcel


STATLER PARCEL
PARK SQ. PARCEL
ELIOT ST. GARAGE PARCEL
BOYLSTON ST.
ARLINGTON ST.
NEW WESTBOUND CONNECTOR
NEW CHARLES ST.
STUART ST.
1 $85/S.F.
BOYLSTON S.P.
2 $85/S.F.
BOYLSTON S.P.
3 $75/S.F.
STATLER SUB-PARCEL
4 $67/S.F.
BOYLSTON SUB-PARCEL
5 $34/S.F.
CHARLES SUB-PARCEL
6 $63/S.F.
MOTOR MART RE-HABILITATION S.P.
7 $64/S.F.
PIANO ROW SUB-PARCEL
8 $64/S.F.
BOYLSTON PLACE S.P.
10 $45/S.F.
STUART SUB-PARCEL
11 $74/S.F.
SAXON THEATER S.P.
PARCELIZATION
N.

It is most important to note the fact that the parcels each cut a north-south band across the site. This is the result of a very deliberate effort on the part of the BRA to package the high cost land along the Boylston Street frontage of the site with the lower cost land along Stuart Street in each of the parcels. [Note average land cost per square foot of land on the map.]

The development alternatives then result by excluding certain parcels from redevelopment. The six million square foot alternative (square footages include both redeveloped space and space on parcels not re-developed) requires redevelopment of all parcels. The five million square foot alternative eliminates redevelopment of the Saxon Theatre Sub-parcel. The four million square foot alternative additionally eliminates redevelopment of the Boylston Street Sub-parcel of the Statler Hilton parcel. To get to the three and a half million square foot alternative, another Boylston Street Sub-parcel is eliminated from re-development. The three million square foot alternative is generated by reducing the building heights on the same land as comprised the three and a half million foot alternative. The two million square foot alternative (which has been called the "no-build" program), requires development on only now vacant sites.

In addition, the BRA set out other physical design objectives. Each of the parcels was to have only one high-rise tower. In order to get the full six million square feet, that alternative required two extra towers.

Buildings with frontage on the major edge streets would be limited in height to match the height of buildings along the street elsewhere. Higher portions of the development would have to be set back from the front of the development in most cases. The office tower at the corner of Arlington and Boylston Streets in the large development schemes is an exception to this rule.

To encourage pedestrian movement across the site from Boylston to Stuart Streets, public open space was to be put at ground level in the middle of the Park Square and Eliot Street Garage parcels.

Mixed uses should be included in the low continuous buildings that make up the Boylston and Stuart Street frontages. The mixing of uses is viewed as essential to keeping the development lively after office hours--to keep residential, retail, and entertainment activities going. In general, two levels of retail space are to be distributed across the built portions of the site.

The parking for the development would be in low buildings along the Stuart Street (least valuable) side of the site. Some schemes involve the re-use of existing parking garages on that side of the site.

The allocation of space in the towers to different uses is held relatively constant over the different development sixe alternatives. As explained by the BRA,

> a) Park Square Parcel - hotel tower (800 rooms). All development programs to date have located a hotel tower in this parcel. Marketing analysis shows there is a strong demand for a hotel and this parcel is the most immediately available of the three parcels (primarily

due to the high proportion of cleared and City-owned land.) Also, a hotel in this parcel can compliment the adjacent Statler Hilton hotel by reinforcing the conventional market, for example.

b) Eliot Street Garage Parcel - apartment tower (600 units). The advantages of locating apartment uses on this parcel were discussed in Section I of the report of January 9th, page 23. [linking residential areas in downtown to the Common]. All the development options shown here assume one major tower of 600 units (increased to 725 units by contiguous low housing elements). One major tower, of course, conforms with the urban design objective of distribution of bulk, but this many apartment units may be difficult to market at one time. If so, either the number will have to be reduced or a more complicated distribution of apartments in several buildings considered.

c) Statler-Hilton Parcel - office tower (800,000 sq. ft.) The contiguous area of the Back Bay financial/insurance district determines the redevelopment of this parcel for office use.

d) As peripheral sub-parcels are not acquired, the building area is reduced incrementally for each successive alternative. As has been stated, with the reduction in the pressure of land cost, a lesser amount of new development is required. Development cannot be reduced simply by decreasing the number of floors or the size of a floor; however, a discrete element of development = a tower, a complete low rise element, etc., may be deleted. Deletion of distinct elements is the simplest means to visualize incremental reduction. This approach also takes into account certain minimum sizes for practical development packages, e.g., a housing tower of ten apartments per floor and 15 stories high, etc. Because of the minimum space requirements for each use, the development programs do not come out to exact multiples of a million square feet.[7]

The development alternatives as generated by the BRA are generally consistent with the urban design objectives.

8.3 Market Analysis

The prices of marketable inputs and outputs from development are primarily specified in Sections III and IV of the BRA's January 9th Report.[8] In general, the BRA tends to view the real estate market in competitive terms; it first attempts to identify the total "potential" demand for a particular real estate product, and then specifies the competitive market price for that product. In the case of Park Plaza, the BRA must abandon its conventional approach because it is clear that if the development is going to succeed it will have to achieve rents above those in the rest of the market. As indicated in the introduction, one of the fundamental rationales for the major mixed use development scheme is that such a mixed use environment would create value for each type of space that it would not have standing alone. Unfortunately, the BRA has developed little data to identify the amount of rent premium that can be supported at Park Plaza. Clearly, the objective of a comprehensive market analysis is to estimate the demand curve for project outputs, and the supply curve for project inputs. The most important attribute of such a curve is that it relates the price at which a commodity can be bought or sold. It is obvious that from its very nature Park Plaza is a development that appeals to only a limited segment of real estate product consumers.

The ability of Park Plaza to realize rents substantially above conventional projects depends directly on its competitive advantages over the alternatives. Prospective tenants may find that the location of Park Plaza is more attractive than other locations. They may find that the Park Plaza design offers more amenities not available elsewhere.

They may simply be attracted to the mixed use environment. The critical question in each case is whether the advantages of Park Plaza can be converted into a rent premium. Although the BRA has support data that identifies the market price for the conventional competitive products, it does not provide any analysis of achievable rent premiums.

On the other hand, the BRA has attempted to identify the "potential demand" for space at Park Plaza. It will be better to demonstrate the BRA's conception of potential demand by looking at how they use it than to attempt a definition.

Office Market

The BRA uses a relatively simple formula to estimate the potential demand for office space. The BRA computes potential demand as the product of the increase in downtown office employment and the square footage of office space required to accommodate each new employee. Over the next 12 years, the BRA expects an increase in downtown office employment of about 40,500 jobs. This increase is expected to be the result of expansion of the local economy. They also expect that each new employee will be accommodated with between 200 and 225 square feet of office space, generating a potential demand of almost 8.5 million square feet of new office space. It should be clear that this estimate depends on the assumption that each of the new employees is accommodated with over 200 square feet of newly constructed office space.

Consider the relevance of this estimate to the potential demand for Park Plaza office space. (Let us assume for the moment that we accept the BRA projection of increased employment.) First, substantial portion of the growth in employment over the next ten years will accrue to existing firms. To the extent that these firms can accommodate their growth in their existing location, there will be no potential demand for space at Park Plaza. Clearly, some of the growing firms will outgrow their space and have to move, but others may have planned ahead at the time of their last move to avoid having to move again. There has been a termendous degree of activity in the Boston office market over the last ten years. Many of the City's most dynamic and rapidly growing firms have relocated in new Class A office space in that period. To the extent that these firms have anticipated their growth over the next ten years, increases in downtown employment will not be translated into potential demand for new downtown office space.

To put this in historical perspective, the city of Boston experienced a period of almost 30 years with virtually no office development activity downtown. Many business firms found their downtown space to be adequate, and managed to accommodate their internal growth within the existing supply. After this long period with no development, there has been a period representing the most rapid pace of development, in the city's history. As a result, almost two-thirds of all downtown office space is now either newly developed Class A space or redeveloped Class B space. What is suggested here is that many of the firms that have relocated into this space may be content for the next thirty years.

Also consider the growth in employment that represents creation of new firms, or that represents growth to firms engaged in those office activities that cannot pay Class A space rents. Clearly, very little of this growth in employment will be translated into potential demand for new space at Park Plaza.

On the other hand, there may be a number of older and successful firms that are still in Class B and C space who will choose in the near future to move up to Class A space. These firms may choose to make the move even if they have no growth in employment. There may also be some businessmen who would move their firm to Park Plaza just for the convenience of the location, or because they don't like to walk outside on the way to work. Clearly, demand from these groups will not be reflected in the BRA potential demand analysis that considers only growth in employment.

The BRA has failed to translate underlying economic trends into potential demand for Park Plaza office space. The potential demand that they claim exists does not reflect the space needs or rent paying capacity of large segments of the space consuming market.

Housing Market

The BRA estimated that potential demand for downtown housing will be between 12,000 and 23,000 units over the next ten years. The derivation of these numbers does not appear in the January 9th BRA report, but it does appear in the BRA working paper of 6/74, "Housing in Boston; Background Analysis and Program Directions."[9] The underlying assumption of the BRA estimate is that demand for downtown housing will grow in direct proportion to the growth in downtown office employment. The BRA estimated that downtown office employment will grow at about 6,000 jobs a year, and that potential demand for downtown housing will grow at 20 to 40 percent of that rate, or between 1,200 and 2,400 units per year. Also implicit in this relationship is the assumption that demand for downtown housing from those who do not work in the Central Business District (CBD) will grow directly in proportion to demand for such housing from CBD workers.

This analysis suffers from the same difficulties as does the office space demand study. Essentially, there is no defense of the proposition that an increase in general level of downtown office employment will translate into demand for the highest priced housing in the city. Most downtown office workers cannot come near to affording the Park Plaza housing at the currently anticipated rents. Of the projected annual increase in downtown office employees, only a small percentage could even choose to move to Park Plaza. Again, the fundamental flaw is the assumption that the projected growth in employment is the actual source of the demand. Many of the prospective tenants for Park Plaza are working downtown now, and their decision to move downtown to live will be independent of the BRA downtown employment projections. The BRA analysis gives no explicit consideration to the severe income limitations on the potential market for Park Plaza housing, and as such, gives no real estimate of the size of that market.

Retail Market

The problem of the retail market analysis presented here is identical to the problem of the other market studies. The potential demand as calculated by the BRA assumes substantial growth in the real disposable (spendable) income of Boston area residents and further assumes that some portion of the increased income will be spent in the downtown area. The BRA study then assumes that new retail space will be built to enable people to spend this additional money. Specifically, the study assumes that one square foot of retail space will be built for each $130 increase in disposable income spent downtown.

Clearly, a substantial portion of the increased income will accrue to individuals who will never shop at Park Plaza, either because they cannot afford the high prices of goods to be sold, or because the site is not convenient. These people will spend their extra income at the same places that they spent whatever money they had before. Other shoppers would come to the site even if they don't have any increase in their income, just because the site is nearby, or a pleasant place to visit, or offers goods not available in other locations. The point is the same as above: the success of retail space at Park Plaza depends on people changing their shopping habits to include shopping at Park Plaza. People may have more to spend, but if there is no reason to spend it at Park Plaza, the retail development won't be successful. It is not helpful to simply _assume_ that increases in income can be converted to Park Plaza sales; that is what the market study should demonstrate.

The BRA study attempts to analyze demand in terms of the _increase_ in income, but the actual source of demand for retail space are the shopping preferences of the consumers. Analysis of the increase in income provides very little information about Park Plaza'a ability to make an impact on consumers' shopping decisions.

The projection of potential demand in each of the markets considered above depends to a great degree on underlying assumptions about the course of the national and local economies. In general, the assumptions on which the current estimates of potential demand are based all predict substantial growth in downtown employment and an increase in personal disposable income. While these assumptions may have been fair several years ago, the BRA would do well to reexamine these estimates in light of the economic events of the last year. Given the inflation in prices over the first half of this decade, it is questionable whether real disposable income will increase at all by 1980. Nor is it clear that employment will continue to grow, given the current recession and reduced population growth rates. Special attention should be given to the impact of current economic events on the projections of downtown employment, since the residential, retail, and office space potential demands are all heavily dependent on this projection.

The BRA market studies reflect an underlying attitude that downtown redevelopment in Boston will proceed over the next ten years in very much the same way that it has gone over the last ten years. This attitude warrants serious re-evaluation.

In this context, it is difficult to have a great deal of confidence in the BRA estimates of the achievable revenues from space in the project. It seems clear, though, that the BRA is skeptical of its own data. Rather than specifying expected revenues, the BRA has provided low, medium, and high estimates of revenues, expenses, and capital costs. The low revenue projections are equivalent to rents being achieved by competitive conventional developments at current prices. The high revenue projections correspond to the BRA's estimates of achievable rents in the full scale mixed use development (i.e., at six million square feet).

In an effort to verify its data, the BRA hired Economics Research Associates (ERA) to review it. In a letter dated January 23, 1975, Mr. Tom Martin of ERA stated:

> In response to your letter of January 14, 1975, E.R.A. has reviewed the financial and market analysis data prepared by the B.R.A. Presented below is a brief evaluation of this project as relates to financial and market analysis. It should be understood that our findings are based on information provided and our perceptions of financial and market conditions that exist in the Boston area and statements pertaining to future development projections are relevant to the extent that one can make projections without conducting a comprehensive cost and market analysis. We assume that information provided by the B.R.A. relates to present value and is not a projection of future conditions.
>
> FINANCIAL EVALUATION
>
> Our review of figures prepared by the B.R.A. have been compared to comparable types of construction in the Boston area. Cost and revenue calculations for the re-use study of the Boston Navy Shipyard study and conversations with knowledgeable persons associated with development in Boston have been used to support our findings.
>
> Office Development
>
> Construction costs and revenue figures appear to be basically in line with present conditions.
>
> > Presently, construction costs of $40/square foot is an average figure that is being used for new construction. Therefore, the estimates presented by the B.R.A. are not unrealistic.
> >
> > It is difficult to accurately define the reality of the "soft costs" prepared by the B.R.A., in that no back-up details are provided; their estimates appear to be realistic.
> >
> > Total development costs are in line with present conditions.

Average gross rent per square foot is equitable when considering the following rent levels for new space:

One Beacon Street - \$8.90-\$10.75/sq. ft.
60 State Street - \$11.00+/sq. ft.
Shawmut Building - \$10.25-\$11.25/sq. ft.

Present operating expenses in Boston office buildings are estimated at approximately \$2.10-\$2.20/sq. ft. (not including electric).

Real estate taxes presently appear to be realistic, but are subject to revision based on 100% property valuation guidelines and a possible 121A tax agreement. Taxes at \$2.50/sq. ft. are representative of general office building figures.

Retail and Entertainment Development

"Hard" construction costs appear to be realistic.

Once again, "soft costs" are not broken out by the B.R.A. Their total figures appear to be in conformity with industry figures.

Gross rent and operating expenses are realistic in terms of quality retail space in Boston.

The "high" estimates presented by the B.R.A. are most realistic for future near-term market conditions and do not relate accurately to present conditions.

Residential Development

For luxury high-rise housing units, "hard" construction costs of \$32-\$35 per square foot are not unrealistic (\$45,000-\$50,000 per unit based on 1,400 sq. ft.).

Average annual rental income per unit between \$6,000 and \$7,200 is realistic (\$500-\$600/month) given present market conditions.

A 3% vacancy allowance should be revised to 5% reflecting the high rents that presently would be more difficult to absorb in the market.

Operational expenses should be reviewed in greater depth. It appears that operating expenses are low (17% of adjusted gross rent) for luxury housing. Massachusetts Housing Finance Agency, for example, uses a "rule of thumb" of approximately \$1,000-\$1,150/unit (without taxes) in subsidized developments with one and two bedrooms.

Financial Assumptions Supporting Feasibility

The methodology used by the B.R.A. to calculate a rate of return for office and retail usage for Park Plaza appears to be consistent with normal investment return procedures.

A review of the method used to calculate an 8.8% return for housing warrants closer inspection. To arrive at a net revenue before debt service figure of $6,000 would mean average monthly rents in excess of $700 per month. This rent level is not consistent with recommendations presented by the housing market survey prepared for Park Plaza, present and near term market conditions in the city of Boston and might seriously affect the absorption rates of available units at Park Plaza.

Assuming that the net revenue before debt service was $5,320 as determined in the "high" calculation in Exhibit "C" (residential development), the return on equity for housing in Exhibit "D" would be only 4.8%. Clearly, the residential scenario needs to be revised, if possible, to reflect competitive rent levels and thus maximize absorption potential.

MARKET EVALUATION

The following comments relate to the market analyses prepared by the B.R.A.:

> The analysis presented by the B.R.A. relating to the housing market is not detailed enough to establish a realistic market demand and absorption. The important factor of rental ranges for the Park Plaza project should be equated with potential demand to effectively estimate absorption rates. It is our opinion that for rental ranges in excess of $700 per month, strong market demand would not be optimized.
>
> The brief methodology used by the B.R.A. to establish demand for retail space indicates that between 1,000,000 and 1,800,000 square feet of space could be absorbed given a proper mix of retail and entertainment uses.
>
> The office market in downtown Boston is greatly dependent on general economic conditions in the future. Without the backup of a complete office market survey and the general uncertainty in the near future, an

> accurate judgment is not obtainable at this time. It is our impression from our activity in the local market that the B.R.A. projections are not out of line and in fact if office space at Park Plaza is planned with a realistic assessment of prime office space absorption in the next few years, absorption of 1,100,000 sq. ft. of space at Park Plaza is within reasonable development guidelines.

The ERA report doesn't generate great confidence in the BRA data. This thesis will privisionally accept the BRA estimates, and concentrate the sensitivity analysis on the importance of the revenue projections. This sensitivity analysis will test specifically the relationship between the Residual Market Value and 1) the revenue premiums that Park Plaza can achieve, and 2) the occupancy level.

In addition, the BRA figures will be adjusted somewhat to reflect the fact that they generally represent the "all goes well" estimate of future cash flows as opposed to the expected (mean) estimate of future cash flows.

Chapter 8 - Footnotes

1. BRA (January 9, 1975).

2. BRA, Park Plaza: Defining the Alternatives, (February 4, 1975).

3. BRA, Park Plaza: Development Staging Plan, (March, 1975).

4. The BRA has prepared a listing of its reference works as of March, 1974. It has also prepared a listing of 215 documents relevant to Park Plaza.

5. Including:

    a) Gladstone Associates, Retail Opportunities, Park Plaza Site, (August, 1971).

    b) Gladstone Associates, Luxury Housing Opportunities, Park Plaza Site (July, 1971).

6. BRA (January 9, 1975), p. 8.

7. BRA (February 4, 1975), p. 7.

8. BRA (January 9, 1975), pp. 33-62.

CHAPTER 9

SPECIFICATION OF FINANCIAL AND FEDERAL TAX PROGRAM

This section specifies the components of the Financial and Tax Programs. This information falls into three groups: the set of expected returns and rates of inflation, the determinants of the amount and term of private debt, and the determinants of the Federal Tax claims. Again, the focus of this thesis is not the collection of the optimal data, but much of this information can be specified adequately for our purposes by reference to similar financial products. The structure of private debt will follow that put forward by the BRA. The determinants of the federal tax program are primarily specified by the tax code.

As a result of the assumptions made in Sections 4 and 5, the following rates must be specified:

k = the expected return on after federal tax cash flows of the unleveraged project.

i_c = the expected return on short term market debt.

i_p = the expected return on long term market debt.

i_m = the expected return on general obligation long term municipal bonds.

z_r = the expected growth rate of rental revenues.

z_e = the expected growth rate of expenses, or the expected rate of inflation (long term).

Before specifying these rates as they will be used in this analysis, a review of the previous work indicates the relative structure between the rates. From Section 4, we know that the expected return on the equity of the unleveraged project is higher than the expected return on market debt. Since the municipal bond rate reflects the priority claims on local real estate assets, it is lower than the expected return on "risky" debt. The long term municipal bond rate would be expected to exceed the expected rate of inflation. Rental revenues would be expected to grow more slowly (if at all) than prices in general, reflecting the actual economic depreciation of the project as it gets older and more outdated. Therefore, it would be expected that

$$k > i_c, i_p > i_m > z_e > z_r$$

Recent offerings have been placed in the municipal bond market with yields on long term portions ranging between 6% and 7% tax free.[1] The BRA has used 6% as the long term projected municipal bond rate in its work.[2] Based on this long term tax free riskless rate, it will be assumed that the expected rate of inflation is 3%, i.e., that the real riskless return is expected to be 3% in the long run. It will also be assumed that rental revenues grow at only 2%, which is roughly equivalent to assuming that the real rent will be about 60% of what it is now at the end of the project's life.

The BRA has indicated that its conversations with members of the financial community have shown that long term private debt would expect a return of between 9% and 9.5% on a project of this type, assuming that debt payments represented about 80% of net cash flow.[3]

The term of this debt would be between 30 and 35 years. Under the current term structure (with prime rate at 7%) short term rates are similar to long rates.

It is difficult to specify an expected return on the unleveraged equity because rates quoted in the market are generally based on the expected return on the leveraged equity. It is not unusual to find expected returns on leveraged equity of 15% to 20% after tax on speculative real estate.[4] Using a simple weighted cost of capital formula, an expected return of 9.5% on debt and an expected return on equity of 20%, and a ratio of cash to debt to cash to equity of 3 to 1, then the overall return would be 12%. Assuming an expected return on the market of 9% and a riskless rate of 6%, a market sensitivity of 2 would result in an expected return of 12% according to the Capital Asset Pricing Model, which is consistent with observed beta's of companies in real estate based businesses (roughly).[5]

It will be assumed here that short term debt is refinanced at the point when the component achieves an occupancy level of 50%. That implies that

$$t^* = (t' - t'')/2.$$

It will be assumed that the marginal tax rate of the equity holders is 50% on ordinary income. Tax preferences will be ignored.

Depreciable lives and allowed acceleration are specified in the first Appendix.

Chapter 9 - Footnotes

1. Wall Street Journal, (June 16, 1975), "Tax Exempts."
2. Ganz, Menconeri, et al., (1973).
3. BRA (January 9, 1975), p. 44.
4. Andre Schwartz, Lehman Brothers
5. Value Line.

CHAPTER 10

SPECIFICATION OF LOCAL TAX PROGRAM

In the summary of the model in Chapter 7, it was shown that the RMV is a function of the specific form of claims used by local government to recover the residual value. Restating Eq. (10) from that chapter,

$$(1)\qquad RMV = NMV + \overline{T}[R'][g_e][F(RR) + F(CR) - F(IP)] - \overline{U}[A][g_e][F(DP)]$$

While Eq. (1) indicates that RMV is an increasing function of the local tax rate, $\overline{T}$, and a decreasing function of the level of capital contributions, $\overline{U}$, feasible combinations of $\overline{U}$ and $\overline{T}$ are determined by the private feasibility constraint. In order to maintain private feasibility,

$$(2)\qquad NMV = \overline{T}[R'][[F(RR) + F(CR)](1-g_e) + F(IP)g_e] - \overline{U}[(L)F(LA) + (A-L)F(CX) - (A)F(DP)g_e]$$

Since both sets of coefficients are positive, an increase in the tax rate requires an increase in public capital contributions.[1] This result is not surprising: as more cash flow is diverted to the local government, less is available to support return on private capital, which must be replaced by public capital. A closer examination of Eq. (2) indicates that increasing the tax rate creates reduced burden to the extent that federal taxes are reduced by deduction of the tax payments. On the other hand, increasing the use of public financing reduces the amount of private debt that can be supported by project cash flow, and therefore reduces the tax deductions for interest. The required increase in public capital contributions also decreases the depreciable basis of private contributions, and resulting tax savings.

We will assume here that the local government determines its program of claims so as to maximize the Residual Market Value. We will further assume that there are political constraints on the local tax program.

Since RMV is a linear function of both $\overline{U}$ and $\overline{T}$, RMV is maximized by combining Eq. (1) and Eq. (2) in terms of either $\overline{U}$ or $\overline{T}$, and determining the sign of the coefficient relating that program variable to RMV. RMV is maximized by increasing variables with positive coefficient to the point of political constraint (or non-negativity constraint inherent in the model itself.)

Combining Eq. (1) and Eq. (2) to eliminate $\overline{U}$, the coefficient on $\overline{T}$ in the function for RMV is

$$(3) \qquad [R'][g_e][F(RR) + F(CR) - F(IP)] - \frac{[A][g_e][F(DP)][R'][[F(RR)+F(CR)](1-g_e)+F(IP)g_e]}{(L)F(LA) + (A-L)F(CX) - (A)F(DP)g_e}$$

Removing the strictly positive terms, setting the federal tax rate at 50%, and reorganizing, the coefficient becomes

$$(4) \qquad 1 - \frac{F(IP)}{F(RR) + F(CR)} - \frac{(A)F(DP)}{(L)F(LA) + (A-L)F(CX)}$$

The first term represents the ratio of the present value of interest payments supportable by a dollar of rental income at substantial occupancy to the present value of rental income over the life of the project per dollar of rental income at substantial occupancy. The second term represents the ratio of the present value of depreciation (of all capital costs) to the present value of all capital expenditures. The negative sign on the first term indicates that the increasing uses of public finance (increasing $\overline{U}$ and $\overline{T}$) reduces the tax savings from the use of private debt, but also increases the tax savings from deduction of local taxes. The second term reflects the lost tax savings as increasing use of public capital reduces the depreciable basis of private capital, but reduces the private capital required.

The actual sign of the coefficient turns out to depend on the type of space being considered. Since all uses are financed on similar long term basis, with debt service consuming the same portion of cash flow, the first term is relatively constant for all uses at 72%. The second term, though, depends more heavily on the type of space. Residential space is depreciable on a 200% declining balance basis while other space must be depreciated on a 150% declining balance basis. The loss of depreciable basis is therefore more costly in the case of residential space. The second term takes on values between 23% and 25% for non-residential space, and between 30% and 33% for residential space.

The result is that the sign of the coefficient on $\overline{T}$ is positive for non-residential space and negative for residential space. There are two implications. First, RMV is maximized by increasing the use of public financing of non-residential space and decreasing the use of public financing of residential space. Second, in either case, the increase in RMV will not be substantial.

The local government tax rate will be set at the maximum political limit for non-residential space and at the minimum for residential space. The BRA has specified a rate of 23% as the maximum to be applied to Park Plaza, while Chapter 121A sets 10% as the minimum.[2] The rate applied to hotel income will be reduced to 12%, reflecting the net income after hotel service expenses.

Chapter 10 - Footnotes

1. The coefficient on $\bar{T}$ is clearly positive as all F( )'s are positive and $0 < g_e < 1$. The coefficient on $\bar{U}$ represents the difference between the present value of capital expenditure and the present value of depreciation deductions. Since total capital expenditure equals the total depreciation deductions, and all expenditures precede deductions, the coefficient must be positive.

2. BRA (January 9, 1975), pp. 41-43.

CHAPTER 11

SUMMARY OF RESULTS

Based on the work presented in Appendix C, the following summary results can be presented:

Alternative	RMV Parcels Redeveloped	RMV Parcels not Redeveloped
SIX MILLION	$ 12,009,000	-
FIVE MILLION	16,830,000	$ 2,335,000
FOUR MILLION	11,006,000	10,325,000
THREE MILLION PLUS	11,903,000	15,334,000
THREE MILLION MINUS	3,588,000	15,334,000
TWO MILLION	(2,170,000)	27,283,000

RMV is maximized at the THREE MILLION PLUS level, but the TWO MILLION alternative has lower RMV as a result of the negative value of the new development. It is also clear that no development at all would show the greatest RMV.

The most resounding result from this work is that at current market prices, major redevelopment doesn't make sense, regardless of the land costs involved. Residential development is the most striking example. In all cases, independent of the land costs absorbed, the residential components of the development alternatives has negative Net Market Value. Simply, new, privately financed, residential development has not been feasible for the last decade. The infeasibility of residential development has controlled and dominated the analysis in many respects. The larger development alternatives become less valuable as more residential space is added. Since residential development is the marginal use included in the project as the scope expands, the larger alternatives have a heavier burden to carry.

A sensible re-orientation of development alternatives would reduce the proportion of the low value uses (residential and parking) and replace them with the higher value uses (hotel, retail, and office). It is certainly clear that the RMV responds much more directly to changes in the use mix than to changes in development density or scope. In no case does any use have to absorb more than $12 in land acquisition costs. In many cases, residential space has a negative RMV of about $12 per square foot. Eliminating one square foot of residential space can therfore impact on RMV more heavily than reducing the land cost on any component to zero.

From the TWO MILLION alternative, the average RMV of parcels not redeveloped is about $ 35 per square foot of existing building. From the SIX MILLION alternative, the RMV of office and retail space is about $5 (depending on land cost) per square foot of new construction. It is therefore necessary to replace each square foot of existing building with about seven times as much new construction to maintain the same level of RMV. The hotel development only requires doubling the amount of space on the site. This upgrading of the density is not at all unreasonable given the amount of vacant land now in the project area, and the low height of the currently existing buildings.

While the alternatives generated by the BRA may warrant the low RMV because of the other non-marketable benefits, it is clear that alternatives producing greater RMV per square foot of development could be constructed. The focusing of development on the parcels most underutilized, and using the more valuable re-uses could clearly produce a redevelopment scheme that increases RMV of all development on site.

Present Value of a Single Payment

$$PW_{i,t} = 1/(1+i)^t$$

Present Value of Stream (Level) Payments

$$RW_{i,t} = \sum_{x=1}^{t} \frac{1}{(1+i)*}$$

$$\text{Given: } \sum_{x=1}^{t} k^x = \frac{k^t - 1}{k - 1}$$

$$= \frac{1 - \frac{1}{(1+i)^t}}{i}$$

Future Value of Stream (Level) Payments

$$SW_{i,t} = \sum_{x=0}^{t-1} (1+i)^x$$

$$= \frac{(1+i)^t - 1}{i}$$

Present Value of Linear Increasing Stream

$$QW_{i,t} = \sum_{x=1}^{t} \frac{x}{(1+i)^x}$$

$$\text{Given: } \sum_{x=1}^{t} x(k)^x = \frac{k^{x+1}(xk-x-1)+k}{(k-1)^2}$$

$$= \frac{(1+i)^{t+1} - (1+i+it)}{i^2(1+i)^t}$$

Construction Loan

Monthly Advance

$$\bar{m}A_t = \frac{\bar{m}(A-L)}{t^d - t^c}$$

Monthly Interest Accrued

$$I_t = i_c \sum_{x=1}^{t} \bar{m}A_x (1+i_c)^{t-x}$$

For constant $A_x = \dfrac{A-L}{t^d - t^c}$

$$= i_c \bar{m} \left[\frac{A-L}{t^d - t^c}\right] \sum_{x=1}^{t} (1+i_c)^{t-x}$$

$$= \bar{m} \left[\frac{A-L}{t^d - t^c}\right] \left[(1+i_c)^{t-t^c} - 1\right]$$

Present Value of Construction Interest

$$PV[I_t] = \bar{m} \left[\frac{A-L}{t^d - t^c}\right] \sum_{t=t^c}^{t^d} \frac{(1+i_c)^{t-t^c} - 1}{(1+i)^t}$$

$$= x \left[\frac{1}{(1+i)^{t^c}}\right] \left[\sum \left(\frac{1+i_c}{1+i}\right)^{t-t^c} - \sum \frac{1}{(1+i)^{t-t^c}}\right]$$

$$= \bar{m} \left[\frac{A-L}{t^d - t^c}\right] PW_{i,t^c} \left[RW_{i_{ci}, t^d - t^c}\right]$$

$$i_{ci} = (i - i_c)/(1+i_c)$$

Permanent Loan

Constant Payment

$$K = M/RW_{i_p,n}$$

Principal Payment

$$P_1 = K - i_p M \qquad = M\left[\frac{1}{RW_{i_p,n}} - i_p\right]$$

$$P_2 = K - i_p(M-P_1) = (1+i)M\left[\frac{1}{RW_{i_p,n}} - i_p\right]$$

$$P_t = (1+i)^{t-1}M\left[\frac{1}{RW_{i_p,n}} - i_p\right]$$

Interest Payment

$$I_t = K - P_t$$

Outstanding Balance

$$M_t = M[1-[SW_{i_p,t}]/[SW_{i_p,n}]$$

Present Value of Interest

$$PV[I_t] = \sum_{x=1}^{t} \frac{K - M(1/RW_{i_p},n-i_p)(1+i_p)^{x-1}}{(1+i)^x}$$

$$= \sum \frac{K}{(1+i)^x} - \sum \frac{M(1/RW_{i_p,n}-i_p)(1+i_p)^{x-1}}{(1+i)^x}$$

$$= K\sum\frac{1}{(1+i)^x} - M\,\frac{1/RW_{i_p,n}-i_p}{1+i}\sum\left(\frac{1+i_p}{1+i}\right)^t$$

$$= K[RW_{i,t}] - M\,\frac{1/RW_{i_p,n}-i_p}{1+i}\,[RW_{i_{pi},t}]$$

$$i_p i = \frac{i-i_p}{1+i_p}$$

$$= M \left[\frac{RW_{i,t}}{RW_{i_p,n}} - \frac{1}{1+i_p} \frac{RW_{i_p i,t}}{SW_{i_p,n}} \right]$$

Depreciation

Period's Deduction - Declining Balance

$$D_1 = q/N \ (B)$$

$$D_2 = q/N \ (B-D_1) = (B)q/N(1-q/N)$$

$$D_t = B(q/N)(1-q/N)^{t-1}$$

Depreciable Basis

$$B_t = B - \sum_{x=1}^{t} D_x$$

$$= B - \sum B(q/N)(1-qN)^{t-1}$$

$$= B[1 - q/N]^t$$

Present Value of Depreciation

$$PV[D_t] = \sum_{x=1}^{t} B(q/N)(1-q/N)^{x-1}/(1+i)^x$$

$$= \frac{B(q/N)}{(1-q/N)} \sum \frac{1}{(1+Q)^x}$$

$$Q = \frac{i+q/N}{1-q/N}$$

$$= \frac{B(q/N)}{(1-q/N)} \ RW_{Q,t}$$

Review of Internal Revenue Code
Sections 167 and 1250 -
Depreciation and Recapture Rules

Use	q	N
Retail	1.5	45
Office	1.5	45
Residential	2.0	40
Hotel	1.5	45
Parking	1.5	45

Use	Applicable Percentage
Retail	100
Office	100
Hotel	100
Parking	100
Residential	100 - (t-100)

t = Useful life in months

APPENDIX B

ARCHITECTURAL PROGRAM DATA

This Appendix specifies the data comprising the architectural program of the six development alternatives. First, current market prices are specified. These prices have been adjusted to reflect expected changes in the price level in the architectural program of each of the alternatives. For each alternative, a schematic site plan is presented. This plan indicates the probable location of each of the development components. Buildings shown as solid are high-rise towers. Diagonally striped buildings are mid-rise, while lightly dotted buildings are low-rise. Buildings to remain are uncolored.

The aggregate development program for each alternative is then presented. This program indicates the amount of each type of building use to be developed or maintained in each phase of development. All such numbers represent gross square feet.

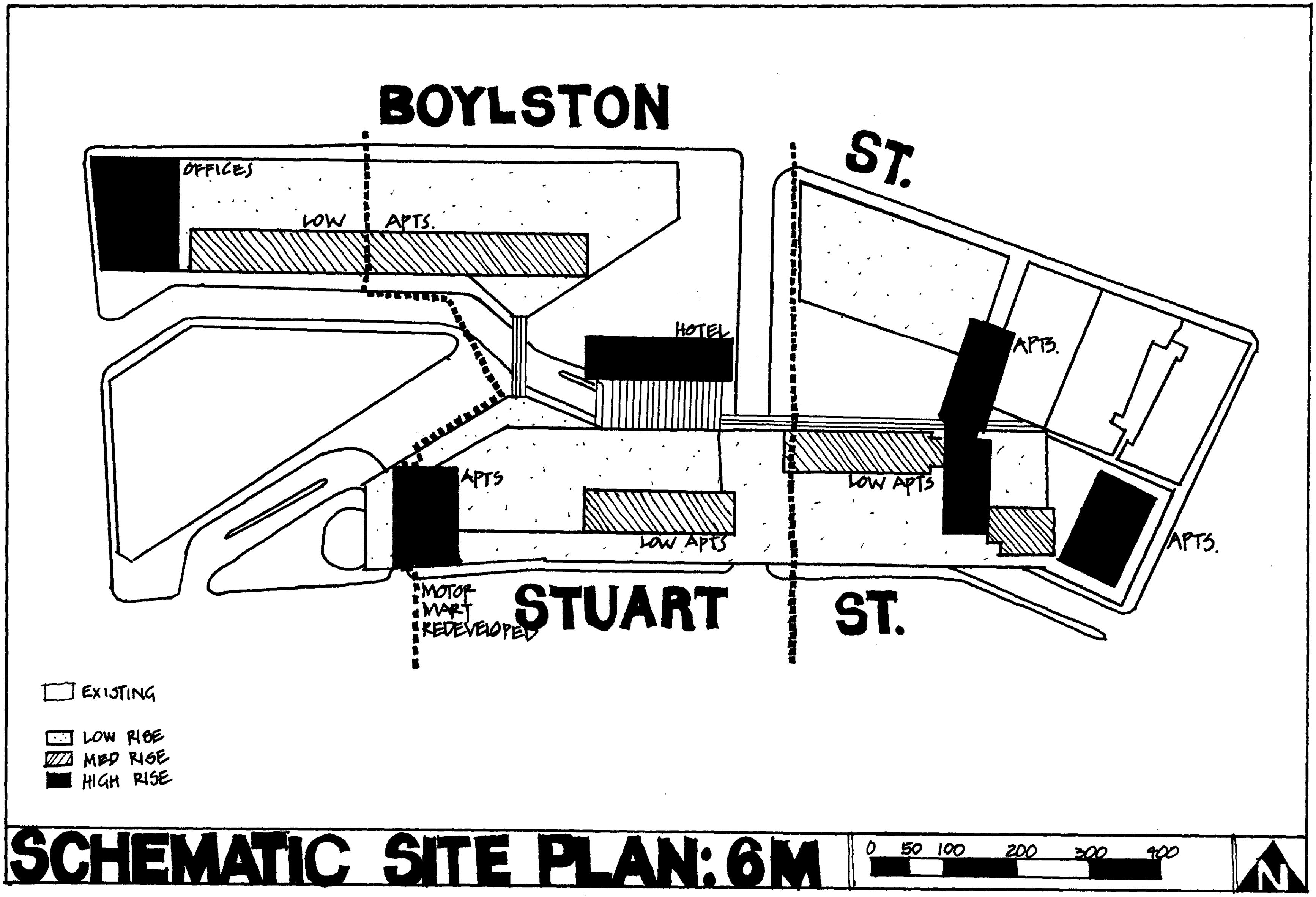
The architectural program specification gives the basic market prices and devèopment schedule. It also disaggregates the development by type of use on each parcel. All times (t's) are in months. All prices are on annual basis per gross square foot of new development.

BASE MARKET PRICES AT t = 0 (1976)

	OFFICE	RETAIL	RESIDENTIAL	HOTEL	PARKING
Construction Cost per Gross Sq. Ft. (A)					
	\$ 44.00	\$ 39.00	\$ 38.00	\$ 60.00	\$ 15.00
Construction Expense per Gross Sq. Ft. (E°·t')					
	\$ 1.00	\$ 1.00	\$ 2.00	\$ 5.00	\$ 1.00
Annual Rent per Net Rentable Sq. Ft.					
	\$ 11.00	\$ 10.00	\$ 5.60	\$ 37.50	-
Building Efficiency (Net Rentable Sq. Ft./Gross Sq. Ft.)					
	85%	85%	85%	80%	
Annual Rent per Gross Sq. Ft.					
	\$ 9.35	\$ 8.50	\$ 4.75	\$ 30.00	
Vacancy Rate					
	5%	5%	5%	40%	
Expected Rent at Substantial Occupancy (R')					
	\$ 8.88	\$ 8.08	\$ 4.50	\$ 18.00	\$ 2.50
Operating Expense per Gross Sq. Ft. (E')					
	\$ 2.25	\$ 2.00	\$ 1.00	\$ 8.00	\$ .50

LAND ACQUISITION COSTS

PARCEL	ACQUISITION PRICE
(1)	$ 2,561,510
(2)	$ 2,561,510
(4)	$ 5,438,500
(5)	$ 2,289,544
(6)	$ 4,306,700
(7)	$ 1,297,497
(8)	$ 1,894,250
(9,10)	$ 4,230,737
(11)	$ 1,497,056
Total	$ 26,077,364



SCHEMATIC SITE PLAN: 6M

SIX MILLION - DEVELOPMENT PROGRAM

PHASE	RETAIL	OFFICE	RESIDENTIAL	HOTEL	PARKING
One	160000	404500	777000	581000	566000
Two	69000	945500	110000	-	-
Three	122000	473500	1078000	-	457500
Total	351000	1823500	1965000	581000	1023500

Total New Development -- 5,744,000 square feet

Total Retention -- 0 square feet

SIX MILLION - ARCHITECTURAL PROGRAM SPECIFICATION

PHASE ONE

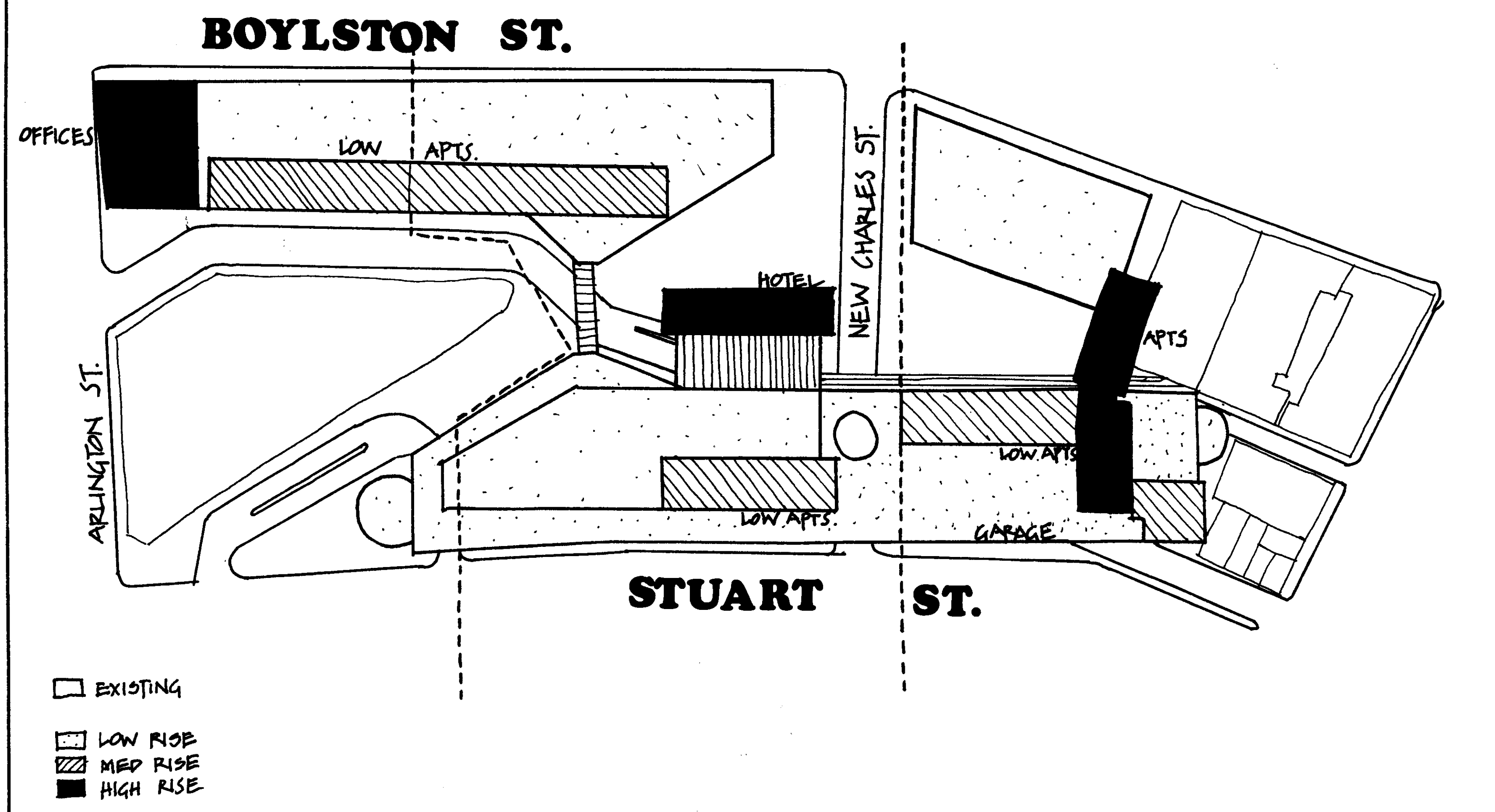
VARIABLE	RETAIL	OFFICE	RESIDENTIAL	HOTEL	PARKING
t^L	12	12	12	12	12
t^c	24	12	24	6	12
t^d	36	36	42	30	30
t"	36	36	42	30	30
t'	60	60	66	54	60
A-L	42.00	46.75	41.25	62.75	15.80
R'	9.39	10.32	5.31	20.60	2.90
E'	2.32	2.61	1.18	9.15	.58
E"	1.74	1.96	.88	4.58	.52
E°	.21	.21	.43	1.08	.21
L					
(4)	8.58	8.58	8.58		
(5)	2.46		2.46	2.46	2.46
(6)	4.66	4.66	4.66		4.66
Gross Sq. Ft.					
(4)	87000	352500	195000	-	-
(5)	31000	-	130000	581000	187500
(6)	42000	52000	452000	-	378500

SIX MILLION - PHASE TWO

VARIABLE	RETAIL	OFFICE	RESIDENTIAL
t^L	48	48	48
t^c	60	48	60
t^d	72	84	72
t''	72	72	72
t'	96	108	96
A-L	46.00	51.85	44.80
R'	10.27	11.63	5.72
E'	2.54	2.95	1.27
E"	1.91	2.21	.95
E°	.23	.23	.47
L			
(1)	3.10	3.10	
(2)	8.58	8.58	8.58
Gross Sq. Ft.			
(1)	23000	803000	
(2)	46000	142500	110000

SIX MILLION - PHASE THREE

VARIABLE	RETAIL	OFFICE	RESIDENTIAL	PARKING
t^L	84	84	84	84
t^c	108	96	84	84
t^d	120	120	120	108
t''	120	114	108	108
t'	144	144	144	144
A-L	51.85	57.60	49.00	19.05
R'	11.58	12.72	6.45	3.58
E'	2.87	3.22	1.43	.72
E"	2.15	2.42	1.07	.64
E°	.22	.22	.44	.22
L (7)	7.59	7.59		
(8)	7.41	7.41		
(9,10)	3.30	3.30	3.30	3.30
(11)	3.53	3.53	3.53	3.53
Gross Sq. Ft.				
(7)	18000	153000		
(8)	35000	220500		
(9,10)	38000	70000	850000	322500
(11)	31000	30000	228000	135000



SCHEMATIC SITE PLAN: 5M

FIVE MILLION - DEVELOPMENT PROGRAM

PHASE	RETAIL	OFFICE	RESIDENTIAL	HOTEL	PARKING
One	160000	456500	325000	581000	467000
Two	69000	945500	110000	-	-
Three	91000	513500	850000	-	315000
Total	320000	1915500	1285000	581000	782000

Total New Development -- 4,883,500 square feet

Retention		
(11)	33169	11056

Total Retention -- 44,225 square feet

Total Development -- 4,927,725 square feet

FIVE MILLION - ARCHITECTURAL PROGRAM SPECIFICATION

PHASE ONE

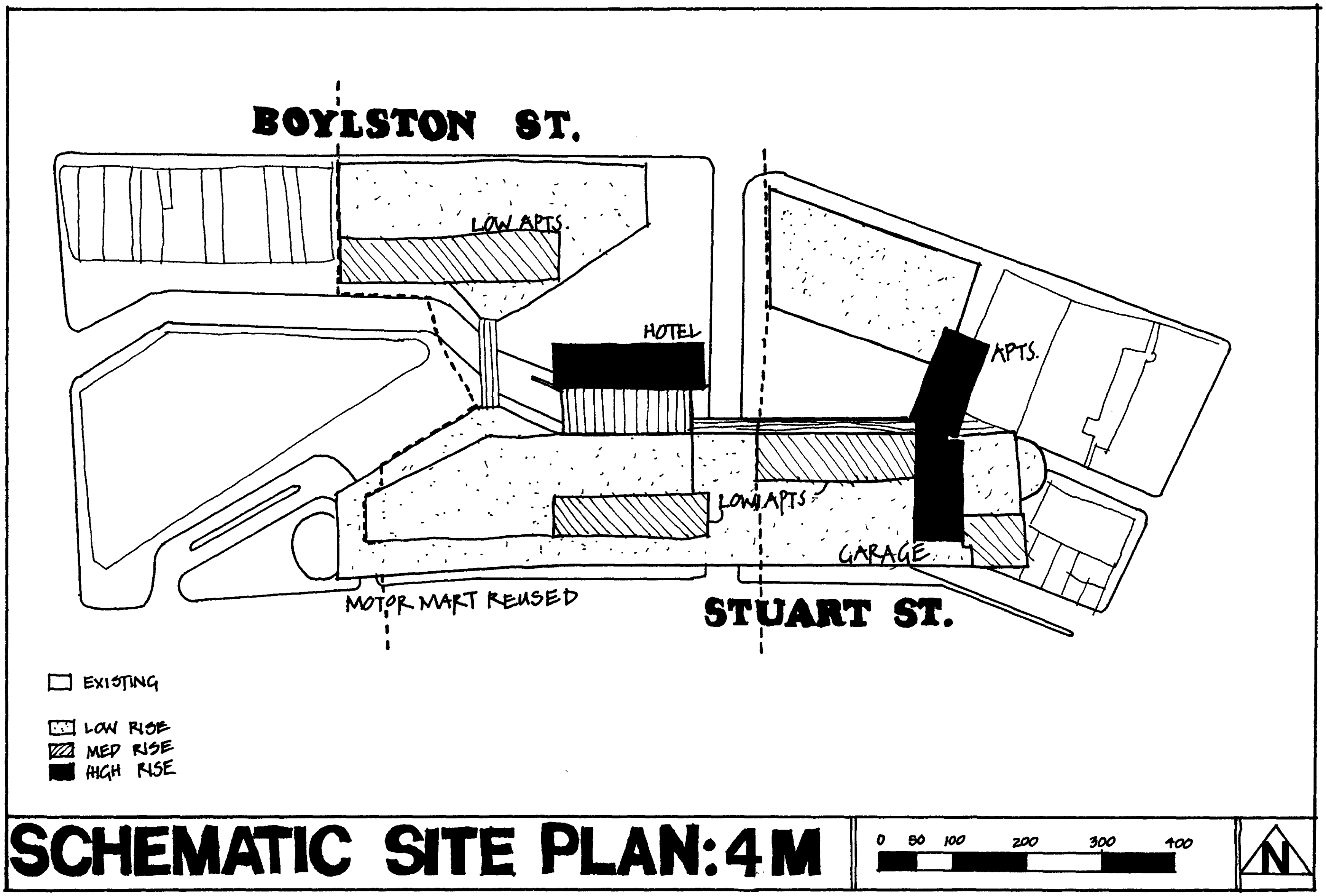
VARIABLE	RETAIL	OFFICE	RESIDENTIAL	HOTEL	PARKING
t^L	12	12	12	12	12
t^c	24	12	24	6	12
t^d	36	36	42	30	30
t''	36	36	42	30	30
t'	60	60	66	54	60
A-L (6)	27.72	30.86			10.43
A-L (4,5)	42.00	46.75	41.25	62.75	15.80
R'	9.39	10.32	5.31	20.60	2.90
E'	2.32	2.61	1.18	9.15	.58
E"	1.74	1.96	.88	4.58	.52
E°	.21	.21	.43	1.08	.21
L					
(4)	8.58	8.58	8.58		
(5)	2.57		2.57	2.57	2.57
(6)	7.00	7.00			7.00
Gross Sq. Ft.					
(4)	87000	352500	195000		
(5)	31000		130000	581000	150000
(6)	42000	104000			317000

FIVE MILLION - PHASE TWO

VARIABLE	RETAIL	OFFICE	RESIDENTIAL
t^L	48	48	48
t^c	60	48	60
t^d	72	84	72
t"	72	72	72
t'	96	108	96
A-L	46.00	51.85	44.80
R'	10.27	11.63	5.72
E'	2.54	2.95	1.27
E"	1.91	2.21	.95
E°	.23	.23	.47
L			
(1)	3.10	3.10	
(2)	8.58	8.58	8.58
Gross Sq. Ft.			
(1)	23000	803000	
(2)	46000	142500	110000

FIVE MILLION - PHASE THREE

VARIABLE	RETAIL	OFFICE	RESIDENTIAL	PARKING
t^L	84	84	84	84
t^c	108	96	84	84
t^d	120	120	120	108
t''	120	114	108	108
t'	144	144	144	144
A-L	51.85	57.60	49.00	19.05
R'	11.58	12.72	6.45	3.58
E'	2.87	3.22	1.43	.72
E"	2.15	2.42	1.07	.64
E°	.22	.22	.44	.22
L				
(7)	7.59	7.59		
(8)	7.41	7.41		
(9,10)	3.15	3.15	3.15	3.15
Gross Sq. Ft.				
(7)	18000	153000		
(8)	35000	220500		
(9,10)	38000	140000	850000	315000



SCHEMATIC SITE PLAN: 4M

FOUR MILLION - DEVELOPMENT PROGRAM

PHASE	RETAIL	OFFICE	RESIDENTIAL	HOTEL	PARKING
One	160000	506000	325000	581000	415500
Two	92000	583500	850000	-	241000
Total	252000	1089500	1175000	581000	656500

Total New Development -- 3,754,000 square feet

Retention (11), (1), (2)

63,175 199527

Total Retention -- 262,702 square feet

Total Development -- 4,016,702 square feet

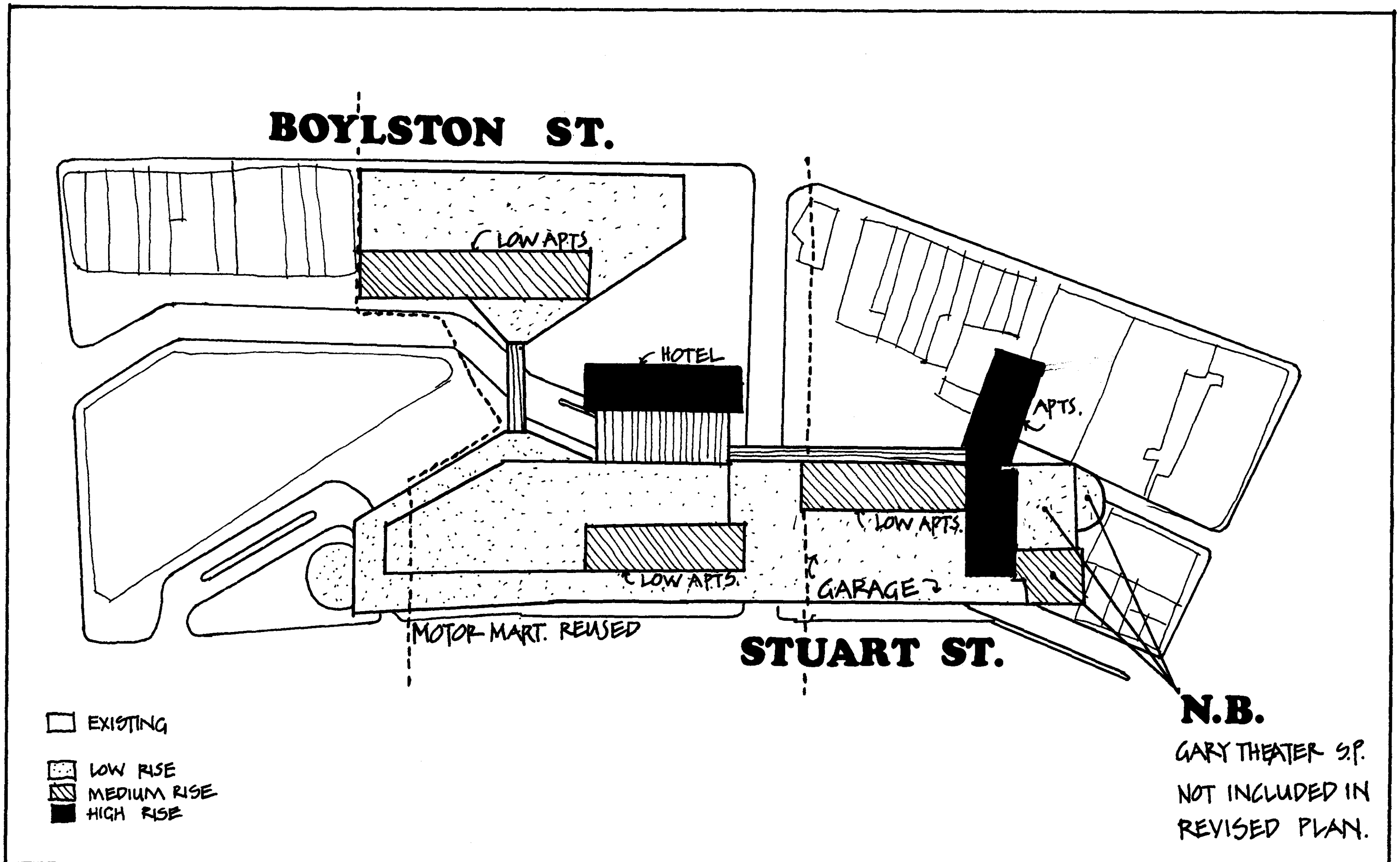
FOUR MILLION - ARCHITECTURAL PROGRAM SPECIFICATION

PHASE ONE

VARIABLE	RETAIL	OFFICE	RESIDENTIAL	HOTEL	PARKING
t^L	12	12	12	12	12
t^c	24	12	24	6	12
t^d	36	36	42	30	30
t''	36	36	42	30	30
t'	60	60	66	54	60
A-L (6)	27.72	30.86			10.43
A-L (4,5)	42.00	46.75	41.25	62.75	15.80
R'	9.39	10.32	5.31	20.60	2.90
E'	2.32	2.61	1.18	9.15	.58
E"	1.74	1.96	.88	4.58	.52
E°	.21	.21	.43	1.08	.21
L					
(4)	8.58	8.58	8.58		
(5)	2.57		2.57	2.57	2.57
(6)	6.98	6.98			6.98
Gross Sq. Ft.					
(4)	87000	352500	195000		
(5)	31000		130000	581000	150000
(6)	42000	156500			265500

FOUR MILLION - PHASE TWO

VARIABLE	RETAIL	OFFICE	RESIDENTIAL	PARKING
t^L	54	54	54	54
t^c	78	66	54	54
t^d	90	90	90	78
t''	90	84	90	78
t'	114	114	114	114
A-L	48.10	53.46	45.83	17.69
R'	10.74	11.80	5.98	3.32
E'	2.66	2.99	1.33	.66
E"	1.99	2.24	1.00	.60
E°	.25	.25	.49	.25
L				
(7)	7.59	7.59		
(8)	7.41	7.41		
(9,10)	3.15	3.15	3.15	3.15
Gross Sq. Ft.				
(7)	18000	153000		
(8)	35000	220500		
(9,10)	39000	210000	850000	241000



SCHEMATIC SITE PLAN: 3 M

THREE MILLION PLUS - DEVELOPMENT PROGRAM

PHASE	RETAIL	OFFICE	RESIDENTIAL	HOTEL	PARKING
One	160000	509000	325000	581000	415500
Two	39000	210000	850000	-	241000
Total	199000	719000	1175000	581000	656500

Total New Development -- 3,330,500 square feet

Retention (11), (1), (2), (7), (8)

	105666	317091

Total Retention -- 422,757 square feet

Total Development -- 3,753,257 square feet

THREE MILLION PLUS - ARCHITECTURAL PROGRAM SPECIFICATION

PHASE ONE

VARIABLE	RETAIL	OFFICE	RESIDENTIAL	HOTEL	PARKING
t^L	12	12	12	12	12
t^c	24	12	24	6	12
t^d	36	36	42	30	30
t''	36	36	42	30	30
t'	60	60	66	54	60
A-L (6)	27.72	30.86			10.43
A-L (4,5)	42.00	46.75	41.25	62.75	15.80
R'	9.39	10.32	5.31	20.60	2.90
E'	2.32	2.61	1.18	9.15	.58
E"	1.74	1.96	.88	4.58	.52
E°	.21	.21	.43	1.08	.21
L					
(4)	8.58	8.58	8.58		
(5)	2.57		2.57	2.57	2.57
(6)	6.98	6.98			6.98
Gross Sq. Ft.					
(4)	87000	352500	195000		
(5)	31000		130000	581000	150000
(6)	42000	156500			265500

THREE MILLION PLUS - PHASE TWO

VARIABLE	RETAIL	OFFICE	RESIDENTIAL	PARKING
t^L	54	54	54	54
t^c	78	66	54	54
t^d	90	90	90	78
t''	90	84	90	78
t'	114	114	114	114
A-L	48.10	53.46	45.83	17.69
R'	10.74	11.80	5.98	3.32
E'	2.66	2.99	1.33	.66
E"	1.99	2.24	1.00	.60
E°	.25	.25	.49	.25
L (9,10)	3.15	3.15	3.15	3.15
Gross Sq. Ft.				
	39000	210000	850000	241000

THREE MILLION MINUS - DEVELOPMENT PROGRAM

PHASE	RETAIL	OFFICE	RESIDENTIAL	HOTEL	PARKING
One	160000	367500	325000	320000	378000
Two	39000	183000	570000	-	182000
Total	199000	530500	895000	320000	560000

Total New Development -- 2,504,000 square feet

Retention (11), (1), (2), (7), (8), part of (10)

	124047	372239

Total Retention -- 496,286 square feet

Total Development -- 3,000,786 square feet

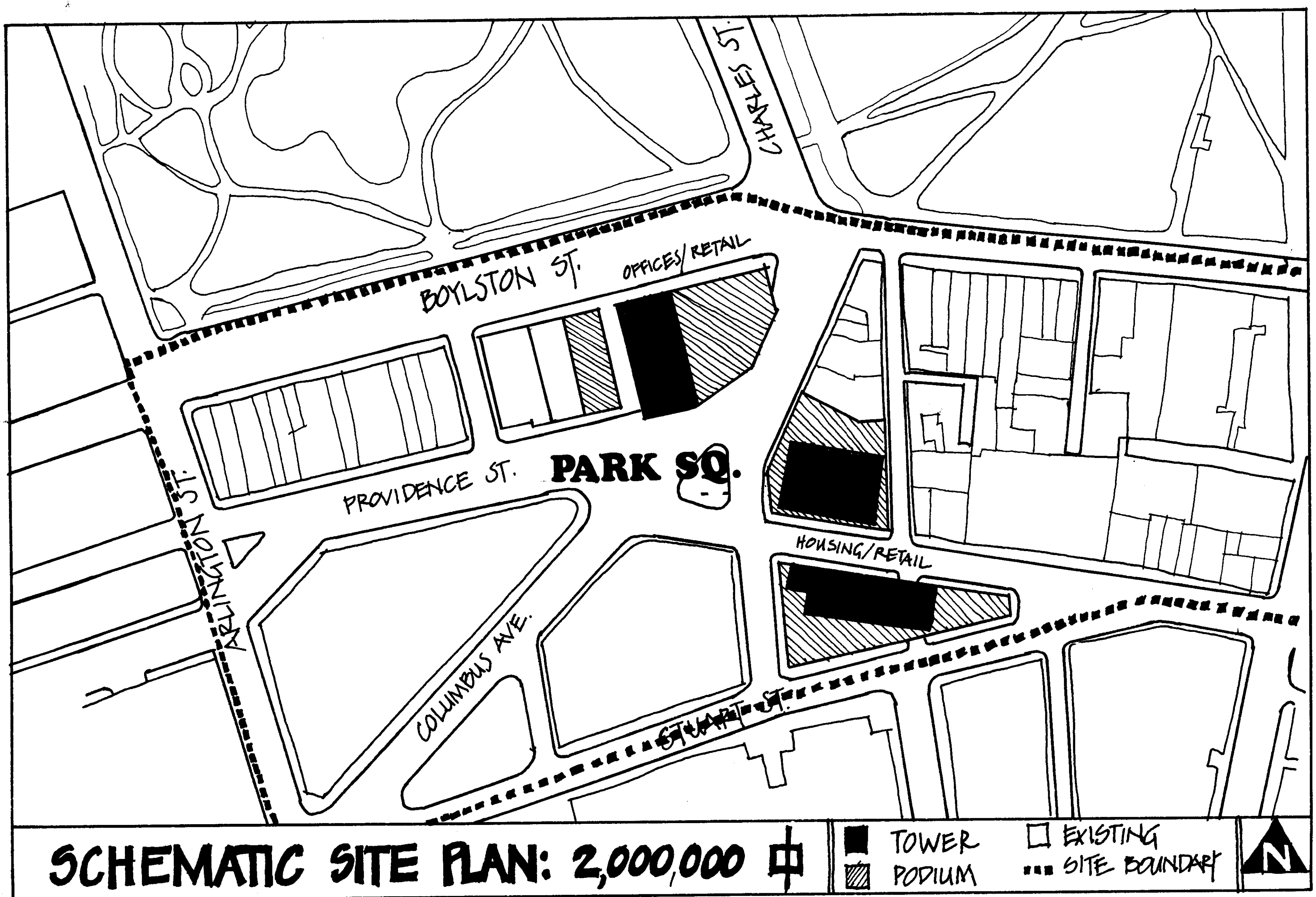
THREE MILLION MINUS - ARCHITECTURAL PROGRAM SPECIFICATION

PHASE ONE

VARIABLE	RETAIL	OFFICE	RESIDENTIAL	HOTEL	PARKING
t^L	12	12	12	12	12
t^c	24	12	24	6	12
t^d	36	37	42	30	30
t''	36	36	42	30	30
t'	60	60	66	54	60
A-L (4,5)	42.00	46.75	41.25	62.75	15.80
A-L (6)	27.72	30.86			10.43
R'	9.39	10.32	5.31	20.60	2.90
E'	2.32	2.61	1.18	9.15	.58
E"	1.74	1.96	.88	4.58	.52
E°	.21	.21	.43	1.08	.21
L					
(4)	11.03	11.03	11.03		
(5)	3.86		3.86	3.86	3.86
(6)	6.98	6.98			6.98
Gross Sq. Ft.					
(4)	87000	211000	195000		
(5)	31000		130000	320000	112500
(6)	42000	156500			265500

THREE MILLION MINUS - PHASE TWO

VARIABLE	RETAIL	OFFICE	RESIDENTIAL	PARKING
t^L	54	54	54	54
t^c	78	66	54	54
t^d	90	90	90	78
t''	90	84	90	78
t'	114	114	114	114
A-L	48.10	53.46	45.83	17.69
R'	10.74	11.80	5.98	3.32
E'	2.66	2.99	1.33	.66
E"	1.99	2.24	1.00	.60
E°	.25	.25	.49	.25
L				
(9,10)	3.11	3.11	3.11	3.11
Gross Sq. Ft.				
	39000	183000	570000	182000


CHARLES ST.
BOYLSTON ST.
OFFICES/RETAIL
PARK SQ.
PROVIDENCE ST.
ARLINGTON ST.
HOUSING/RETAIL
COLUMBUS AVE.
STUART ST.
SCHEMATIC SITE PLAN: 2,000,000
TOWER
PODIUM
EXISTING
SITE BOUNDARY
N

TWO MILLION - DEVELOPMENT PROGRAM

PHASE	RETAIL	OFFICE	RESIDENTIAL	PARKING
One	47000	351500	407500	-
Total	47000	351500	407500	-

Total New Development -- 806,000 square feet

Retention (11), (1), (2), (7), (8), (9,10), (6)

	94371	534711		560000

Total Retention -- 1,189,142 square feet

Total Development -- 1,995,142 square feet

TWO MILLION - ARCHITECTURAL PROGRAM SPECIFICATION

VARIABLE	RETAIL	OFFICE	RESIDENTIAL
t^L	12	12	12
t^c	24	12	24
t^d	36	36	42
t"	36	36	42
t'	60	60	66
A-L	42.00	46.75	41.25
R'	9.39	10.32	5.31
E'	2.32	2.61	1.18
E"	1.74	1.96	.88
E°	.21	.21	.43
L			
(4)	7.40	7.40	
(5)	5.92		5.92
Gross Sq. Ft.			
(4)	28000	351500	
(5)	19000		407500

APPENDIX C

RMV BY DEVELOPMENT COMPONENT

This section computes the RMV for each development component of the six development alternatives as specified in the body of the text. The first page provides a summary of the RMV of each component of the development alternative. Behind that is the computation of RMV from redeveloped parcels. All such computations are done in terms of dollars per gross square foot of new development. Following that is a computation of the RMV of unredeveloped parcels and the contribution of taxes prior to eminent domain taking to the RMV of redeveloped parcels.

SIX MILLION - RMV BY DEVELOPMENT COMPONENTS

COMPONENT		RMV_{new}	RMV_{old}	Gross Sq. Ft.	RMV
Phase One					
Retail	(4)	4.21	.57	87,000	415,000
	(5)	9.61	.16	31,000	303,000
	(6)	7.67	.31	42,000	335,000
Office	(4)	3.41	.57	352,500	1,403,000
	(6)	6.75	.31	52,000	367,000
Residential	(4)	(12.33)	.57	195,000	(2,293,000)
	(5)	(6.87)	.16	130,000	(872,000)
	(6)	(8.83)	.31	452,000	(3,854,000)
Hotel	(5)	17.83	.16	581,000	10,451,000
Parking	(5)	(.37)	.16	187,500	(38,000)
	(6)	(2.31)	.31	378,500	(756,000)
Phase Two					
Retail	(1)	7.05	.76	23,000	180,000
	(2)	3.67	2.11	46,000	266,000
Office	(1)	6.10	.76	803,000	5,511,000
	(2)	2.84	2.11	142,500	705,000
Residential	(2)	(8.86)	2.11	110,000	(742,000)
Phase Three					
Retail	(7)	2.28	3.11	18,000	97,000
	(8)	2.35	3.03	35,000	189,000
	(9,10)	4.03	1.35	38,000	205,000
	(11)	3.95	1.44	31,000	167,000
Office	(7)	2.94	3.11	153,000	926,000
	(8)	3.02	3.03	220,500	1,335,000
	(9,10)	4.72	1.35	70,000	425,000
	(11)	4.63	1.44	30,000	182,000

Phase Three - Con't.

COMPONENT		RMV_{NEW}	RMV_{old}	Gross Sq. Ft.	RMV
Residential	(9,10)	(4.39)	1.35	850,000	(2,582,000)
	(11)	(4.49)	1.44	228,000	(694,000)
Parking	(9,10)	(.54)	1.35	322,500	260,000
	(11)	(.64)	1.44	135,000	109,000

TOTAL RMV FROM REDEVELOPED PARCELS $ 12,009,000

SIX MILLION - PHASE ONE

	PARCEL	RETAIL	OFFICE	RESIDENTIAL	HOTEL	PARKING
$R'(.5)[F(RR)+F(CR)+F(IP)]$		49.30	54.18	26.26	114.81	15.66
$-E'(.5)[F(RR)+F(CE)+F(IP)]$		12.86	14.47	6.16	53.84	3.30
$-E^{\circ}(.5)F(DE)$		.40	.40	.86	1.87	.40
$-E''(.5)F(RE)$		.54	.54	.26	1.50	.21
$-(A-L)[F(CX)-.5F(IC)-.5F(DP)]$		25.36	29.50	22.85	42.04	10.23
$-L[F(LA)-F(FD)-.5F(DP)]$	(4)	6.69	6.69	6.55		
	(5)	1.92		1.88	1.96	1.92
	(6)	3.64	3.64	3.54		3.64
NET MARKET VALUE	(4)	3.44	2.67	(10.42)		
	(5)	8.22		(5.74)	13.60	(.41)
	(6)	6.50	5.63	(7.43)		(2.13)
$\overline{T}^{*}(R')(.5)[F(RR)+F(CR)-F(IP)]$	(4)	.76	.74	(1.91)		
	(5)	1.39		(1.12)	4.23	.04
$-\overline{U}^{*}(A)(.5)F(DP)$	(6)	1.16	1.13	(1.41)		(.18)
RESIDUAL MARKET VALUE	(4)	4.21	3.41	(12.33)		
	(5)	9.61		(6.87)	17.83	(.37)
	(6)	7.67	6.75	(8.83)		(2.31)

SIX MILLION - PHASE TWO

	PARCEL	RETAIL	OFFICE	RESIDENTIAL	HOTEL	PARKING
$R'(.5)[F(RR)+F(CR)+F(IP)]$		53.92	57.33	30.03		
$-E'(.5)[F(RR)+F(CE)+F(IP)]$		14.08	15.31	7.04		
$-E^{\circ}(.5)F(DE)$		.44	.50	.88		
$-E''(.5)F(RE)$		.59	1.00	.29		
$-(A-L)[F(CX)-.5F(IC)-.5F(DP)]$		27.77	31.10	25.73		
$-L[F(LA)-F(FD)-.5F(DP)]$	(1)	2.42	2.37			
	(2)	6.70	6.56	6.70		
NET MARKET VALUE	(1)	8.62	7.34			
	(2)	4.34	3.16	(10.61)		
$\bar{T}^{*}(R')(.5)[F(RR)+F(CR)-F(IP)]$	(1)	1.47	1.38			
$-\bar{U}^{*}(A)(.5)F(DP)$	(2)	.91	.90	(2.06)		
RESIDUAL MARKET VALUE	(1)	7.05	6.10			
	(2)	3.67	2.84	(8.86)		

SIX MILLION - PHASE THREE

	PARCEL	RETAIL	OFFICE	RESIDENTIAL	HOTEL	PARKING
$R'(.5)[F(RR)+F(CR)+F(IP)]$		52.39	60.94	31.79		17.65
$-E'(.5)[F(RR)+F(CE)+F(IP)]$		14.12	16.27	7.42		3.74
$-E°(.5)F(DE)$		.47	.47	.93		.47
$-E''(.5)F(RE)$		.59	.87	.48		.29
$-(A-L)[F(CX)-.5F(IC)-.5F(DP)]$		27.78	32.66	28.13		11.73
$-L[F(LA)-F(FD)-.5F(DP)]$	(7)	5.67	5.76			
	(8)	5.53	5.62			
	(9,10)	2.47	2.50	2.52		2.52
	(11)	2.64	2.68	2.70		2.70
NET MARKET VALUE	(7)	3.77	4.94			
	(8)	3.90	5.07			
	(9,10)	6.97	8.19	(7.70)		(1.10)
	(11)	6.80	8.01	(7.87)		(1.27)
$\bar{T}^{*}(R')(.5)[F(RR)+F(CR)-F(IP)]$	(7)	.90	1.09			
	(8)	.91	1.11			
$-\bar{U}^{*}(A)(.5)F(DP)$	(9,10)	1.30	1.49	(1.29)		(.02)
	(11)	1.28	1.47	(1.31)		(.04)
RESIDUAL MARKET VALUE	(7)	2.27	2.94			
	(8)	2.35	3.02			
	(9,10)	4.04	4.73	(4.39)		(.54)
	(11)	3.95	4.63	(4.49)		(.64)

SIX MILLION - RMV_{old}

PARCEL		L	t^L	RMV
Phase One	(4)	8.58	12	.57
	(5)	2.46	12	.16
	(6)	4.66	12	.31
Phase Two	(1)	3.10	48	.76
	(2)	8.58	48	2.11
Phase Three	(7)	7.59	84	3.11
	(8)	7.41	84	3.03
	(9,10)	3.30	84	1.35
	(11)	3.53	84	1.44

FIVE MILLION - RMV BY DEVELOPMENT COMPONENT

COMPONENT		RMV_{new}	RMV_{old}	Gross Sq. Ft.	RMV
Phase One					
Retail	(4)	4.21	.57	87,000	415,000
	(5)	9.52	.17	31,000	300,000
	(6)	15.38	.46	42,000	666,000
Office	(4)	3.31	.57	352,500	1,368,000
	(6)	16.01	.46	104,000	1,713,000
Residential	(4)	(12.33)	.57	195,000	(2,293,000)
	(5)	(6.97)	.17	130,000	(883,000)
Hotel	(5)	15.69	.17	581,000	9,217,000
Parking	(5)	(.46)	.17	150,000	(44,000)
	(6)	(.65)	.46	317,000	(60,000)
Phase Two					
Retail	(1)	7.05	.76	23,000	180,000
	(2)	3.67	2.11	46,000	266,000
Office	(1)	6.10	.76	803,000	5,511,000
	(2)	2.83	2.11	142,500	705,000
Residential	(2)	(8.86)	2.11	110,000	(742,000)
Phase Three					
Retail	(7)	2.28	3.11	18,000	97,000
	(8)	2.35	3.03	35,000	189,000
	(9,10)	4.05	1.29	38,000	203,000
Office	(7)	2.94	3.11	153,000	926,000
	(8)	3.02	3.03	220,500	1,335,000
	(9,10)	4.79	1.29	14,000	85,000

COMPONENT		RMV_{new}	RMV_{old}	Gross Sq. Ft.	RMV
Phase Three, con't.					
Residential	(9,10)	(4.32)	1.29	850,000	(2,579,000)
Parking	(9,10)	(.48)	1.29	315,000	255,000
TOTAL RMV FORM REDEVELOPED PARCELS					$ 16,830,000
<u>Parcels Not Redeveloped</u>					
	(11)	-	52.79	44,225	2,335,000
TOTAL RMV					$ 19,165,000

FIVE MILLION - PHASE ONE

	PARCEL	RETAIL	OFFICE	RESIDENTIAL	HOTEL	PARKING
R'(.5)[F(RR)+F(CR)+F(IP)]		49.30	54.18	26.26	114.81	15.66
-E'(.5)[F(RR)+F(CE)+F(IP)]		12.86	14.47	6.16	53.84	3.30
-E°(.5)F(DE)		.40	.40	.86	1.87	.40
-E"(.5)F(RE)		.54	.54	.26	1.50	.21
-(A-L)[F(CX)-.5F(IC)-.5F(DP)]	(4,5)	25.36	29.50	22.85	42.04	10.23
	(6)	16.74	19.48	22.85	42.04	7.02
-L[F(LA)-F(FD)-.5F(DP)]	(4)	6.70	6.70	6.55		
	(5)	2.01		1.96	2.05	2.01
	(6)	5.46	5.46			5.46
NET MARKET VALUE	(4)	3.44	2.57	(10.42)		
	(5)	8.14		(5.83)	13.51	(.49)
	(6)	13.30	13.83			(.67)
$\overline{T}^{*}$(R')(.5)[F(RR)+F(CR)-F(IP)]	(4)	.76	.74	(1.91)		
	(5)	1.38		(1.13)	2.18	.03
-$\overline{U}^{*}$(A)(.5)F(DP)	(6)	2.09	2.18			.02
RESIDUAL MARKET VALUE	(4)	4.21	3.31	(12.33)		
	(5)	9.52		(6.97)	15.69	(.46)
	(6)	15.38	16.01			(.65)

FIVE MILLION - PHASE TWO

	PARCEL	RETAIL	OFFICE	RESIDENTIAL	HOTEL	PARKING
R'(.5)[F(RR)+F(CR)+F(IP)]		53.92	57.33	30.03		
-E'(.5)[F(RR)+F(CE)+F(IP)]		14.08	15.31	7.04		
-E°(.5)F(DE)		.44	.50	.88		
-E"(.5)F(RE)		.59	1.00	.29		
-(A-L)[F(CX)-.5F(IC)-.5F(DP)]		27.77	31.10	25.73		
-L[F(LA)-F(FD)-.5F(DP)]	(1)	2.42	2.37			
	(2)	6.70	6.56	6.70		
NET MARKET VALUE	(1)	8.62	7.34			
	(2)	4.34	3.16	(10.61)		
$\overset{*}{\overline{T}}$(R')(.5)[F(RR)+F(CR)-F(IP)]	(1)	1.47	1.38			
-$\overset{*}{\overline{U}}$(A)(.5)F(DP)	(2)	.91	.90	(2.06)		
RESIDUAL MARKET VALUE	(1)	7.05	6.10			
	(2)	3.67	2.84	(8.86)		

FIVE MILLION - PHASE THREE

	PARCEL	RETAIL	OFFICE	RESIDENTIAL	HOTEL	PARKING
R'(.5)[F(RR)+F(CR)+F(IP)]		52.39	60.94	31.79		17.65
-E'(.5)[F(RR)+F(CE)+F(IP)]		14.12	16.27	7.42		3.74
-E°(.5)F(DE)		.47	.47	.93		.47
-E"(.5)F(RE)		.59	.87	.48		.29
-(A-L)[F(CX)-.5F(IC)-.5F(DP)]		27.78	32.66	28.13		11.73
-L[F(LA)-F(FD)-.5F(DP)]	(7)	5.67	5.76			
	(8)	5.54	5.62			
	(9,10)	2.35	2.39	2.41		2.41
NET MARKET VALUE	(7)	3.77	4.94			
	(8)	3.90	5.07			
	(9,10)	7.09	8.30	(7.58)		(.98)
$\bar{T}^{*}$(R')(.5)[F(RR)+F(CR)-F(IP)]	(7)	.90	1.09			
	(8)	.91	1.11			
$-\bar{U}^{*}$(A)(.5)F(DP)	(9,10)	1.21	1.50	(1.27)		(.00)
RESIDUAL MARKET VALUE	(7)	2.28	2.94			
	(8)	2.35	3.02			
	(9,10)	4.05	4.79	(4.32)		(.48)

FIVE MILLION - RMV_{old}

PARCEL		L	t^L	RMV
Phase One	(4)	8.58	12	.57
	(5)	2.57	12	.17
	(6)	7.00	12	.46
Phase Two	(1)	3.10	48	.76
	(2)	8.58	48	2.11
Phase Three	(7)	7.59	84	3.10
	(8)	7.41	84	3.03
	(9,10)	3.15	84	1.29
Not Redeveloped	(11)	33.85	-	52.79

FOUR MILLION - RMV BY DEVELOPMENT COMPONENT

COMPONENT		RMV_{new}	RMV_{old}	Gross Sq. Ft.	RMV
Phase One					
Retail	(4)	4.21	.57	87,000	415,000
	(5)	9.52	.17	31,000	300,000
	(6)	15.38	.46	42,000	666,000
Office	(4)	3.31	.57	352,500	1,368,000
	(6)	16.01	.46	156,500	2,578,000
Residential	(4)	(12.33)	.57	195,000	(2,293,000)
	(5)	(6.97)	.17	130,000	(883,000)
Hotel	(5)	15.69	.17	581,000	9,217,000
Parking	(5)	(.46)	.17	150,000	(44,000)
	(6)	(.65)	.46	265,500	(51,000)
Phase Two					
Retail	(7)	3.52	2.08	18,000	101,000
	(8)	3.62	2.03	35,000	198,000
	(9,10)	5.99	.86	39,000	267,000
Office	(7)	3.28	2.08	153,000	821,000
	(8)	3.38	2.03	220,500	1,194,000
	(9,10)	5.77	.86	210,000	1,394,000
Residential	(9,10)	(5.88)	.86	850,000	(4,261,000)
Parking	(9,10)	(.78)	.86	241,000	19,000
TOTAL RMV FROM REDEVELOPED PARCELS					$ 11,006,000
Parcels Not Redeveloped					
	(11)	-	52.79	44,225	2,335,000
	(1)	-	36.54	109,328	3,995,000
	(2)	-	36.54	109,328	3,995,000
TOTAL RMV FROM PARCELS NOT REDEVELOPED					$ 10,325,000
TOTAL RMV					$ 21,331,000

FOUR MILLION - PHASE ONE

	PARCEL	RETAIL	OFFICE	RESIDENTIAL	HOTEL	PARKING
R'(.5)[F(RR)+F(CR)+F(IP)]		49.30	54.18	26.26	114.81	15.66
-E'(.5)[F(RR)+F(CE)+F(IP)]		12.86	14.47	6.16	53.84	3.30
-E°(.5)F(DE)		.40	.40	.86	1.87	.40
-E"(.5)F(RE)		.54	.54	.26	1.50	.21
-(A-L)[F(CX)-.5F(IC)-.5F(DP)]	(4,5)	25.36	29.50	22.85	42.04	10.23
	(6)	16.74	19.48	22.85	42.04	7.02
-L[F(LA)-F(FD)-.5F(DP)]	(4)	6.70	6.70	6.55		
	(5)	2.01		1.96	2.05	2.01
	(6)	5.46	5.46			5.46
NET MARKET VALUE	(4)	3.44	2.57	(10.42)		
	(5)	8.14		(5.83)	13.51	(.49)
	(6)	13.30	13.83			(.67)
$\overline{T}^{*}(R')(.5)[F(RR)+F(CR)-F(IP)]$	(4)	.76	.74	(1.91)		
	(5)	1.38		(1.13)	2.18	.03
$-\overline{U}^{*}(A)(.5)F(DP)$	(6)	2.09	2.18			.02
RESIDUAL MARKET VALUE	(4)	4.21	3.31	(12.33)		
	(5)	9.52		(6.97)	15.69	(.46)
	(6)	15.38	16.01			(.65)

FOUR MILLION - PHASE TWO

	PARCEL	RETAIL	OFFICE	RESIDENTIAL	HOTEL	PARKING
R'(.5)[F(RR)+F(CR)+F(IP)]		50.04	56.54	29.47		16.36
-E'(.5)[F(RR)+F(CE)+F(IP)]		13.08	15.10	6.90		3.42
-E°(.5)F(DE)		.53	.53	1.05		.53
-E"(.5)F(RE)		.55	.81	.45		.27
-(A-L)[F(CX)-.5F(IC)-.5F(DP)]		25.77	30.31	26.31		10.89
-L[F(LA)-F(FD)-.5F(DP)]	(7)	5.67	5.76			
	(8)	5.54	5.62			
	(9,10)	2.35	2.39	2.41		2.41
NET MARKET VALUE	(7)	4.44	4.04			
	(8)	4.58	4.18			
	(9,10)	7.76	7.41	(7.65)		(1.16)
$\bar{T}^*(R')(.5)[F(RR)+F(CR)-F(IP)]$	(7)	.92	.95			
	(8)	.93	.96			
$-\bar{U}^*(A)(.5)F(DP)$	(9,10)	1.34	1.36	(1.28)		(.03)
RESIDUAL MARKET VALUE	(7)	3.53	3.28			
	(8)	3.62	3.38			
	(9,10)	5.99	5.77	(5.88)		(.78)

FOUR MILLION - RMV_{old}

PARCEL		L	t^L	RMV
Phase One	(4)	8.58	12	.57
	(5)	2.57	12	.17
	(6)	6.98	12	.46
Phase Two	(7)	7.59	54	2.08
	(8)	7.41	54	2.03
	(9,10)	3.15	54	.86
Not Redeveloped	(11)	33.85	-	52.79
	(1)	23.43	-	36.34
	(2)	23.43	-	36.34

THREE MILLION PLUS - RMV BY DEVELOPMENT COMPONENT

COMPONENT		RMV_{new}	RMV_{old}	Gross Sq. Ft.	RMV
Phase One					
Retail	(4)	4.21	.57	87,000	415,000
	(5)	9.52	.17	31,000	300,000
	(6)	15.38	.46	42,000	666,000
Office	(4)	3.31	.57	352,500	1,368,000
	(6)	16.01	.46	156,500	2,578,000
Residential	(4)	(12.33)	.57	195,000	(2,293,000)
	(5)	(6.97)	.17	130,000	(883,000)
Hotel	(5)	15.69	.17	581,000	9,217,000
Parking	(5)	(.46)	.17	150,000	(44,000)
	(6)	(.65)	.46	265,500	(51,000)
Phase Two					
Retail	(9,10)	5.99	.87	39,000	268,000
Office	(9,10)	5.77	.87	210,000	1,394,000
Residential	(9,10)	(5.88)	.87	850,000	(1,052,000)
Parking	(9,10)	(.78)	.87	241,000	20,000
TOTAL RMV FROM REDEVELOPED PARCELS					$ 11,903,000
Parcels Not Redeveloped					
	(11)	-	52.79	44,225	2,335,000
	(1)	-	36.54	109,328	3,995,000
	(2)	-	36.54	109,328	3,995,000
	(7)	-	31.64	63,950	2,024,000
	(8)	-	30.80	95,926	2,995,000
TOTAL RMV FROM PARCELS NOT REDEVELOPED					$ 15,334,000
TOTAL RMV					$ 27,247,000

THREE MILLION PLUS - PHASE ONE

	PARCEL	RETAIL	OFFICE	RESIDENTIAL	HOTEL	PARKING
R'(.5)[F(RR)+F(CR)+F(IP)]		49.30	54.18	26.26	114.81	15.66
-E'(.5)[F(RR)+F(CE)+F(IP)]		12.86	14.47	6.16	53.84	3.30
-E°(.5)F(DE)		.40	.40	.86	1.87	.40
-E"(.5)F(RE)		.54	.54	.26	1.50	.21
-(A-L)[F(CX)-.5F(IC)-.5F(DP)]	(4,5)	25.36	29.50	22.85	42.04	10.23
	(6)	16.74	19.48	22.85	42.04	7.02
-L[F(LA)-F(FD)-.5F(DP)]	(4)	6.70	6.70	6.55		
	(5)	2.01		1.96	2.05	2.01
	(6)	5.46	5.46			5.46
NET MARKET VALUE	(4)	3.44	2.57	(10.42)		
	(5)	8.14		(5.83)	13.51	(.49)
	(6)	13.30	13.83			(.67)
$\bar{T}^{*}$(R')(.5)[F(RR)+F(CR)-F(IP)]	(4)	.76	.74	(1.91)		
	(5)	1.38		(1.13)	2.18	.03
$-\bar{U}^{*}$(A)(.5)F(DP)	(6)	2.09	2.18			.02
RESIDUAL MARKET VALUE	(4)	4.21	3.31	(12.33)		
	(5)	9.52		(6.97)	15.69	(.46)
	(6)	15.38	16.01			(.65)

THREE MILLION PLUS - PHASE TWO

	PARCEL	RETAIL	OFFICE	RESIDENTIAL	HOTEL	PARKING
R'(.5)[F(RR)+F(CR)+F(IP)]		50.04	56.54	29.47		16.36
-E'(.5)[F(RR)+F(CE)+F(IP)]		13.08	15.10	6.90		3.42
-E°(.5)F(DE)		.53	.53	1.05		.53
-E"(.5)F(RE)		.55	.81	.45		.27
-(A-L)[F(CX)-.5F(IC)-.5F(DP)]		25.77	30.31	26.31		10.89
-L[F(LA)-F(FD)-.5F(DP)]	(9,10)	2.35	2.39	2.41		2.41
NET MARKET VALUE	(9,10)	7.76	7.41	(7.65)		(1.16)
$\overset{*}{\overline{T}}$(R')(.5)[F(RR)+F(CR)-F(IP)]	(9,10)	1.34	1.36	(1.28)		(.03)
-$\overset{*}{\overline{U}}$(A)(.5)F(DP)						
RESIDUAL MARKET VALUE	(9,10)	5.99	5.77	(5.88)		(.78)

THREE MILLION PLUS - RMV_{old}

PARCEL		L	t^L	RMV
Phase One	(4)	8.58	12	.57
	(5)	2.57	12	.17
	(6)	6.98	12	.46
Phase Two	(9,10)	3.16	54	.87
Not Redeveloped	(11)	33.85	-	52.79
	(1)	23.43	-	36.34
	(2)	23.43	-	36.34
	(7)	20.29	-	31.65
	(8)	19.75	-	30.80

THREE MILLION MINUS - RMV BY DEVELOPMENT COMPONENT

COMPONENT		RMV_{new}	RMV_{old}	Gross Sq. Ft.	RMV
Phase One					
Retail	(4)	2.05	.73	87,000	241,000
	(5)	8.37	.25	31,000	267,000
	(6)	15.38	.46	42,000	666,000
Office	(4)	1.17	.73	211,000	399,000
	(6)	16.01	.46	156,500	2,578,000
Residential	(4)	(14.52)	.73	195,000	(2,689,000)
	(5)	(8.38)	.25	130,000	(1,057,000)
Hotel	(5)	14.53	.25	320,000	4,732,000
Parking	(5)	(1.60)	.25	112,500	(151,000)
	(6)	(.65)	.46	265,500	(51,000)
Phase Two					
Retail	(9,10)	6.02	.85	39,000	268,000
Office	(9,10)	5.80	.85	183,000	1,217,000
Residential	(9,10)	(5.85)	.85	570,000	(2,850,000)
Parking	(9,10)	(.76)	.85	182,000	18,000
TOTAL RMV FROM PARCELS REDEVELOPED					$ 3,588,000
Parcels Not Redeveloped					
	(11)	-	52.79	44,225	2,335,000
	(1)	-	36.54	109,328	3,995,000
	(2)	-	36.54	109,328	3,995,000
	(7)	-	31.64	63,950	2,024,000
	(8)	-	30.80	95,926	2,995,000
TOTAL RMV FROM PARCELS NOT REDEVELOPED					$ 15,334,000
TOTAL RMV					$ 18,932,000

THREE MILLION MINUS - PHASE ONE

	PARCEL	RETAIL	OFFICE	RESIDENTIAL	HOTEL	PARKING
R'(.5)[F(RR)+F(CR)+F(IP)]		49.30	54.18	26.26	114.81	15.66
-E'(.5)[F(RR)+F(CE)+F(IP)]		12.86	14.47	6.16	53.84	3.30
-E°(.5)F(DE)		.40	.40	.86	1.87	.40
-E"(.5)F(RE)		.54	.54	.26	1.50	.21
-(A-L)[F(CX)-.5F(IC)-.5F(DP)]	(4,5)	25.36	29.50	22.85	42.04	10.23
	(6)	16.74	19.48	22.85	42.04	7.02
-L[F(LA)-F(FD)-.5F(DP)]	(4)	8.61	8.61	8.42		
	(5)	3.01		2.95	3.08	3.01
	(6)	5.46	5.46			5.46
NET MARKET VALUE	(4)	1.53	.66	(12.29)		
	(5)	7.13		(6.82)	12.48	(1.50)
	(6)	13.30	13.83			(.67)
$\bar{T}^{*}$(R')(.5)[F(RR)+F(CR)-F(IP)]	(4)	.52	.51	(2.22)		
	(5)	1.25		(1.57)	2.05	(.10)
$-\bar{U}^{*}$(A)(.5)F(DP)	(6)	2.09	2.18			.02
RESIDUAL MARKET VALUE	(4)	2.05	1.17	(14.51)		
	(5)	8.37		(8.38)	14.53	(1.60)
	(6)	15.38	16.01			(.65)

THREE MILLION MINUS - PHASE TWO

	PARCEL	RETAIL	OFFICE	RESIDENTIAL	HOTEL	PARKING
R'(.5)[F(RR)+F(CR)+F(IP)]		50.04	56.54	29.47		16.36
-E'(.5)[F(RR)+F(CE)+F(IP)]		13.08	15.10	6.90		3.42
-E°(.5)F(DE)		.53	.53	1.05		.53
-E"(.5)F(RE)		.55	.81	.45		.27
-(A-L)[F(CX)-.5F(IC)-.5F(DP)]		25.77	30.31	26.31		10.89
-L[F(LA)-F(FD)-.5F(DP)]	(9,10)	2.32	2.35	2.37		2.37
NET MARKET VALUE	(9,10)	7.80	7.44	(7.62)		(1.12)
$\overset{*}{\bar{T}}$(R')(.5)[F(RR)+F(CR)-F(IP)]	(9,10)	1.34	1.36	(1.27)		(.03)
-$\overset{*}{\bar{U}}$(A)(.5)F(DP)						
RESIDUAL MARKET VALUE	(9,10)	6.02	5.80	(5.85)		(.76)

THREE MILLION MINUS - RMV_{old}

PARCEL		L	t^L	RMV
Phase One	(4)	11.03	12	.73
	(5)	3.86	12	.25
	(6)	6.98	12	.46
Phase Two	(9,10)	3.11	54	.85
Not Redeveloped	(11)	33.85	-	52.79
	(1)	23.43	-	36.34
	(2)	23.43	-	36.34
	(7)	20.29	-	31.65
	(8)	19.75	-	30.80

TWO MILLION - RMV BY DEVELOPMENT COMPONENT

COMPONENT		RMV_{new}	RMV_{old}	Gross Sq. Ft.	RMV
Phase One					
Retail	(4)	5.25	.49	28,000	161,000
	(5)	6.55	.39	19,000	132,000
Office	(4)	4.35	.49	351,500	1,700,000
Residential	(5)	(9.96)	.39	407,500	(3,899,000)
TOTAL RMV FROM REDEVELOPED PARCELS					$ (2,170,000)
Parcels Not Redeveloped					
	(11)	-	52.79	44,225	2,335,000
	(1)	-	36.54	109,328	3,995,000
	(2)	-	36.54	109,328	3,995,000
	(7)	-	31.64	63,950	2,024,000
	(8)	-	30.80	95,926	2,995,000
	(9,10)	-	24.30	271,619	6,600,000
	(6)	-	10.79	494,724	5,339,000
TOTAL RMV FROM PARCELS NOT REDEVELOPED					$ 27,283,000
TOTAL RMV					$ 25,113,000

TWO MILLION

	PARCEL	RETAIL	OFFICE	RESIDENTIAL	HOTEL	PARKING
R'(.5)[F(RR)+F(CR)+F(IP)]		49.30	54.18	26.26		
-E'(.5)[F(RR)+F(CE)+F(IP)]		12.86	14.47	6.16		
-E°(.5)F(DE)		.40	.40	.86		
-E"(.5)F(RE)		.54	.54	.26		
-(A-L)[F(CX)-.5F(IC)-.5F(DP)]		25.36	29.50	22.85		
-L[F(LA)-F(FD)-.5F(DP)]	(4)	5.78	5.78			
	(5)	4.62		4.52		
NET MARKET VALUE	(4)	4.36	3.49			
	(5)	5.52		(8.39)		
$\overset{*}{\overline{T}}$(R')(.5)[F(RR)+F(CR)-F(IP)]	(4)	.88	.86			
-$\overset{*}{\overline{U}}$(A)(.5)F(DP)	(5)	1.03		(1.57)		
RESIDUAL MARKET VALUE	(4)	5.25	4.35			
	(5)	6.55		(9.96)		

TWO MILLION - RMV_{old}

PARCEL		$\dot{L}$	t^L	RMV
	(4)	7.40	12	.49
	(5)	5.92	12	.39
Not Redeveloped	(11)	33.85	-	52.79
	(1)	23.43	-	36.34
	(2)	23.43	-	36.34
	(7)	20.29	-	31.65
	(8)	19.75	-	30.80
	(9,10)	15.58	-	24.30
	(6)	6.92	-	10.79