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CITY 1

PLAYER'S MANUAL

CITY GAMES

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CITY I
PLAYER'S MANUAL

Edited by John E. Moriarty

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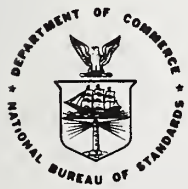

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I. INTRODUCTION

City I is an operational simulation game in which participants make economic, government and social decisions affecting a hypothetical metropolitan area. Through the use of a computer, the simulated urban system responds to the participants' decisions as any real city would. Each player in City I is assigned to a team which shares an economic and governmental role. The interrelated decisions made by teams will guide the way the simulated city changes in composition and size.

The simulation approach to cities offers the players an opportunity not only to make decisions but to implement them as well. They receive a feedback from their actions and see the effects from other forces that are constantly at work altering the effectiveness of the players' decisions. Players therefore have a learning experience in how to deal with a changing environment. The round-by-round play gives the players the necessary experience in selecting the type of analysis to move them towards their objectives while the allocation of their time and Game resources is a critical determinant of the success they hope to achieve. As the Game progresses, players learn to increase their involvement in the management of the environment while at the same time learning more about the relationships between business and society.

One of the primary purposes of the Game is to improve the players understanding of urban problems in systemic terms. In other words, the aim is to encourage players to view the activities of the City as being closely related and interdependent (e.g., an unemployment problem will exacerbate a health problem, the loss of industry and jobs in the private sector will reduce the number and quality of services offered in the public sector through reduced tax revenues, etc.). The Game also encourages players to use an interdisciplinary perspective when dealing with urban problems; that is, to look at the problem not only from the viewpoint of an economist, but also from the perspective of a geographer, planner, political scientist, etc.. For instance, if a player is dealing with a land use problem such as zoning, he soon realizes that he cannot escape the broader concepts of land-use planning. The problems of housing, unemployment, education, health, highways, etc., are all related in a system of interconnected activities and institutions to his original land-use problem of zoning. Hence, many of the outputs of this particular gaming model (e.g., land use maps, economic indicator tables, etc.) are designed in such a fashion that the City can be viewed more easily as a single entity than as several separate and disparate parts.

Although no two games are ever identical, most games have common characteristics that are noteworthy. In a typical game, the economic decision makers can best be described as rather conservative and cautious players. This aversion to risk-taking is especially noticeable in the early rounds when players are uncertain as to the outcome of particular decisions. Economic decision makers generally do not have a game plan and most decisions in the early rounds are not made in a systematic fashion or developed in a coordinated manner. In later rounds, many decisions are made as the result of actions taken in earlier rounds. For example, an economic decision maker might build some housing units for rental purposes and then find that they are underutilized. The decision maker might then consider building commercial or manufacturing establishments close by in order to induce more people to live in the underutilized housing units and build up a good supply of labor. Just as likely, the procedure would be reversed, and the emphasis would be on building housing units near a previously built manufacturing plant in order to maintain an adequate supply of labor close to the plant.

The economic decision makers usually make profits on their business operations, although losses on particular investments are not uncommon. It is characteristic of economic decision makers that profit maximization is the primary motive for making decisions, subject, of course, to the twin constraints of risk-taking and uncertainty.

The public decision makers attempt to make a concerted effort to improve the welfare of the City, although the indicators used to measure economic progress do not clearly reflect the intensity of this effort. During the early rounds, a typical game plan is to obtain additional revenue to upgrade the school system and municipal services, while at the same time attempting to redistribute the tax burden to fall more heavily on the business community and to a lesser extent on the work force. Lower income residents generally receive a tax break through the reduction of the sales tax on goods and services while the tax on auto owners is raised in the hope that the use of public transportation will increase.

As in a real city, the public deficit looms as an obstacle in the path of all social reforms. So it is with the City game. The public administrators must face the debt problem and solve it before money can be allocated in significant amounts to create the utopian society we all dream about. These administrative processes that implement social reforms require the integration of decision making through the various disciplines. As the game progresses,

the conflict between the objectives of the public and private sectors becomes amplified. Both sectors begin to realize that they cannot perform their objectives independently and the learning process begins. As an example of this learning process, consider the micro-level analysis of shopping centers which are simulated by the "personal goods" and "personal service" industries. To perform this analysis, appraisals are required along with business and property analysis. Investment portfolio analysis is required to manage a variety of business enterprises and a portfolio of real estate resources. The constraints on the entrepreneur come from the public sector in terms of zoning restrictions, building permits, taxes, utilities, etc., which can prove very formidable. Hence, the public and private interests become interwoven and the Game provides a way of demonstrating decision-making in a society where there is a community of interest between the public and private sectors. The inefficiencies of independent decisions become expensive not only to the developers but to the community as a whole, so it becomes evident that it pays to have an improved analysis of the problems of managing the environment in order to achieve public objectives, whatever they may be.

The Players manual is designed to be a reference manual for game players and cannot be read as a text book. This manual is one of a set comprised of a Director's Manual, Player's Manual, and Computer Operator's Manual. It is assumed that players will be given complete instructions in the rules for a particular game play by the Game Director who is experienced in running this particular game. Individual players will use only those portions of the manual that are applicable to their game role.

In the playing of the actual game, participants assume various roles in the public and private sector as outlined in the players manual. A Game Director who is familiar with the Game in detail begins the Game with a classroom type lecture devoted to the discussion of the major decision-roles in the City Model as well as the many printouts and reports that result from each role player's decision inputs. During this session, players are assigned a particular role (i.e. economic decision maker, mayor, school board member, etc.) and asked to read that portion of the Player's Manual dealing with his role. Using the manual as a technical guide, the players address themselves to the mechanics of coding forms and interpreting the computer printouts. It is at this time that the Director describes the preprogrammed city in the computer to the players. The Director has the option of choosing initial parameters such as economic growth rates, social conditions, production capacities, etc. to suit the particular objects of the players and thereby making the Game more flexible and susceptible to innovative approaches to urban

problem-solving. The Director can structure the role assignments to be directed at individuals who concentrate on single objectives such as heavy industry to multi-disciplinary task forces to consider urban problems within an interdisciplinary framework (e.g., a task force on transportation policy might include a sociologist, political scientist, geographer, planner, engineer and an economist).

With initial roles established, the game begins. The Director generally starts the game by discussing possible objectives with each player or group of players along with the present or initial city conditions. For example, if the Director chooses to use the planning-programming-budgeting systems approach, each player or group of players must:

1. Define his general Goal which is Output Oriented.
2. Identify objectives which indicate conditions or levels which must be obtained or maintained to successfully reach the designated Goal.
3. Draft Programs which are designed to achieve the standards set by the various objectives.
4. Evaluate the Programs to determine their effectiveness (in cost/benefit terms) as compared to alternative programs. Consider a political role in the urban system that is abstracted as follows:

   Political Goal: School Department

   Develop a school system comparable to the best in the nation, which will provide high quality, accessible and meaningful educational experience to the City's population.

   Objective #1

   Maintain the pupil/teacher ratio at less than 21/1.

   Program #1

   Using the population growth projections, determine future student levels. Hire middle and high income teachers, at the optimum mix, to meet this demand.

   Program #2

   Redistrict school boundaries to better utilize existing City resources.

   Program #3

   Construct new schools or add to existing facilities as projected. (Specific round-by-round projections are used.)

Objective #2

Keep unmet demand for adult education at less than 10% of the total demand.

Program #1

Use the population growth projections, determine future student levels. Hire middle and high income teachers, at the optimum mix, to meet this demand.

It can be seen that the School Department has:

1. A definite goal (to be the best)
2. Identified meaningful standards of performance (student/teacher ratio of 21/1 and unmet demand for adults at 10% or less)
3. Determined approaches to achieve these standards (population projections, new construction, redistricting, etc.)

The previous example of the School Departments (see page 104) political goal could apply to most school systems in any City. We all want low student/teacher ratios and the best possible teachers for our children. New construction, better utilization of facilities and adult education programs with the most competent teachers available is certainly a laudable goal. The only obstacle to this utopian dream is that other government departments leave their dreams and all departments compete for the lion's share of limited tax dollars. Besides education, the government sector (see page 66) must consider the problems of budgeting, taxation, assessment and bonding (see page 78), highways (see page 117), fire and police protection (see page 88), planning and zoning (see page 133), utilities and bus and rail transportation (see page 117). Departments make decisions which include allocating capital and current funds, changing salaries and maintenance levels, requesting Federal-state aid, changing district boundaries, constructing or demolishing public buildings and changing levels of service.

In the game, all of the above roles are enacted by various players who strive to optimize their goals just as in the example of the school department. Collectively, the Government players work from a tax base that is continually being attacked by the tax payers as excessive and yet their very employment is insured by the elective process which, of course, is determined by the same tax payers who are continually demanding more services from the government. The source of government revenue is taxes

which are levied on the population just as in a real city. Other players must assume roles in the city's economic sector to create employment for the population. The activities of the businessmen must include the operation of the industrial, commercial, and residential establishments which in turn require land purchases and sales, salary changes, maintenance level alterations, business goods and services, purchases for operating exigencies, boycotts of commercial firms, acquisition of long and short term loans, and constructing, improving and demolishing businesses.

The commercial activities (see page 25) are subdivided within the game into Basic Industries, Construction Industries, Commercial Activities and Residences. The Basic Industry includes heavy and light industries and national services (including Standard SIC classes) which spend money for business goods and business services, utilities, a labor force, transportation and above all taxes. The Construction Industry (see page 41) builds and/or demolishes other developments and firms from outside of the local area may also perform construction work. Commercial activities spend money on many of the same items as the basic industry in order to maintain a level of service capacity. This service capacity is available to serve local customers. Finally, the residences, (single-family, townhouse, and highrise) spend money on goods and services, utilities, taxes and earn income based on rent charged and the number and type of occupants residing in their housing units (see page 41).

The City model selected for game play may be a typical city or it may be the player's own city. The model employs a grid board (see page 14) geographical map that can be loaded with data from any regional or metropolitan area. The map contains 625 parcels in which each parcel represents one square mile of land. Many of these land parcels are unowned at the beginning of play and those that are occupied are represented by a specific, representative land use. For instance if a square mile consists mainly of middle income residences, this parcel would be designated as such even though there could be a few commercial businesses within the square mile. The only requirement to assigning parcels is that the assignment typify the most representative land use. In a similar manner highways and roads are represented along the boundaries of the parcels. If you imagine a parcel as represented by a square, then a road is described as one or more sides of the square.

Once the representations are made, there remains the task of determining the zoning classifications (see page 133), the cash available to each player or team, salaries, city financial resources, department expenditures, tax base estimates, road configurations and utilities and terminals (see page 28). These inputs along with the parcel classifications describe the starting city. The files of this starting city are stored in the computer and can be altered by the game director to suit the players needs (see Director's Manual). Changes in these files may affect the output of the computer but will have no bearing on how the computer calculates the output. The computer program directs the computer to act upon the data files in fixed relationships using the various data stored in the city file. In this way the computer can respond to updated file changes, act as an outside system, perform routine functions or processes that would be time consuming for the players and finally act as a bookkeeper (see Computer Operator's Manual).

At this point the game is ready to be played. Each player studies his printout generated from the starting city to evaluate his status as an individual and as a team member. Each team defines its specific problems, establishes objectives and develops strategies. Various groups will then gather for informal sessions for the purposes of bargaining, trade-offs and consumating deals. Eventually each group arrives at final decisions for actions to be taken in that particular round of the game. These decisions are then entered into the computer by a special code and the model is ready to run. The computer then prints out a new series of data representing the changed city.

In a typical game play the players generally behave in a predictable way with a minimum of player interaction early in the game. Players tend to feel that most inter-relations should be avoided for the sake of secrecy. Most players use the guise of ignorance when talking to their peers early in the game and their contacts are limited to attempts at acquiring knowledge. As the player's command over the technical content increases, so does his awareness of the necessity for a properly functioning system. The player realizes that his economic aspirations will not be achieved unless his public counterpart can create a suitable "service-rich" environment in which he can operate. Typically, one or two players generally emerge quickly with an extensive grasp of the system and its technical content and assume the role of educator. In a fashion similar to the old ward politicians, the educators disperse favors (the patronage in the form of technical explanations), to gain the initial respect of his constituents. Needless to say, it is then a simple matter for the educator to insure his election to the mayoralty of the City.

As time passes, other players come to understand their role and the role of others and begin to realize that the mayor, although helping the city to function, often is insuring his own economic prominence at their expense. At this point, the era of the ward politician is inevitably (or generally) over and with this passing comes the emergence of the city-manager. The political cooperation that grows from the new regime eventually leads to a full appreciation of the efforts of others and will open up higher levels of discussion concerning city-wide urban problems. Although the previous discussion concerns player behavior during game play, the influence of the gaming process has created a learning experience for the players. This learning experience is one of the fundamental purposes of City Games and these experiences with the game can be transferred to the problem of the real city.

In most games, the Game Director's role diminishes as the play progresses and players become more familiar with the technical content of the game. Since bribes and boycotting are allowed along with collusion and other forms of special interest groups, a new aspect of the game appears, namely law and order. Players rapidly learn that disputes cannot be settled by opposing interest groups and the enforcement of agreements and compromises becomes almost impossible. Players demand legal systems and police departments and the local government is faced with new expenses to deal with. If these demands are met, the City managers must generate more income to meet these expenses and forego other spending plans. At this point, the hypothetical city is becoming very real and very complicated to run. Even though it is a hypothetical city, players become emotionally involved and the intensity of their involvement permeates the playing area. Time is a constant enemy for the players just as in real life. Everyone wants everything at once and a typical game play allows the players about two to three hours per round to make their decisions. One round of the game is equivalent to one year of real time. If elections are required every two years, only two rounds are played before new elections. If the newly elected officials fail to honor prior commitments by their predecessors, well the best laid plans.....

It is within this framework that the City I manuals are written. There are three manuals for City I: a Director's Manual, a Players' Manual, and an Operator's Manual. The Director's manual is designed to explain the technical content of the computer program including term definitions, programming change procedure and the numerous technical details associated with the game. It is assumed that the Game Director has been taught the gaming operations prior

to assuming the Director's role and will use the manual as his primary reference source rather than a set of instructions for running the game. The manual further assumes that a Director has had training in Fortran programming and understands formatting and coding in addition to being knowledgeable about Urban problems. The Director designs the initial city conditions for the start of a game. The manual provides initial conditions for a typical city and specific computer commands for altering these conditions.

The Players' manual is also designed to be a reference manual and not a text book. The complexity of the game requires extensive reading on the players part prior to the start of a game or selective reference material which is coordinated with the Director's introductory lectures and possibly monitors who are trained in the gaming procedures and will coach the individual players when required. This latter approach has proven to be the most effective method of training players. If past games are indicative, individuals seem to learn their roles much faster when coached by a monitor during actual playing conditions as opposed to concentrated reading and memorizing prior to the start of a game. It is not presumed that players have prior knowledge of this game or even simulation in general. The game is designed so players do not need to know computer programming or how to operate the computer. These functions lie with the Director and the Computer operator.

The Operator's manual is written for an IBM 1131 and presumes that the operator knows how to cold start the computer and mount the tapes. This manual explains the relationship between the programming data, the taped program and the operation of the computer. Test sequences are given along with a detailed explanation of switch control and error messages. It is not required for the operator to understand the Director's or Players' role but only to be knowledgeable in operating the computer.

In general, the game should be played with at least 25 players utilizing a large room where players can move freely about. Computer printouts are usually taped on walls for easy access by all players. An optional display would be a gaming board for visual display of the city. The board is marked off in grids to conform to the City map and plastic playing pieces are used to represent the various types of buildings. Colored tape is used to mark off highways and boundaries. Human interest is added if one player agrees to become the Big City News editor. The idea is to subtly report on the good and bad features

of the game play in a humorous way. The Game Director reports the results of each round to the news editor who proceeds to write his paper and distribute it before the players learn the results of the round. The detailed computer outputs are then distributed to the players so that they may learn how well their particular game plan went. In other words, the paper presents the overview and the computer reports on the specifics. This method allows the Game Director to concentrate his time on selected areas rather than all areas at the end of each round.

In addition to the normal problems of the City, the Gaming Model can be used for more sophisticated analysis. The Economic Base can be investigated to determine the causes of a changing growth rate along with identifying the components of the economic base. Business cycles can be explored since they are dependent upon sales of goods and services outside the local economy and must be supplemented by an analysis of the condition of the National economy. This provides a useful yardstick for measuring economic performance. By charting the prices for basic industry output, the return on investments and the interest rate on loans and bonds, the players can determine which phase of the business cycle they are in, which in turn, would partially explain capital investment attitudes.

Other basic studies important to public and private decision-makers concern the tracing of population growth and projecting future levels. Trends in employment (total), employment distribution by industry, unemployment rates and income distribution are available and in a usable form in the City's output. Here again a PPBS format would guide the player in assembling the pertinent facts and disregard peripheral information.

Housing market analysis becomes important in any geographic area where dwelling units are in competition with one another as alternatives for the users of housing. This problem incorporates many of the previously mentioned types of analysis: economic base, employment trends, income distribution and population analysis along with the additional component of housing stock or inventory. The magnitude of the total housing stock in terms of dwelling units, reflecting changes over time, is one of the most significant indicators of city growth coupled with a changing distribution of the inventory by structural type. Equipped with this knowledge plus an awareness of vacancy rates, rents, property values and financial market conditions, the private developer could make a rational decision as to the advisability of a housing investment.

Appraisal theory can be utilized to aid prospective purchasers and sellers as to the market value of particular parcels of land. The data needed to apply to the cost, income and marketing approaches to appraisal theory is available on the various output sheets supplied by the game.

The above are only examples of types of game play because each time a game is played, it is structured to meet the needs of the particular group of players.

II. MODEL PROCESSES

A. The Computer

The computer performs several major functions in City I. First, it stores all the relevant statistics for the area; updates data when changes are made, and prints out yearly reports. Second, the computer acts as an Outside System, simulating decision-makers, influences and markets that are outside the local metropolitan area. For example, the computer simulates the National Economy business cycle which determines interest rates on most loans, determines the income of basic industries, and is the source of required goods and services when the local system is unable to supply them. Third, the computer performs certain routine functions or processes that would be time consuming if the players themselves were to perform them. For example, the computer assigns workers to jobs under the assumption that workers will attempt to earn as much money as possible. Other processes include assessing all property, assigning buyers of goods and services to shop at particular commercial establishments, and assigning children to public or private schools based upon the capacity and quality of the public schools.

Finally, the computer acts as a bookkeeper. It records all the transactions of players, deducts their expenditures and adds their incomes to their financial accounts.

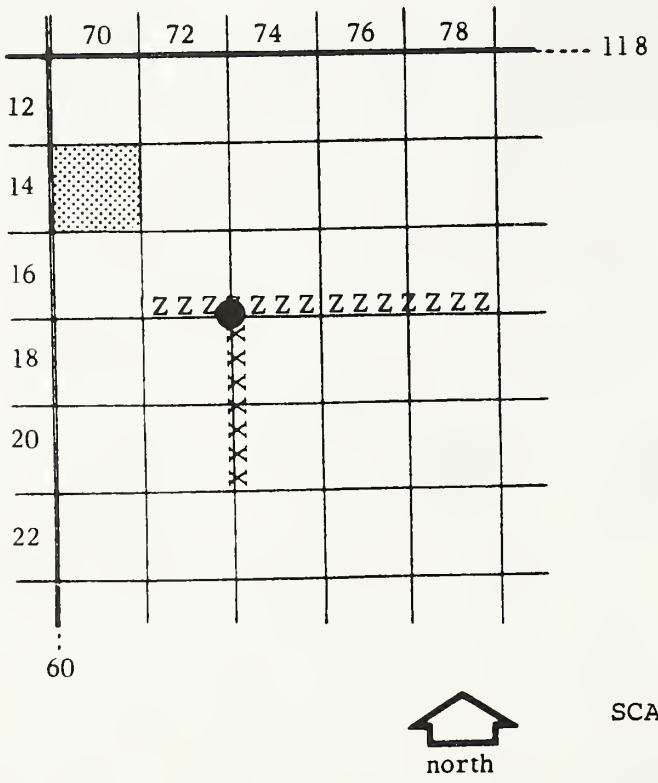
The computer does not have a large vocabulary. Thus, players must write their decisions or questions in a language developed specifically for the computer. This language is an abbreviated code which the computer can understand. For example, when economic team A wants to change a salary, it will write $CS followed by the necessary information, instead of the entire word. In order to send information to the computer, a player must fill in certain blanks on the input decision form.

B. The Game Board

The City I metropolitan area is represented on a game board consisting of 625 squares (25 x 25). Each square represents one square mile of land. Many of these land parcels are unowned parcels at the beginning of play. Unowned parcels may be purchased and developed by decision-makers during the course of the game. As players continue to play City I over the course of several rounds, the physical changes inherent to all cities will be visible on the playing board.

The game board and all computer maps are keyed to a coordinate system of even numbers. Each square mile parcel can be identified by its coordinates. Horizontal coordinates range from 70 to 118 and vertical coordinates range from 12 to 60. Intersections are identified by odd-numbered coordinates and highways are identified by even-odd (east-west) or odd-even (north-south) coordinates. In all cases, the horizontal coordinate (i.e., the large number) is identified first.

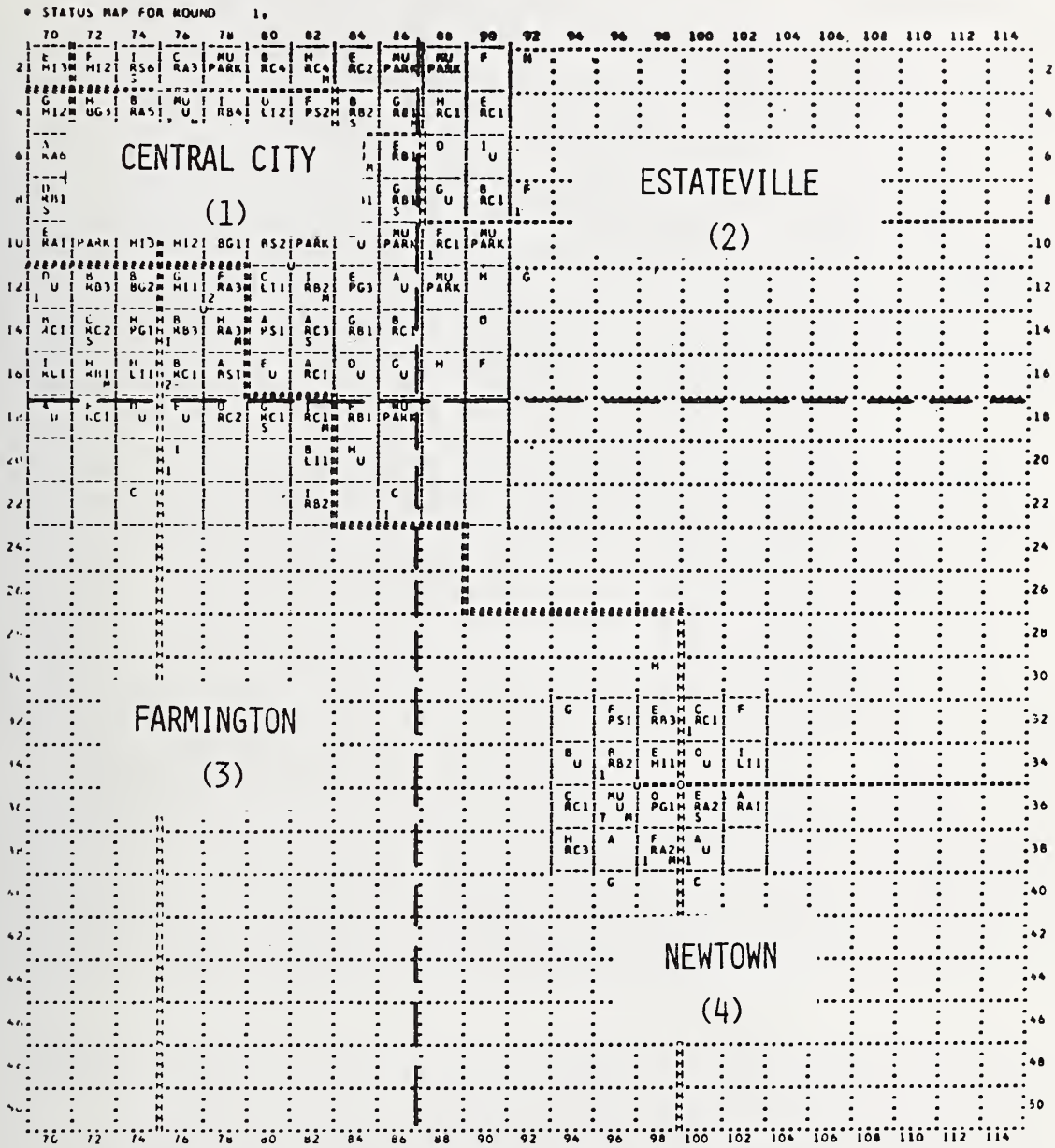
For example, in the map below the shaded parcel is identified as 7014. Further, the four mile highway indicated by ZZZ is identified as 7217, 7417, 7617, and 7817, while the two mile highway indicated by XXX is identified as 7318, 7320. The intersection marked ● is located at 7317.



SCALE:

1 square = 1 square mile

Figure I-A shows the simulated county of four separate areas: Central City, Estateville, Farmington, and Newtown and indicates the location and jurisdiction code (1-4) of these areas.



PARCEL INFORMATION CODE

TOP LINE: Economic Owner (A thru I)

or Municipal (MU)

MIDDLE LINE: Private Land Use and Level, Park, or Presence of Utility Service (U)

- HI = Heavy Industry
- LI = Light Industry
- BG = Business Goods
- BS = Business Services
- PG = Personal Goods
- PS = Personal Services
- RS = Slum Residences
- RA = Low-Income Residences
- RB = Middle-Income Residences
- RC = High-Income Residences

BOTTOM LINE: Left Side: Units of Park (Maximum is 7)

Middle: School(s)

Right Side: Municipal Service Unit (M)

ROAD INFORMATION

- M or = - Type 1
- H or = - Type 2
- I or - - Type 3
- ..... - ROADBED

TERMINAL INFORMATION (AT INTERSECTIONS OF ROADS)

- O Type I
- X Type II
- ⊗ Type III

UTILITY PLANT (AT INTERSECTIONS OF ROADS)

C. Levels of Aggregation and Scale

Since City I is a fairly complex model, it has been necessary for the designers to build in a level of aggregation in order to simplify calculations. For example, land is aggregated in square mile parcels, rather than acres or blocks. Furthermore, people are considered in groups of one thousand or more rather than as individuals.

In City I, all dollar figures are scaled down by a factor of 1,000. You will discover, for example, that whereas an RB1 supplies 1,000 middle income workers, the typical salary is $5,000 per 1,000 workers. Hence, the typical income of an RB1 is $5,000 rather than $5,000 x 1,000 (workers) or $5,000,000. Furthermore, the typical income for an HI1 (Heavy Industry) is $70,000 per year rather than the more realistic number of $70,000,000 per year.

Since this scale factor is constant however, it does nothing to affect the relationships in the City I model. On the contrary, it simplifies the calculations that must be performed by the players.

D. How to Begin Play of City I

At the beginning of play, participants should be divided into nine economic teams (A, B, C, D, E, F, G, H, I). These teams should then nominate and elect a Chairman and two Councilmen (1 from Central City and 1 from the suburbs, Estateville, Farmington and Newtown). Voting can be done either by a simple show of hand or by computing the voting power of each team in the Central City and the suburbs. The Game Director will help the players in determining their roles and will describe the voting regulations at the beginning of the Game. This is one of the reasons why the initial lecture as described in the introduction is so important.

Once the Chairman has been elected, he should appoint teams to serve as his bureaucracy: Finance, Schools, Highways, Public Works and Safety, and Planning and Zoning Departments. It is recommended that most teams have at least one governmental role in addition to its economic role (remember, there are nine economic roles and eight governmental roles.)

After teams have been found, the Director will then ask each player to read the portion of the manual that applies to his role. When this is done, there should be a question and answer period for player's to ask questions and the Director and monitors to supply the answers. At this point, teams can begin to formulate their ideas and learn the mechanics of filling out the computer input forms. The Director should check the forms for accuracy and logic prior to submitting them to the computer.

E. The City I Round

In the City I game, a round represents a year of change in the life of the simulated area. From the standpoint of the participants, however, a round may be thought of as a decision-making cycle which starts when they receive output and ends when they feed their decisions to the computer.

During the early part of a typical round decision-makers will be simultaneously reviewing their computer output and attempting to organize their possible actions. Economic decision-makers for example, will probably bid on the various unowned parcels of land and attempt to acquire desirable land from other participants. They may attempt to secure loans from local or outside sources, apply for zoning changes, and request utility expansions and increased highway access.

Meanwhile, the governmental decision-makers may be receiving requests from the economic and social decision-makers to lower taxes, improve schools, provide better municipal services, expand highways, build additional utilities, enlarge the park system, and improve other services. Budget officials are faced with the task of finding additional revenue to meet expanding public needs and dividing appropriations among the many local departments, all of which have attempted to justify their expanding budgets.

Toward the middle of the round, it becomes clear to many decision-makers that all of their requests will not be granted. Thus, trade-offs and bargains must be made. Elected officials will begin to worry about staying in office. Departments must plan to operate with less funds than they had requested. Businessmen begin to look for short-cuts to reduce their losses and increase their activity and profit-making ventures.

As the round approaches a conclusion, the participants formalize the bargains they have made, continue to record their decisions for the computer, terminate the negotiations on new wage levels and new prices, and complete any other possible actions. When the round ends, participants campaign and carry out new elections, hold town meetings, debrief their actions, and develop new strategies while the computer is performing its functions and preparing new output on the status of City I.

F. Optional Citizen's and Mass Media Team

A game director can choose to include a Citizen's and Mass Media team in a City I play to reflect the dynamics of public opinion and public pressure in an urban system. The team could function as the news media, public interest group, citizen's pressure group (as against more highways), civic and neighborhood associations, and the like in any combination of those activities.

The team can be selected in several ways: as a separate team at the beginning of play, or comprised of representatives from other teams (to add a partisan or economically-based influence that usually characterizes such pressure groups), or in other ways that the game director may devise.

Some of the team's responses will be derived from the output entitled "Socio-Economic Parameters For Round". This output describes some of the factors which show how well the social units of the game are doing. For example, the Growth Desirability Factor for the Next Round is essentially a dissatisfaction index that tells how contented the residents are.

III. ECONOMIC SECTOR

There are nine economic teams in City I. Each economic team (represented by A, B, C, etc.) is distinguished by the fact that it controls tangible assets. In the first place, it owns land. Some of this land is developed (i.e., has buildings on it) and some of it is undeveloped. The economic team inherits the responsibility of operating the developments which are on its land.

Another asset of the economic team is cash. Each economic team begins playing City I with a cash balance. A team may use these cash resources for such activities as acquiring new land, building new businesses, upgrading or demolishing old ones and lending and investing money. In a sense, the economic activity of the city provides a rationale for its existence, dynamic growth and future development. In City I, therefore, the economic sector is not only a series of individual teams concerned with maximizing their own profit but also an entrepreneurial community whose decisions, biases and judgements will greatly influence and change the simulated area.

A. Economic Land Uses

There are ten types of economic land uses in City I. Each of these land uses represents a development which is owned and operated by an economic decision-maker. These land uses are divided among basic industry, commercial establishments, and residences. They include:

BASIC INDUSTRY

HI . . . . . Heavy Industry: steel, petroleum automobiles, etc.

LI . . . . . Light Industry: electronic, pharmaceutical, etc.

COMMERCIAL ESTABLISHMENTS

BG . . . . . Business Goods: intermediate products, raw materials, etc.

BS . . . . . Business Services: computer, accounting, legal, etc.

PG . . . . . Personal Goods: food, drugs, appliances, etc.

PS . . . . . Personal Services: banking, dry cleaning, restaurants, etc.

RESIDENCES

RA . . . . . Low-income housing

RB . . . . . Middle-income housing

RC . . . . . High-income housing

RS . . . . . Slum housing

1. Development level

Every land use has a development level. This level indicates the size of a building, the capacity of a business to produce output, etc. Levels range from 1 to 3 for all non-residential (HI, LI, BG, BS, PG, PS) land uses and from 1 to 8 for RA or RS, 1 to 6 for RB and 1 to 5 for RC residences. On all computer output, the development level is indicated by the number immediately to the right of the land use code. Thus, an HI2 is a heavy industry at the second level of development.

2. Value Ratio

Every land use depreciates each round. Basic industries (HI, LI) and residences (RA, RB, RC, RS) depreciate at 5% of their original value; commercial establishments (BG, BS, PG, PS) depreciate at 7% of their original value times the number of RPU's sold (output) divided by their design capacity.

The value ratio of a building indicates its condition. Value ratio is determined by dividing the present value of a building by its original value (construction cost). All buildings are, therefore, constructed at a value ratio of 1.00 -- the highest possible. A building that has depreciated 5% would have a value ratio of .95.

Value ratio affects the earning capacity of an industry and the capacity of a commercial establishment. Furthermore, a residence with a value ratio which falls below .50 becomes inhabited by the next lowest income class, until it becomes a slum.

3. Capacity

In City I commercial establishments (BG, BS, PG, PS) have design capacities. The design capacity indicates the amount that a business can sell to customers in the local system during a round. Capacity is expressed in terms of RPU's or Round Purchase Units. The design capacities of commercial establishments are outlined below:

Land Use Type & Level	Design Capacity
Business Goods	
BG1	29 RPU's
BG2	43 RPU's
BG3	64 RPU's
Business Services	
BS1	52 RPU's
BS2	69 RPU's
BS3	80 RPU's
Personal Goods	
PG1	45 RPU's
PG2	64 RPU's
PG3	77 RPU's
Personal Services	
PS1	51 RPU's
PS2	74 RPU's
PS3	90 RPU's

As mentioned before, the value ratio of a commercial establishment affects its ability to produce and sell RPU's. The design capacity is multiplied by the value ratio to determine the actual number of RPU's that can be sold. In other words, a PS3 with a value ratio of .90 can sell only .90 x 90 RPU's or 81 RPU's.

B. Buyers and Sellers

In City I economic land uses buy and sell goods and services among themselves and the Outside System. These intersector relationships are summarized as follows:

Land Use	Buys From	Sells to
HI	BG, BS	Outside
LI	BG, BS	Outside
BG	Outside	HI, LI, PG
BS	Outside	HI, LI, PG, PS
PG	BG, BS	RA, RB, RC, RS
PS	BS	RA, RB, RC, RS
RA, RB, RC, RS	PG, PS	---

Basic industries (HI and LI) require business goods (BG) and business services (BS) for the normal operation of a plant each round. These BG and BS are purchased from local establishments. The requirements are outlined below:

	Requirements	
Basic Industry	BG	BS
HI1	6 RPU's	6 RPU's
HI2	10 RPU's	10 RPU's
HI3	14 RPU's	14 RPU's
LI1	8 RPU's	8 RPU's
LI2	12 RPU's	12 RPU's
LI3	14 RPU's	14 RPU's

Commercial establishments (BG, BS, PG, PS) also require goods and/or services for their normal operation. Since BG and BS establishments cannot buy from themselves,

however, they are forced to purchase goods and services from the Outside System. These requirements are outlined below:

Commercial Establishments	Requirements
BG1	$1500 x RPU's sold*
BG2	$1500 x RPU's sold*
BG3	$20,000 + $1500 x RPU's sold*
BS1	$400 x RPU's sold*
BS2	$400 x RPU's sold*
BS3	$3000 + $400 x RPU's sold*

	BG	BS
PG1	2 RPU's	2 RPU's
PG2	3 RPU's	3 RPU's
PG3	4 RPU's	4 RPU's
PS1	--	2 RPU's
PS2	--	2 RPU's
PS3	--	2 RPU's

Residences require personal goods (PG) and personal services (PS) for their normal operation. These goods and services are purchased from local PG and PS establishments. The requirements are:

	Requirements	
Residences	PG	PS
RC1	3 RPU's**	3 RPU's**
RB1	2 RPU's**	2 RPU's**
RA1(or RS)	1 RPU**	1 RPU**

*These requirements are fixed and paid to the Outside System.

**PG and PS requirements for residences are a function of the development level. For example, a RC3 requires 3 x 3 or 9 RPU's of PG.

The price charged for BG, BS, PG or PS is determined by the owner of the commercial establishment which is selling the goods or services. The maximum prices (including transportation costs) that will be paid by each customer are as follows:

	Maximum Prices That Can Be Paid for			
Customer	BG	BS	PG	PS
HI1	$21,000	$10,000	--	--
HI2	34,000	16,000	--	--
HI3	50,000	26,000	--	--
LI1	30,000	13,000	--	--
LI2	46,000	20,000	--	--
LI3	56,000	23,000	--	--
PG1	6,000	4,000	--	--
PG2	10,000	5,000	--	--
PG3	13,000	6,000	--	--
PS1	--	4,000	--	--
PS2	--	4,000	--	--
PS3	--	4,000	--	--
RC	--	--	3,580	1,890
RB	--	--	1,970	880
RA	--	--	1,070	450

The transportation costs which the customer must pay in order to travel to a particular establishment to purchase goods and services are outlined below on a per mile basis over a Type I road:

	Travel to:	
Customer	BG	BS
HI1	$ 500	$ 200
HI2	750	300
HI3	1000	400
LI1	500	50
LI2	750	80
LI3	1000	100

	Travel to:	
Customer	BG	BS
BG1		
BG2		
BG3	No transportation costs. BG and BS purchase from the Outside System.	
BS1		
BS2		
BS3		
PG1	$ 150	$ 100
PG2	200	100
PG3	250	100
PS1	---	100
PS2	---	100
PS3	---	100
	PG	PS
RC1*	100	70
RB1*	60	40
RA1*	20	10

[NOTE: Costs are double for a Type II and triple for a Type III road.

*Residences pay transportation costs in direct multiples of their development level. For example, an RC1 pays $100 per mile and an RC3 pays $300 per mile.

1. The Commercial Process

Since it would consume too much time for players to make individual contracts with commercial establishments, the computer assigns buyers to particular commercial establishments. This assignment is called the Commercial Process. During this process, the computer first calculates the least transportation cost from each buyer to each seller. It then adds the seller's price to the transportation cost and looks at the seller at which the total cost (price plus transportation) to the buyer is least. A buyer shops at the seller which is "best" (least total cost) for him unless: 1) the total cost to shop there exceeds the maximum; or 2) the seller is already serving at its capacity. In case (1), the buyer will shop outside, since he cannot shop more cheaply locally. In

case(2), the buyer will look at his second best shopping location. Again, the buyer will shop at that second best location unless: 1) the total cost to shop there exceeds the maximum; or 2) the seller is already serving at its capacity. In case (1) the buyer will shop outside and in case (2) the buyer will look at its third best shopping location. The process is repeated until the buyer finds a shopping location with sufficient capacity or finds it cheapest to shop outside.

C. Employment Process

The employment requirements vary for each business type and level. These requirements are summarized below:

	Workers		
	High (RC)	Middle (RB)	Low (RA)
HI1	1	1	1
HI2	1	2	3
HI3	2	3	4
LI1	1	1	0
LI2	1	2	1
LI3	2	3	1
BG1	1	1	1
BG2	1	2	1
BG3	1	2	2
BS1	2	0	0
BS2	2	1	0
BS3	2	1	1
PG1	1	1	2
PG2	1	2	2
PG3	1	2	3
PS1	1	0	0
PS2	1	1	0
PS3	1	1	1

Residences do not employ.

When an economic team builds a business, it sets salaries which that business will pay to employees of each of the three classes. Typical salaries are $10,000 per high income worker, $5,000 per middle income worker and $2,500 per low income worker. If a business requires 2 employees from a particular class, the same salary is offered to each; the business does not set two different salary levels within that class. Residents are assigned jobs by the computer in the following manner.

The employment assignment process runs first for high income (RC), second for middle income (RB), third for low income (RA), and last for slum (RS) residents. Each population group (actually 1000 workers) applies for the best job available. The "best" job for a worker is at the employment location for which the salary offered by the business minus the transportation cost to get there is greatest.* If there are more job applicants at a business than there are job openings, those applicants having the greatest dollar difference between their best and second-best jobs are chosen to work there. The assumption is that those workers will fight hardest for their "best" jobs because of the dollar differential. An applicant who is refused a job at his best employment location then applies for a job at his second-best job location. This process continues until either all workers have found jobs or all jobs are filled.

If all jobs are filled and there are still workers without jobs, those workers are the first to be hired when the employment process runs for the next lowest class and is paid the salary corresponding to that lower class. Here the assumption is that an employer would prefer more highly skilled labor, particularly when the better labor does not have to be paid higher wages.

If the employment process for a class is finished, all workers are employed and there are still job openings, those unfilled jobs will be taken by labor from outside the local economy. Outside labor must be paid an amount double the typical local wage. For example, a high-income worker from the outside must be paid $20,000.

When calculating the transportation cost to an employment location, the computer selects the cheapest route. When a road is congested, i.e., when there is more traffic on it than it was designed to bear, the cost to travel on it increases. If a road is being over-used by 50% of its

*There is no transportation cost to get to a government job.

design capacity, the cost to travel on it is 50% greater. Road congestion therefore affects the route selection.

Transportation costs per mile for workers over the various types of roads are:

	Road Type		
	I	II	III
High Income (RC)	$130	$260	$390
Middle Income (RB)	90	180	270
Low Income (RA)	30	60	90
Slum (RS)	30	60	90

Since the people are represented by the owners of the residences in which they live, these owners should ascertain that fair salaries are being offered and that there are sufficient roads which are not overcrowded. Furthermore, by building new residences, economic teams can fill jobs which may presently be occupied by workers from the Outside System.

D. Income

Economic teams owning different land uses earn income from various sources.

Basic Industry (HI and LI) earns income from the sale of its products to the Outside System representing the national economy. The normal incomes for these industries at full capacity are:

	Normal Income
Heavy Industry	
HI1	$ 70,000
HI2	112,000
HI3	173,000
Light Industry	
LI1	$ 83,000
LI2	129,000
LI3	162,000

The normal income for industries may fluctuate from round to round. The factor by which it fluctuates is the Ratio of Industry Income to Normal (see "Outside Economic Status Report," p. 114). This ratio is determined by the computer, which simulates the business cycle of the Outside System. By multiplying this ratio times the normal income for an industry, you can determine the income for a particular round. If the ratio is greater than 1, the income will be greater than normal; if it is less than 1, the income will be less than normal.

Another factor which affects the income of basic industry is the value ratio. Since the value ratio affects production, industries with value ratio less than 1.00 will earn an income equivalent to the Normal Income times the Ratio of Industry Income to Normal times the effect on production of the value ratio.

The manner in which the value ratio affects production is given in Figure II-A. For example, an LI3 with a value ratio of .78 would be producing at 60% of its capacity. Assuming that the Ratio of Industry Income to Normal is 1.07, the LI3 would earn an income of $162,000 (normal income) times 1.07 (Ratio of Industry Income to Normal) times 60% (effect of value ratio on production) or $104,004.

Commercial establishments (BG, BS, PG, PS) earn income from selling their goods and services (RPU's) to customers in the local area and from the construction that takes place in the area.

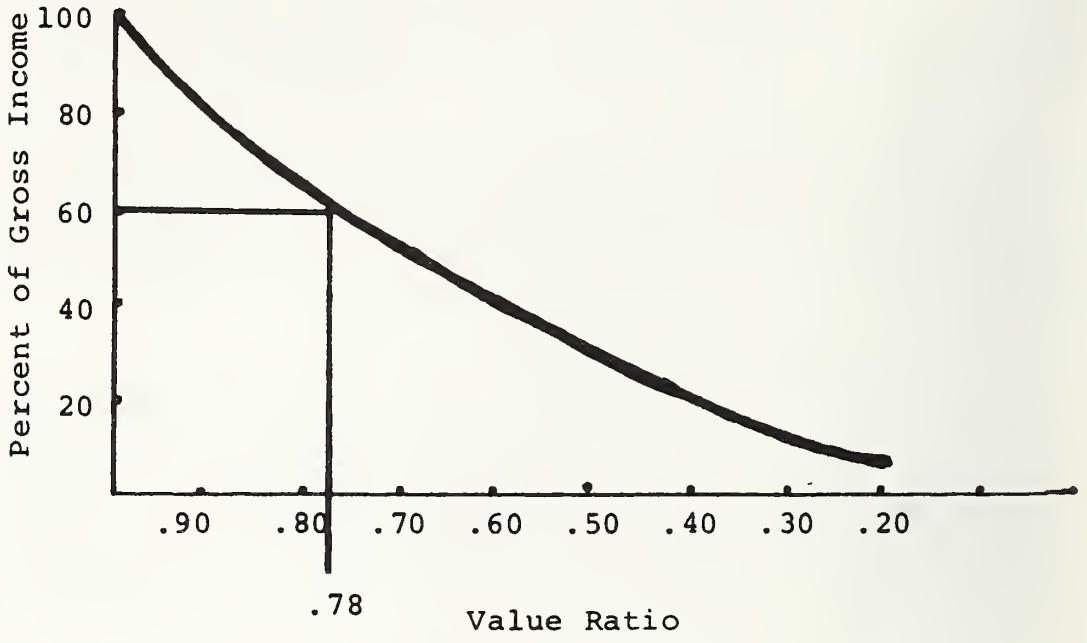
As mentioned before, commercial establishments sell RPU's to basic industry, other commercial establishments, and residences. Furthermore, teams owning commercial establishments can set the price charged to each customer. This information is summarized below:

Commercial Land Use	Design Capacity (RPU's)	Customer Consumption
Business Goods		
BG1	29	HI1- 6 RPU's; LI1- 8 RPU's; PG1- 2 RPU's
BG2	43	HI2-10 RPU's; LI2-12 RPU's; PG2- 3 RPU's
BG3	64	HI3-14 RPU's; LI3-14 RPU's; PG3- 4 RPU's

FIGURE II-A

PERCENTAGE OF GROSS INCOME RECEIVED BY

BASIC INDUSTRY AS A FUNCTION OF THE VALUE RATIO



Commercial Land Use	Design Capacity (RPU's)	Customer Consumption
Business Services		
BS1	52	HI1- 6 RPU's; LI1 -8 RPU's; PG1- 2 RPU's; PS1- 2 RPU's
BS2	69	HI2-10 RPU's; LI2-12 RPU's; PG2- 3 RPU's; PS1- 2 RPU's
BS3	80	HI3-14 RPU's; LI3-14 RPU's PG3- 4 RPU's; PS - 2 RPU's
Personal Goods		
PG1	45	RC1- 3 RPU's*
PG2	64	RB1- 2 RPU's*
PG3	77	RA1- 1 RPU's*
Personal Services		
PS1	51	RC1- 3 RPU's*
PS2	74	RB1- 2 RPU's*
PS3	90	RA1- 1 RPU*

[*NOTE: PG and PS consumption for residences is a function of the development level. For example, a RC3 requires 3 x 3 or 9 RPU's of PG.]

MAXIMUM (TOTAL) PRICES THAT CAN BE CHARGED

Consumer	Seller			
	BG	BS	PG	PS
HI1	21,000	10,000	--	--
HI2	34,000	16,000	--	--
HI3	56,000	26,000	--	--
LI1	30,000	13,000	--	--
LI2	46,000	20,000	--	--
LI3	56,000	23,000	--	--

Consumer	Seller			
	BG	BS	PG	PS
PG1	6,000	4,000	--	--
PG2	10,000	5,000	--	--
PG3	13,000	6,000	--	--
PS1	--	4,000	--	--
PS2	--	4,000	--	--
PS3	--	4,000	--	--
RC1*	--	--	3,580	1,890
RB1*	--	--	1,970	880
RA1*	--	--	1,070	450

[*NOTE: Prices charged to residences of other development levels are multiples of the development level. For example, if a PS charges 450 to a RA1, it charges 1,350 to a RA3.]

Value ratio affects the number of RPU's that can be sold. For example, a BG3 has a design capacity of 64 RPU's, but if the value ratio is .80, the actual capacity is .80 x 64 or 51.2 (rounded to 51) RPU's. When the computer assigns customers to that BG3, it will assign at most 51 RPU's.

Also remember that the maximum prices paid by customers include transportation costs. Transportation costs for a Type I road are:

	Travel to:	
	BG	BS
HI1	$ 500 per mile	$200 per mile
HI2	750 per mile	300 per mile
HI3	1,000 per mile	400 per mile
LI1	500 per mile	50 per mile
LI2	750 per mile	80 per mile
LI3	1,000 per mile	100 per mile
PG1	150 per mile	100 per mile
PG2	200 per mile	100 per mile
PG3	250 per mile	100 per mile

	Travel to:	
	BG	BS
PS1		$100 per mile
PS2		100 per mile
PS3		100 per mile
RC1	$ 150 per mile	70 per mile
RB1	60 per mile	40 per mile
RA1	20 per mile	10 per mile

[Note: Costs are double on a Type II and triple on a Type III road.]

Some commercial establishments (BG and BS) also earn income from a share of the construction that is undertaken by teams in the simulated county. In addition, construction consumes RPU's of BG and BS (the equivalent of equipment and materials) which are subtracted from the effective capacity (value ratio times design capacity) of the establishment.

BG establishments can receive 75% of the total expenditures for private construction in the county. BS establishments can receive 25% of the total. The manner in which an establishment derives its share of the construction income is determined by the proportionate amount of business which a particular establishment is doing in the county. For example, a BG which is doing 1/8 of all the BG business in the county is eligible to receive 1/8 of 75% of the total expenditures for construction during that round. $2500 of construction income consumes 1 RPU of BG output and $1500 of construction income consumes 1 RPU of BS output. A BG or BS cannot receive more construction income and/or be drained of more RPU's than its effective capacity (design capacity times value ratio).

Residences earn income on behalf of the workers which they supply to the labor market. A RC1 supplies 1 high income worker (typical salary $10,000); a RB1 supplies 1 middle-income worker (typical salary $5,000); and a RA1 or RS1 supplies 1 low income worker (typical salary $2500).

Residences above the first level of development supply additional workers in proportion to their level of development. For example, a RC3 would supply 3 high income workers who, if employed and offered the "typical salary" of $10,000 each, would earn a total income of $30,000.

Economic teams can also earn income from a variety of sources not related to the operation of a particular development. These sources include property sold, subsidies received, return on investments, and interest (fixed at 5%) on savings (i.e., unspent funds).

E. Expenditures

Basic Industries (HI and LI) and Commercial Establishments (BG, BS, PG, PS) spend money on salaries, business goods (BG), business services (BS) for normal operation, transportation to BG and BS establishments (except BG and BS) and transportation to terminals (HI LI, and BG only).

Expenditures for salaries vary according to the salary per worker which is set by the team owning an industry, and the employment requirements of that industry. The typical salaries are $2,500 per low income worker, $5,000 per middle income worker, and $10,000 per high income worker. If the local labor force does not supply sufficient workers, the computer is forced to recruit workers from the Outside System and salaries equivalent to double the typical must be deducted. The typical wage bill for all employees is given below:

Type of Business	Employment Requirements			Typical Wage Bill
	High (RC)	Middle (RB)	Low (RA)	
HI1	1	1	1	$ 17,500
HI2	1	2	3	27,500
HI3	2	3	4	45,000
LI1	1	1	0	15,000
LI2	1	2	1	22,500
LI3	2	3	1	37,500
BG1	1	1	1	17,500
BG2	1	2	1	22,500
BG3	1	2	2	25,000

Type of Business	Employment Requirements			Typical Wage Bill
	High (RC)	Middle (RB)	Low (RA)	
BS1	2	0	0	$ 20,000
BS2	2	1	0	25,000
BS3	2	1	1	27,500
PG1	1	1	2	20,000
PG2	1	2	2	25,000
PG3	1	2	3	27,500
PS1	1	0	0	10,000
PS2	1	1	0	15,000
PS3	1	1	1	17,500

Businesses must buy goods and services for their normal operation. The prices of BG and BS are set by the owners of the establishments. Different prices are charged to different customers. There is a maximum charge (including transportation) that a buyer will pay. These consumption requirements, maximum prices, etc., are outlined below:

Consumer	Transportation Charges		RPU's Consumed & Maximum Prices	
	To BG	To BS	BG	BS
HI1	500/mile*	200/mile*	6($21,000)	6($10,000)
HI2	750/mile*	300/mile*	10($34,000)	10($16,000)
HI3	1000/mile*	400/mile*	14($56,000)	14($26,000)
LI1	500/mile*	50/mile*	8($30,000)	8($13,000)
LI2	750/mile*	80/mile*	12($46,000)	12($20,000)
LI3	1000/mile*	100/mile*	14($56,000)	14($23,000)
BG1	--	--	$15,000 x # RPU's sold	
BG2	--	--	" " "	
BG3	--	--	$20,000 + 15,000 x # RPU's sold	
BS1	--	--	$400 x # RPU's sold	
BS2	--	--	" " "	
BS3	--	--	$3,000 + $400 x $ RPU's sold	
PG1	150/mile*	100/mile*	2($6,000)	2($4,000)
PG2	200/mile*	100/mile*	3(10,000)	3($5,000)
PG3	250/mile*	100/mile	4(13,000)	4($6,000)

Consumer	Transportation Charges		RPU's Consumed & Maximum Prices	
	To BG	To BS	BG	BS
PS1	--	100/mile*	--	2($4,000)
PS2	--	100/mile*	--	2($4,000)
PS3	--	100/mile*	--	2($4,000)

*[NOTE: These costs are per mile on a Type I road. Costs are double on a Type II and triple on a Type III road.]

If total costs (including transportation) are below the maximum, all industrial and commercial establishments (except BG and BS) will purchase goods and services from local BG and BS establishments until the supply is depleted, in which case they purchase goods and services from the Outside at prices equivalent to the maximum. There are no transportation charges when purchasing goods and services from the Outside.

Since HI and LI sell their output to the Outside they must ship their goods to a terminal for distribution. BG establishments also incur transportation costs to terminals for receiving goods from the Outside. These costs are summarized below:

Land Use	Transportation Charges to Terminals on Type I Road*
HI1	$2,000/mile
HI2	3,000/mile
HI3	4,000/mile
LI1	500/mile
LI2	1,000/mile
LI3	1,500/mile
BG1	500/mile
BG2	1,000/mile
BG3	1,500/mile

[Terminals are built by the Highway Department. They are usually located at intersections of major roads in the simulated area.]

*Costs are double on a Type II and triple on a Type III road.

Residences* spend money on transportation to work, purchases of PG and PS, transportation to PG and PS, and in some cases, schools.

Costs for transportation to work on a Type I road are summarized below:

Land Use	Number of Workers			Transportation Charges
	High	Middle	Low	
RC1	1	-	-	$130 per mile
RB1	-	1	-	90 per mile
RA1 (RS)	-	-	1	30 per mile

Like basic industries and commercial establishments, residences spend money on goods and services required for normal consumption. The amount of money expended for PG and PS depends on the price charged by the teams owning PG and PS establishments. However, there is a maximum amount (including transportation to PG and PS) that a residence will pay. This is summarized below:

Residence Type	Transportation Charges		Requirement for Normal Consumption: RPU's consumed and Maximum Price	
	To PG	To PS	PG	PS
RC1	$100/mile	$70/mile	3($3,580)	3($1,890)
RB1	60/mile	40/mile	2($1,970)	2($880)
RA1 (RS)	20/mile	10/mile	1($1,070)	1($450)

[NOTE: These costs are per mile on a Type I road. Costs are double on a Type II and triple on a Type III road.]

If total costs (including transportation) are below the maximum all residential establishments will purchase goods and services from local PG and PS establishments until the supply is depleted; in which case they purchase goods and services from the Outside at prices equivalent to the maximum. There are no transportation charges when purchasing goods or services from the Outside.

*All costs and characteristics for residences of different development levels are directly proportionate. For example, an RB3 spends three times as much on transportation as an RB1. The same holds true for PG and PS requirements, and transportation to PG and PS.]

School costs are incurred by residences under either of two circumstances: (1) if they are forced to attend private schools because the local schools fail to meet certain criteria for attendance; or (2) if transportation costs for schools are excessive.

Students from a middle-income residence (RB) will not attend a school with any one of the following characteristics: (1) a student-teacher ratio in excess of 16 to 1; (2) a value ratio less than .65, or (3) a larger number of middle-income teachers than high-income teachers. Similarly, students from a high-income residence will not attend a school unit with (1) a student-teacher ratio in excess of 13.0, (2) a value ratio lower than .85, or (3) a teacher staff with less than twice as many high-income teachers as middle-income teachers.

If a team has residence units whose students do not attend local public schools, it is charged $2,000 per residence (development level) for private school costs.

Teams also pay for all the transportation costs to school for residence units that have more than a $500 transportation charge. If the transportation cost for students is $500 or less, it is paid by the School Department. Transportation costs to schools are $50 per mile on Type I road, $100 per mile on Type II road and $150 per mile on Type III road, per residence (development level).

Teams may also spend money on items not related to the operation of a specific business. These include purchase of land, loans granted, investments, loan payments, and taxes and construction. Taxes are paid on the property (the assessed value of land and developments); net income (all parcels earning positive income); and sales (purchases of personal goods). All tax rates are set by the Chairman. Construction costs involve building a new development or upgrading an older development. These costs are:

Land Use	Construction Costs
HI1	$100,000
HI2	150,000
HI3	200,000
LI1	120,000
LI2	175,000
LI3	200,000

Land Use	Construction Costs
BG1	$150,000
BG2	175,000
BG3	200,000
BS1	150,000
BS2	175,000
BS3	200,000
PG1	50,000
PG2	75,000
PG3	100,000
PS1	30,000
PS2	45,000
PS3	60,000
RC1	30,000*
RB1	15,000*
RA1	7,500*

*NOTE: Construction costs for residences are multiples of the development level. For example, an RC3 would cost 3 x $30,000 or $90,000.

Upgrading costs are the difference between costs for the present level of development and for the level to be attained. For example, it costs $80,000 to upgrade an LI1 to an LI3.

Demolition costs (i.e., lowering the level of development) are 1/5 of construction costs.

IV. INPUT

A. Economic Sector Decisions

1. Borrow or Lend Money

Economic teams may take out loans from the Outside Economy or from other teams. When borrowing from another team the interest rate and term of the loan is determined by the teams involved. When borrowing from the Outside the interest rate is determined by the computer (see Outside Economic Status Report) and the term is five years.

Teams may not incur a debt to the Outside of greater than 13.3% of their total assessed value (land and developments).

2. Transfer Cash

Teams may transfer money to each other without making loans.

3. Invest in Speculative or Conservative Stocks

Teams may invest outside the local economy. Two types of national investments exist: speculative and conservative. Speculative investments average a return of between 4% and 14% for 80% of the time and -30% and +30% for 20% of the time. Conservative investments have an average rate of return of between 3% and 9%.

4. Restore Slums

Low-income housing which has depreciated below a value ratio of .50 (see page 9, value ratio) becomes slum housing (RS) with a value ratio of 1.00. The workers are out of the labor market for a round while the population is in transition. Slum workers are the last to be considered for low-income job-openings. Slums can be restored to low-income housing at a cost per RS of $5,000 + (1.00 - value ratio) x $20,000. When a slum has deteriorated to a value ratio below .80, it is cheaper to demolish it and build new low-income housing. A restored slum becomes a low-income residence (RA) with a value ratio of 1.00. Restoration is not affected by local growth restrictions. (For more information on growth restrictions, see "Socio-Economic Parameters for the Round.")

5. Purchase and Bid on Land

Teams may trade, sell, or give away full parcels of land among themselves. It is not possible for two teams

to own parts of the same parcel of land; but public and private ownership of parts of the same parcel is possible if the parcel is undeveloped or developed residential. When land is sold to an economic decision-maker, all buildings on the parcel are included in the transaction.

Teams may bid on unowned parcels of land.* The minimum amounts of bid are in Estateville, $5000; in Newtown, $3000; and in Farmington, $1500. Bids must be in multiples of $100. The probability of a land bid being accepted is proportional to the excess of the bid over the minimum bid. If an amount above the minimum bid is offered then the probability of acceptance increases. Regardless of the amount of the bid, however, the probability of acceptance does not rise above 70 percent. The maximum probability of acceptance (70 percent) is reached when $10,000 is bid in Farmington; when $15,000 is bid in Newtown, and when $20,000 is bid in Estateville. When bidding on land owned by the Outside there is a bidding fee of 10% of the bidding price. This fee is charged regardless of whether or not the bid is successful.

6. Build or Upgrade Residences

An economic team may build new residences or upgrade old ones (i.e., add an existing level of development). The costs for construction are $30,000 for an RC, $15,000 for an RB, and $7,500 for an RA for each level of development. Only one type of residence may exist on a parcel.

When building residences on a parcel of land, the economic team should check to see that zoning is not prohibitive and that the parcel, if undeveloped, has utility service installed. Zoning codes are listed on page 73.

7. Build or Upgrade Businesses

An economic team may build new businesses or upgrade (i.e., add an additional level of development) old ones. The costs for construction are outlined below:

Land Use	Construction Costs
HI1	$100,000
HI2	150,000
HI3	200,000

*These parcels of land are owned by the Outside Economy.

Land Use	Construction Costs
LI1	$120,000
LI2	175,000
LI3	200,000
BG1	150,000
BG2	175,000
BG3	200,000
BS1	150,000
BS2	175,000
BS3	200,000
PG1	50,000
PG2	75,000
PG3	100,000
PS1	30,000
PS2	45,000
PS3	60,000

Only one type of business may exist on a parcel. When building a business, economic teams should check to see that zoning is not prohibitive and that the parcel, if undeveloped, has utility service installed. (Zoning codes - page 98.)

8. Demolish Residences

Economic teams may lower the development level of any residences. Demolition costs are 1/5 of construction costs. A low-income residence may not be demolished unless a low-income residence has been constructed previously in the same round.

9. Demolish Businesses

Economic teams may lower the development level of any business. Demolition costs are 1/5 of construction costs.

10. Renovate Residences or Businesses

Economic teams may renovate (i.e., raise the value ratio) of any land use and thereby increase the value and improve the physical condition and the capacity of a building. The cost of renovation is determined by taking the difference between the present value ratio and the new (renovated) value ratio and multiplying it times the

construction cost. For example, the cost of renovating an HI3 with a present value ratio of .80 to a value ratio of 1.00 would be .20 times $200,000, or $40,000.

Renovation is necessary because the value ratio affects the gross income from the Outside Economy for basic industry; the capacity of a commercial establishment; and the class of a residence unit. For all land uses, as the value ratio decreases, the chances of natural disaster increase (see page 120).

11. Change Prices or Salaries

A team may change the price charged at any of its commercial developments by giving the location of the development and the new price to be charged. For example, a BG sets a price only for HI1, LI1 and PG1, and a PG sets a price only for low (RA), middle (RB) and high (RC). Prices are set only for the lowest level of development because the prices for higher levels of development are specified proportions of those for the lowest level. The maximum prices (including transportation charges) and the proportional constants (for all other levels of development) for all consumers of goods and services are given below:

Buyers			Sellers	
	BG	Proportional Constant	BS	Proportional Constant
HI1	21,000	1.00	10,000	1.00
HI2	34,000	1.62	16,000	1.6
HI3	56,000	2.67	26,000	2.6
LI1	30,000	1.00	13,000	1.00
LI2	46,000	1.53	20,000	1.54
LI3	56,000	1.87	23,000	1.77
PG1	6,000	1.00	4,000	1.00
PG2	10,000	1.67	5,000	1.25
PG3	13,000	2.17	6,000	1.50
PS1	--	--	4,000	1.00
PS2	--	--	4,000	1.00
PS3	--	--	4,000	1.00

Buyers			Sellers	
	PG	Proportional Constant	PS	Proportional Constant
RC1	1,070	---	450	---
RB1	1,970	---	880	---
RA1(RS)	3,580	---	1,890	---

In other words, if a BG sets a price of $19,000 to an HI1, it is charging an HI2 $30,780 (1.62 x $19,000) and an HI3 $50,730 (2.67 x $19,000).

Residences are charged in direct multiples of their development levels.- (i.e., an RB2 will be charged twice as much as an RB1.)

Economic teams can also change the salaries offered to employees at businesses which they own. The "typical" salaries are $2,500 per low income (RA) workers, $5,000 per middle income (RB) workers, and $10,000 per high income (RC) workers. Salary changes may be desirable in periods of inflation or deflation in the local economy. If the number of workers becomes scarce, employment services can be acquired by raising salaries to an appropriate level*. Conversely, if the number of residential units seeking jobs is excessive, a lowering of salaries will still obtain workers for the business offering the lowered salaries.

*Remember: If a business is forced to employ workers from the Outside, it pays salaries which are twice those offered to local workers.

B. Procedures and Formats

Since City I is a computer-assisted model, it is necessary that information be fed to the computer in a certain format. This format is quite elementary and requires no knowledge of computer programming. It merely involves filling out forms in the proper manner with the required information for each decision.

In order to make a decision and feed it to the computer, participants in the City I game must fill in an input decision form (see Figure V-A) with certain information. The information which is required on the input decision form varies with the type of decision being implemented. The type of information which is required is explained on the decision formats (see pages 136 to 143). There are six input explanation formats: one for economic teams, and one each for the Chairman and Council, School Department, Public Works and Safety Department, Highway Department, Planning and Zoning Department. An input decision form has the following components: Decision Code; (first card) and additional information (second card). Each of these components is explained below:

1. Decision Code

This indicates the type of decision that is being made. It is always a two-letter abbreviation preceded by a dollar sign ($). Essentially, the decision code describes the type of decision being made to the computer. These codes are summarized below:

Private Decisions

1. $LO - borrow or lend money
2. $CT - transfer cash
3. $IN - Invest in speculative or conservative stocks
4. $RS - Restore slums
5. $PU - Purchase land or bid on land
6. $DR - Demolish residences
7. $DB - Demolish businesses
8. $RN - Renovate residences and businesses

Private Decisions

9. $BR - Build and upgrade residences
10. $BB - Build businesses
11. $UB - Upgrade businesses
12. $CS - Change prices and salaries

Public Decisions

13. $ZO - Change Zoning
14. $LB - Grant appropriations
15. $TR - Change tax rate and estimate tax base
16. $SB - Grant subsidy
17. $UR - Construct and/or upgrade roads
18. $RR - Renovate roads
19. $BT - Construct and/or upgrade terminals
20. $BM - Build MS plants and change MS employment
21. $RM - Renovate MS plants
22. $DS - Demolish MS plant and demolish schools
23. $CH - Change MS salaries and school salaries
24. $BU - Build utility plants and/or change utility service
25. $BS - Build schools and change employment
26. $RS - Renovate Schools

2. Additional Information

The additional information concerning a decision is filled in the spaces immediately following the decision code. These spaces correspond to the columns marked (a), (b), (c), etc. on the input decision form and the input explanation form. The amount and type of additional information varies with the type of decision being made.

To clarify the procedure for filling out forms, it is suggested that participants review the sample decisions on page 84 of this manual.

INPUT DECISION FORM

NOTE: When filling out this form, refer to input description format in the manual.

Please write clearly; distinguish between "l" (one) and "I" (eye), "Ø" (oh) and "0" (zero); be sure to fill in the numbers exactly as required, omitting commas within numbers (for example, 100000).

Decision Code	a	b	c	d	e
$ _____	_____ ,	_____ ,	_____ ,	_____ ,	_____
$ _____	_____ ,	_____ ,	_____ ,	_____ ,	_____
$ _____	_____ ,	_____ ,	_____ ,	_____ ,	_____
$ _____	_____ ,	_____ ,	_____ ,	_____ ,	_____
$ _____	_____ ,	_____ ,	_____ ,	_____ ,	_____
$ _____	_____ ,	_____ ,	_____ ,	_____ ,	_____
$ _____	_____ ,	_____ ,	_____ ,	_____ ,	_____
$ _____	_____ ,	_____ ,	_____ ,	_____ ,	_____
_____	_____ ,	_____ ,	_____ ,	_____ ,	_____

FIGURE V-A

SAMPLE DECISIONS

1. The School Department wishes to change salaries to $6,500 for middle income and $11,500 for high-income teachers.

Decision Code	a	b	c	d	e	f
$ CH	SC,	0,	65,	115,	,	.

2. Economic team B lends $25,000 to economic team D. The term is three rounds and the interest rate is 7%

$ LØ	D,	250,	B,	3,	70,	.

3. Economic team C is building a BG2 at 98-34. Salaries will be $2600 for low, $5100 for middle, and $10,100 for high. The charge will be $22,000 to LI1, $18,000 to HI1, and $5,000 to PG1.

$ BB	C,	9834,	BG,	2,	,	,
$	26,	51,	101,	,	,	,
$	2200,	1800,	500,	,	,	.

ECONOMIC SECTOR: Explanation of Decision Formats

Decision Description	Code	a	b	c	d	e	f
Borrow or Lend Money	$LO	team borrowing	amount (in $100's)	lender (OU if "Outside")	term, if team lending	interest rate in tenths of a percent, if team lending (i.e. "80" is 8%)	
Transfer Cash	$CT	team transferring cash	team receiving cash	amount (in $100's)			
Invest in Speculative or Conservative stocks	$IN	team investing	amount (in $100's), if selling write a negative number	SP (speculative) or BC (conservative			
Restore Slums	$RS	owner	location				
Purchase Land or Bid on Land	$PU	location of parcel	amount (in $100's)	purchaser	seller (CI if seller is county or OU if "Outside")	1, if Planning and Zoning is seller and only a portion of parcel is sold.	
Demolish Residences	$DR	owner	location of residence	new development level (0, if complete demolition)			

Economic Sector: Explanation of Decision Formats (Cont'd)

Decision Description	Code	a	b	c	d	e	f
Demolish Businesses	$DB	owner	location	new development level (0, if complete demolition)			
Renovate Residences or Business	$RN	owner	location	new value ratio (expressed as an integer 100 or less)			
Build and Upgrade Residences	$BR	owner	location of residence	number of new development levels to be added	class (1 = low or RA; 2 = middle or RB; 3 = high or RC)		
Build Businesses	$BB	owner	location of business	building type (HI, LI, BG, BS, PG, PS)	development level		
		salaries to low income (in $100's)	salaries to middle income (in $100's)	salaries to high income (in $100's)			
		if BG or BS, charges to LI1 (in $10's); if PG or PS, charges to low income (RA) (in $10's)	if BG or BS charges to HI1 (in $10's); if PG or PS charges to middle income (RB) (in $10's)	if BG or BS charges to PG1 (in $10's); if PG or PS charges to high income (RC) (in $10's)	if BS, charges to PS1 (in $10's)		
Upgrade Business	$UB	owner	location of business	new development level			

Economic Sector: Explanation of Decision Formats (Cont'd)

Decision Description	Code	a	b	c	d	e	f
Change Prices	$CS	location	1				
		if BG or BS, new prices (in $10's) to LI1; if PG or PS new prices (in $10's) to low income (RA)	if BG or BS new prices (in $10's) to HI1; if PG or PS, new prices (in $10's) to middle income (B)	if BG or BS, new prices(in $10's) to BG1; if PG or PS, new prices (in $10's) to high income (RC)	if BG or BS new prices (in $10's) to PS1		
Change Salaries	$CS	location	2				
		new salary to low income (RA) (in $100's)	new salary to middle income (RB) (in $100's)	new salary to high income (RC) (in $100's)			

V. OUTPUT

A. Description of Economic Output

The following section offers a detailed description of computer output distributed to teams in the economic sector. Each description includes samples of the output being discussed. When reading output participants should refer to the Economic Sector Master Sheets on pages 30-32. This will help them to understand the numbers with which they are dealing.

At the beginning of each round, economic teams receive output describing their economic status. This output is divided into three parts: Detailed Property Statement, Summary Property Statement, and Summary Financial Statement.

1. Detailed Property Statement

This output summarizes the status of all the land uses owned by the team. The type of information differs between residences, basic industries, and commercial establishments.

a. For residences (RC, RB, RA and RS) it shows:

(1) Location - the even-numbered horizontal and vertical coordinates which identify the parcel on all maps.

(2) Class - the income class of people who live there: A (low), B (middle), and C (high) and S (slum) or none (where there are no residences but there is public ownership of part of the parcel).

(3) Type - the type of land use on the parcel. This is usually RES (for residence) but if the government owns part of the parcel, it may indicate SCH (school), MS (municipal service unit); or PARK (parkland). If the government owns a portion of a parcel, it can only be developed as residential.

(4) Employment Location - the location where the inhabitants of a residence are employed.

(5) Employment Number - the number of inhabitants of the residence which are employed at the previously given location. In some cases, residential units may be at different locations, or due to insufficient jobs, there may be unemployment.

(6) Salary - the total salary earned by a residence at each employment location. "Typical" salaries are $2500 per low income worker (RA or RS), $5000 per middle income worker (RB), and $10,000 per high income worker (RC). Depending on conditions in the local labor market, it is possible for a worker to become employed below his residential class.

(7) Transportation - the transportation charges incurred for travelling to work. These charges take into account distance, type of road, and congestion if any.

(8) PG or PS Location - the location of the Personal Goods and Personal Services establishments to which the computer has assigned the residence to purchase the goods and services which it requires for normal operation. A location of "OUT" specifies the Outside economy. This means that the supply of PG or PS in the local area is insufficient or the local prices are too high, and the residence units purchase personal goods and services at a cost equivalent to the maximum.

(9) Payment - the total price paid for the purchase of PG or PS. Prices are set by the teams owning PG and PS establishments, but residential customers will only pay up to a certain maximum (including transportation costs). If the price charged plus transportation costs is greater than the maximum, they will purchase PG and PS from the Outside system at prices equivalent to the maximum.

(10) Transportation - the transportation charges incurred for travelling to PG and PS establishments. There is no transportation charge when purchasing goods and/or services from the Outside economy.

(11) MS Location - the location of the municipal service unit serving the residence. The extent of damage that occurs when a parcel is struck by a natural disaster is determined by the quality of the municipal service unit that is serving it. (For explanation, see page 120).

(12) School Location - the location of the school which the students in a residence are attending. If the students are attending Outside schools because local schools fail to meet minimum standards for a class, the location given is 70-62.

TEAM A FOR ROUND 1

RESIDENCES

LOCATION	CLASS	TYPE	EMPLOYMENT LOC	NO	SALARY	TRANS	PG LOC
70-16	A	RES.	70-14	3	$ 7500	$ 00	76-16
		RES.	70-12	3	$ 7500	$ 90	
82-16	C	RES.	80-20	1	$10000	$ 390	70-62
82-24	C	SCH.					84-22
		RES.	80-22	1	$10000	$ 00	
		RES.	78-20	1	$10000	$ 520	
		RES.	76-22	1	$10000	$ 650	
82-26	C	RES.	80-24	1	$10000	$ 00	84-22
102-46	A	RES.	M.S.	1	$ 2500	$ 00	98-46
100-48		PARK		1			0- 0

PAYMENT	TRANS	PS LOC	PAYMENT	TRANS	MS LOC	SC LOC	SC CST
$ 6000	$ 180	74-18	$ 2400	$ 240	72-18	70-18	$ 0
$ 3580	$ 00	82-14	$ 1600	$ 00	84-16	82-24	$ 0
$ 9000	$ 00	80-24	$ 4800	$ 00	82-22	70-62	$ 6000
$ 3000	$ 00	80-24	$ 1600	$ 300	82-28	70-62	$ 2000
$ 1000	$ 00	70-62	$ 450	$ 40	98-48	100-46	$ 0
$ 00	$ 00	0- 0	$ 00	$ 00	0- 0	0- 0	$ 0

(13) School Cost - a residence must pay the transportation cost of its students if it is greater than $500. Costs are $50 per mile on Type I road, $100 per mile on Type II road, and $150 per mile on Type III road per residential level of development. If the travel cost is $2000 or more, it will cost $2000 per residential level of development to send students to schools in the Outside System. It also costs $2000 to send students to Outside Schools if local schools do not meet certain minimum standards.

b. For Basic Industries, the Detailed Property Statement shows:

(1) Type - the type of industry: HI (Heavy Industry) or LI (Light Industry).

(2) Level - the level of development: This ranges from 1 to 3.

(3) Location - the even-numbered horizontal and vertical coordinates which identify the parcel on all maps.

(4) Employee Location - the residence location of the workers employed at the industry. A location of "OUT" indicates that there is an insufficient supply of local workers and that the industry is importing employees from the Outside economy at twice the "typical" salaries.

(5) Employee Number - the number of employees actually hired. Each industry has different employment requirements for different levels of development.

(6) Class - the income class of the employees working at the basic industry: (RC) high, (RB) middle, and (RA or RS) low.

(7) Salary - the total salary paid to each class of workers. "Typical" salaries are $2500 per low-income worker, $5000 per middle-income worker, and $10,000 per high income worker. "Typical" salaries are doubled if the industry is forced to hire employees from the "Outside" economy.

(8) BG or BS Location - the location of the Business Goods or Business Services establishments to which the computer has assigned the industry to purchase the goods and services which it requires for normal operation. A location of "OUT" specifies Outside

economy. This means that the supply of BG or BS in the local area is insufficient or the local prices are too high and the industry must purchase business goods and services at a cost equivalent to the maximum.

(9) Payment - the total price paid for the purchase of business goods and services. Prices are set by the teams owning BG and BS establishments, but industrial customers will only pay up to a certain maximum (including transportation costs). If the price charged, plus transportation costs, is greater than the maximum, they will purchase BG and BS from the Outside economy at prices equivalent to the maximum.

(10) Transportation - the transportation charges incurred for travelling to BG and BS establishments. There is no transportation charge when purchasing goods and/or services from the Outside economy.

(11) Terminal Location - the odd-numbered coordinates of the terminal (located at an intersection) which is used by the basic industry. The computer assigns a basic industry to a terminal on the basis of least transportation cost.

(12) Transportation - the charges incurred for transporting output to a terminal for shipment to the Outside economy.

c. For Commercial Establishments (BG, BS, PG, PS), the Detailed Property Statement shows:

(1) Type - the type of commercial establishment: BG (Business Goods), BS (Business Services), PG (Personal Goods), PS (Personal Services).

(2) Level - the development level for the commercial establishment. This ranges from 1 to 3.

(3) Location - the even-numbered horizontal and vertical coordinates which identify the parcel on all maps.

(4) Employee Location - the residence location of the workers employed at the commercial establishment. A location of "OUT" indicates that there is an insufficient supply of local workers and that the commercial establishment is importing employees from the Outside economy at twice the typical salaries.

TEAM A FOR ROUND 1 (Cont.)

BASIC INDUSTRY

TYPE	LEVEL	LOCATION	EMPLOYEE LOC	NO	CLASS	SALARY	BG LOC
HI	2	76-20	80-28	1	HIGH	$10000.	74-22
			78-18	2	MED.	$10000.	
			78-22	3	LOW	$ 7500.	

BUSINESS GOODS + SERVICES

TYPE	LEVEL	LOCATION	EMPLOYEE LOC	NO	CLASS	SALARY	BG LOC
BS	1	78-26	76-26	1	HIGH	$10000.	0- 0
			78-28	1	HIGH	$10000.	

LI1	CHARGE TO HI1
11000.	9000.

PAYMENT	TRANS	BS LOC	PAYMENT	TRANS	TERM LOC	TRANS
$ 29140.	$ 0.	80-20	$ 14390.	$ 300.	75-21	$ 0.

PAYMENT	TRANS	BS LOC	PAYMENT	TRANS	TERM LOC	TRANS
$ 0.	$ 0.	0- 0	$ 0.	$ 0.	0- 0	$ 0.

PG1	PS1
3400.	3400.

CUSTOMER LIST

LOCATION	TYPE	LEVEL	RPUS	CHARGE
80-24	PS	1	2	$ 3400.
74-26	LI	1	8	$11000.
82-30	LI	1	8	$11000.
102-44	LI	1	8	$11000.
TOTAL			26	$ 36400.

SERVICE CHARGES $ 10400

TEAM A FOR ROUND 1 (CONT.)

PERSONAL GOODS + SERVICES

TYPE	LEVEL	LOCATION	EMPLOYEE LOC	EMPLOYEE NO	CLASS	SALARY	BG LOC
PS	1	80-24	82-26	1	HIGH	$10000.	0- 0

PAYMENT	TRANS	BS LOC	PAYMENT	TRANS	TERM LOC	TRANS
$ 0.	$ 0.	78-26	$ 3400.	$ 0.	0- 0	$ 0.

LOW 400. CHARGE TO MED 700. HIGH 1600.

CUSTOMER LIST

LOCATION	TYPE	LEVEL	RPUS	CHARGE
78-22	RA	3	3	$ 1200.
82-22	RB	2	4	$ 1400.
78-24	RA	3	3	$ 1200.
82-24	RC	3	9	$ 4800.
84-24	RB	1	2	$ 700.
76-26	RC	1	3	$ 1600.
82-26	RC	1	3	$ 1600.
78-28	RC	2	6	$ 3200.
80-28	RC	1	3	$ 1600.
82-28	RC	1	3	$ 1600.
84-28	RB	1	2	$ 700.
TOTAL			41	$ 19600.

(5) Employee Number - the number of employees actually hired from each location. Each commercial establishment has different employment requirements for different levels of development.

(6) Class - the income class of the employees working at the commercial establishment: high (RC), middle (RB) and low (RA and RS).

(7) Salary - the total salary paid to each worker (by location). Typical salaries are $2500 per low-income worker, $5000 per middle-income worker, and $10,000 per high-income worker. Typical salaries are doubled if the commercial establishment is forced to hire workers from the Outside economy.

(8) BG or BS Location - the location of the BG or BS establishment from which a commercial establishment purchases BG or BS for normal operation. Since BG and BS do not trade with each other, but with the Outside economy, this location is always 0-0 for them. PG does require BG and BS, however, and PG requires BS only. In this case, a location of "OUT" would specify the Outside Economy. This means that the supply of BG or BS is depleted in the local area and PG and PS establishments must purchase goods and/or services from the Outside system at costs equivalent to the maximum.

(9) Payment - the total price paid for BG or BS. This applies only to PG which purchases BG and BS, and PS which purchases BS only. Prices are set by the teams owning BG and BS establishments, but customers will pay only up to a certain maximum (including transportation costs). If the price charged, plus transportation costs, is greater than the maximum, they will purchase BG and BS from the Outside economy at prices equivalent to the maximum.

(10) Transportation - the transportation charges incurred for travelling to BG and BS establishments. This is applicable only to PG which purchases BG and BS, and PS which purchases BS only. There is no transportation charge when purchasing goods and/or services from the Outside economy.

(11) Terminal Location - the location of the terminal to which a BG has been assigned by the computer. This is applicable to BG only, since BG must receive large quantities of goods which it requires for normal operation from the Outside economy. BG establishments are assigned to terminals on the basis of least transportation cost and the size of the terminal.

(12) Transportation - the costs paid by the BG to receive goods at the terminal and transport them to the location of the BG.

(13) Charges - this shows the prices which the owner of a commercial establishment is charging to its customers . BG and BS customers are LI, HI, PG and PS Prices charged are specified for the first level of development, and prices charged for other levels if developments are multiples of that price (see page 45). PG and PS customers are high (RC), middle (RB) and low (RA or RS) income residential units. Again, prices charged are specified for the first level of development. Unlike other customers, the prices charged to other levels of development for residences are direct multiples of their development level. For example, an RB2 will be charged twice as much as an RB1.

(14) Customer List - the customers purchasing goods and/or services from commercial establishments; the development level of the land use purchasing; the number of RPU's of capacity consumed by each customer; and the charge (i.e., the price paid) by each customer. This also includes income earned from construction in the county.

(15) Service Charges - the amount paid to the Outside economy for purchase of goods and services for normal operation. This is applicable to BG and BS only.

(16) Construction Income - for BG and BS only, the income earned from a share of the construction undertaken in the simulated area. For further explanation, see page 23.

2. Summary Property Statement

This piece of output summarizes the status of all land and developments owned by an economic team. For each parcel owned it indicates:

a. Location - the even-numbered horizontal and vertical coordinates which identify the parcel on all maps.

b. Land Use - the type of land use and level of development. Undeveloped land which is owned by the team is specified by "UNO." If a residential land use is given a development level of zero (i.e., RA0 the government owns a portion of that land and only residences can be built there (as long as the government owns part of the parcel).

* * * * * SUMMARY PROPERTY STATEMENT FOR A * * * * *

ROUND 1

LOCATION	LAND USE	AREA	VALUE	RATIO	GROSS INCOME	TRANS. CHARGES	SERVICE CHARGES	WAGE COSTS	TAXES	NET INCOME
70-16	RA6	1	0.700		15000.	510.	8400.	0.	1264.	4825.
82-16	RC1	1	0.795		10000.	390.	5180.	0.	851.	3578.
82-24	RC3	1	0.875		30000.	1170.	19800.	0.	2304.	6725.
82-26	RC1	1	0.895		10000.	300.	6600.	0.	833.	2267.
102-46	RA1	4	0.905		2500.	40.	1450.	0.	250.	759.
100-48	RA0	4	0.000		0.	0.	0.	0.	68.	-68.
SUBTOTAL					67500.	2410.	41430.	0.	5572.	18087.
76-20	HI2	1	0.570		51013.	300.	43530.	27500.	3138.	-23454.
SUBTOTAL					51013.	300.	43530.	27500.	3138.	-23454.
78-26	BS1	1	0.925		36400.	0.	10400.	20000.	3156.	2844.
SUBTOTAL					36400.	0.	10400.	20000.	3156.	2844.
80-24	PS1	1	0.935		19600.	0.	3400.	10000.	778.	5422.
SUBTOTAL					19600.	0.	3400.	10000.	778.	5422.
86-22	UN0	1	0.000		0.	0.	0.	0.	108.	-108.
70-28	UN0	3	0.000		0.	0.	0.	0.	64.	-64.
96-48	UN0	4	0.000		0.	0.	0.	0.	64.	-64.
SUBTOTAL					0.	0.	0.	0.	236.	-236.
GRAND TOTAL					174513.	2710.	98760.	57500.	12880.	2662.

c. Area - the political jurisdiction in which a land parcel may be located. They are: 1. Central City; 2. Estateville; 3. Farmington; and 4. Newtown.

d. Value Ratio - the value ratio of a development. The value ratio affects gross income from the Outside economy for basic industries and the capacity of a commercial establishment. When the value ratio of a residence falls below .50, its occupants become members of the class below their previous class, i.e., an RC would become an RB, etc. Furthermore, the developments with the lowest value ratios are those most likely to be struck by natural disasters (see page 79).

The value ratio of all undeveloped land is 0.00 and all new buildings have a value ratio of 1.00.

e. Gross Income - the total income earned by each parcel. Owners of residences earn income by supplying workers to employers in the county. Commercial establishments earn income from selling goods and services to the local economy and from performing construction. Basic industry earn income from the sale of output to the outside economy.

f. Transportation Charges - the total transportation charges paid by each land use. For residences, this includes transportation to work, to PG, and to PS. For commercial establishments, it includes transportation charges to BG and BS (PG and PS only) and to terminals (BG only). For basic industry it includes transportation charges to BG and BS and to terminal.

g. Service Charges - total purchases of BG, BS, PG, and PS required for normal operation, whether purchased from local establishments or from the Outside economy. School costs (if any) for residences are also included in this category.

h. Wage Costs - total salaries paid by each development.

i. Taxes - total taxes paid by each parcel. Sales taxes are levied on residences only (on purchase of PG); property taxes are levied on the assessed value of all land and development, and income taxes are levied on any developments earning a positive net income before taxes. All tax rates are set by the Chairman.

j. Net Income - the gross income minus expenditures (transportation charges, service charges, wage costs, taxes) for each parcel. Usually, the net income for an undeveloped

parcel is negative, since it earns no income but must pay a property tax.

3. Summary Financial Statement

This output is a combination of a cash flow statement and a balance sheet. The cash balance sheet shows:

a. Cash on Hand at End of Round - cash available at the end of the previous round, after all expenditures have been made.

b. Previous Cash Balance - cash on hand at the beginning of the previous round before any expenditures are made.

c. Minus (Expenditures) - these include funds spent for such items as: properties purchased, new construction, loans granted to others, investments (speculative or conservative) and loan payments to other teams or the Outside economy.

d. Plus (Income) - income from various sources, including: property sold, loan payments received from others, subsidies received from the government, loans granted by others or the Outside economy, the total net income of all parcels (developed and undeveloped); interest on savings (unspent funds earn 5% interest); and miscellaneous (i.e., cash transfers from other teams, stocks bought or sold).

e. New Cash Balance - cash on hand at the end of previous round minus expenditures plus income. This becomes the cash available for the next round.

The cash balance sheet outlines the following:

(1) Assets

(a) Property - the market value of all land and developments owned by a team.

(b) Speculative and Conservative Investments - the amount of money invested in Outside stocks and return on the investments.

(c) Accounts Receivable - money owed to the team by others.

* * * * * SUMMARY FINANCIAL STATEMENT FOR A * * * * *

ROUND 1

CASH FLOW STATEMENT

CASH ON HAND AT END OF ROUND	$	220000.
PREVIOUS CASH BALANCE	$	220000.
MINUS		
PROPERTIES PURCHASED	$	0.
NEW CONSTRUCTION	$	0.
LOANS GRANTED	$	0.
INVESTMENTS	$	0.
LOAN PAYMENTS MADE	$	0.
PLUS		
PROPERTY SOLD	$	0.
LOAN PAYMENT RECEIVED	$	0.
SUBSIDIES RECEIVED	$	0.
LOANS RECEIVED	$	0.
NET INCOME	$	2662.
INTEREST ON SAVINGS	$	11000.
MISCELLANEOUS	$	0.
NEW CASH BALANCE	$	233662.

BALANCE SHEET

ASSETS				
PROPERTY			$	595500.
SPECULATIVE INVESTMENTS			$	0.
INCLUDING RETURN OF	$	0.		
CONSERVATIVE INVESTMENTS			$	0.
INCLUDING RETURN OF	$	0.		
ACCOUNTS RECEIVABLE			$	0.
CASH ON HAND			$	233662.
LIABILITIES				
OUTSTANDING DEBTS			$	0.
NET WORTH				$ 829163.
NEW BORROWING LIMIT	$	110278.		

(d) Cash on Hand - cash balance from Cash Flow Statement.

(2) Liabilities - Outstanding Debts - funds owed to other teams or the Outside economy.

(3) Net Worth - assets minus liabilities.

VI. GOVERNMENT SECTOR

The Government Sector in City I comprises the elected officials, a Chairman and two Councilmen (one from Central City and one from the three suburban jurisdictions), and the five bureaucratic departments: Finance, Highways, Schools, Public Works and Safety, and Planning and Zoning. Each team has at least one governmental role in addition to its economic one.

Each team acting as a public official has a number of responsibilities and resources which provide some general direction for its behavior as a public official. For example, the Planning and Zoning Department has the responsibility to acquire parkland and to maintain local zoning regulations. The resources available to the Planning and Zoning Department are its local appropriations and federal-state aid and its power to change the zoning of up to five parcels of land during each round. Given these responsibilities and resources, the team acting as the Planning and Zoning Department may attempt to achieve a wide variety of goals.

It is both the difference and the similarities in goals, established by different teams and with different resources, that bring about the dynamic interplay of decision-making in the public sector. For example, the Planning and Zoning Department may favor the development of industrial parks and satellite residential communities, but the Public Works and Safety Department may disapprove because of the need for new utility plants and new municipal service units. Naturally, the interests and desires of the private decision-makers (as voters and entrepreneurs) could be for or against the plan for any number of reasons.

As public decision-makers, teams should always remember that as a group, they comprise all of the decision-makers of the local system. Thus, the teams as a group may establish a legal system and enforce it if they so wish. At the beginning of play, there are no legal restrictions on private or public decision-making. (There are, however, procedural restrictions that are imposed by the computer programs). If teams want to, they may impose legal restrictions on the misuse of the powers of government office, bribery, conflict of interest, or any one of the other types

of actions that might not meet with the approval of the teams as a group. Once a law is passed by the teams in a demoractic vote, it must be enforced by the teams in any way they wish.

There are several major government programs in actual life, such as welfare and public housing, that are not explicitly institutionalized in the City I Model. Public programs such as welfare and public housing may be established through the use of public subsidies which are granted by the Chairman through the budget of the Planning and Zoning Department. For example, if a welfare program providing unemployed residence units with a minimum payment is desired, the Chairman team can establish the per residence unit payment and have the teams controlling unemployed residence units apply for payment based upon proof of unemployment during the previous round.

A. CHAIRMAN AND COUNCIL

1. EXPLANATION OF THE ROLE

The Chairman team has the resources to be the most powerful political force in the community. It is elected by a majority of the teams and is responsible for appointing the five bureaucratic departments (Finance, Highways, Schools, Public Works and Safety, and Planning and Zoning), recommending tax rates and a budget to the Council and voting with the Council on a final budget. In addition, the Chairman controls the allocation of any public subsidies for private development.

The Chairman team has responsibility for and control over its bureaucracy, organizing and running the bureaucracy in any way it wishes. The success of the Chairman team is judged in the same manner as the success of elected government officials is judged in a real life situation, (i.e., at the polls).

The Council is comprised of two Councilmen who represent the four jurisdictions of Central City, Estateville, Farmington, and Newtown. A Councilman is elected by a majority of the residences in the Central City and suburban jurisdictions with the vote of each residence weighted by income class.

The Chairman and Council base their decisions on (1) computer output showing county revenues, expenditures, and fiscal balance in the last round; (2) estimates of the tax base for the round for which a budget is being prepared; (3) department appropriation requests; and (4) city conditions which may indicate what public actions are necessary. The computer output indicates public expenditures in the last round, the Finance Department estimates the tax base and department requests show the need for public expenditures in the round under consideration. From this information the Chairman and Council attempt to balance the public needs of the community with its fiscal resources.

2. CHAIRMAN AND COUNCIL DECISIONS

In order to carry out his governmental role, the Chairman may make any or all of the following decisions (subject to the approval of the Council) during a round of play:

Grant Appropriations

The Chairman can grant appropriations to each of four departments: Public Works and Safety, Schools, Highways, and Planning and Zoning. All appropriations come out of local tax revenue sources.

It is the function of the Finance Department to coordinate the budgetary process and review appropriations requests from each department.

When granting appropriations, the Chairman should be aware of the availability of federal-state aid for each department. This aid is automatically granted by the computer each round. The amount of aid is dependent upon the population of the county and matching ratios for each department. This information is summarized as follows:

Department	Maximum Aid per 100 Population	Matching Ratio (Local Funds: Federal-State Funds)
School	$20.00	2:1
Public Works and Safety	7.00	5:1
Highway	18.00	1:2
Planning and Zoning	.50	1:1

For example, if the population of the county is 300,000 the School Department is eligible for $60,000 in aid. Under the matching ratio of this department (2:1), one dollar in aid is allocated for every two dollars of local funds that are spent by the department. Therefore, if the department requests a budget of $120,000, the Chairman must appropriate at least $80,000 for the department to be eligible for the remaining $40,000 in federal-state aid.

Set Tax Rates and Estimate Tax Base

The Chairman may set tax rates of three types: sales, income and property. Sales taxes are paid by residences on their total purchases of personal goods (PG); income taxes are paid by all parcels owned by economic teams which earn a positive income; and property taxes are paid by economic teams on the assessed value of land and developments which they own.

Tax base estimates are sent to the Chairman by the Finance Department. This provides a method for predicting revenue for the current round.

Transfer Cash

The Chairman may transfer cash to any economic team. Cash transferred in such a way comes out of the Chairman's budget.

Grant Subsidies

The Chairman may grant subsidies to teams for a variety of purposes, including development incentives, tax rebates for low income housing, etc. Subsidies come out of the budget of the Planning and Zoning Department.

3. INPUT PROCEDURE

Since City I is a computer-assisted model, it is necessary that information be fed to the computer in a certain format. This format is quite elementary and requires no knowledge of computer programming. It merely involves filling out forms in the proper manner with the required information for each decision.

In order to make a decision and feed it to the computer, participants in the City I game must fill in an input decision form with certain information. The information which is required on the input decision form varies with the type of decision being implemented. The type of information which is required is explained on the decision formats. There are six input explanation formats: one for economic teams, and one each for the Chairman and Council, School Department, Public Works and Safety Department, Highway Department, Planning and Zoning Department. An input decision form has the following components: Decision Code; (first card) and additional information (second card). Each of these components is explained below:

a. Decision Code

This indicates the type of decision that is being made. It is always a two-letter abbreviation preceded by a dollar sign ($). Essentially, the decision code describes the type of decision being made to the computer. These codes are summarized below:

Private Decisions

1. $LO - borrow or lend money
2. $CT - transfer cash
3. $IN - Invest in speculative or conservative stocks
4. $RS - Restore slums
5. $PU - Purchase land or bid on land
6. $DR - Demolish residences
7. $DB - Demolish businesses
8. $RN - Renovate residences and businesses

Private Decisions

9. $BR - Build and upgrade residences
10. $BB - Build businesses
11. $UB - Upgrade businesses
12. $CS - Change prices and salaries

Public Decisions

13. $ZO - Change Zoning
14. $LB - Grant appropriations
15. $TR - Change tax rate and estimate tax base
16. $SB - Grant subsidy
17. $UR - Construct and/or upgrade roads
18. $RR - Renovate roads
19. $BT - Construct and/or upgrade terminals
20. $BM - Build MS plants and change MS employment
21. $RM - Renovate MS plants
22. $DS - Demolish MS plant and demolish schools
23. $CH - Change MS salaries and school salaries
24. $BU - Build utility plants and/or change utility service
25. $BS - Build schools and change employment
26. $RS - Renovate Schools

b. Additional Information

The additional information concerning a decision is filled in the spaces immediately following the decision code. These spaces correspond to the columns marked (a), (b), (c), etc. on the input decision form and the input explanation form. The amount and type of additional information varies with the type of decision being made.

To clarify the procedure for filling out forms, it is suggested that participants review the sample decisions in this manual.

4. SAMPLE DECISIONS

1. The School Department wishes to change salaries to $6,500 for middle income and $11,500 for high-income teachers.

Decision Code	a	b	c	d	e	f
$ CH	SC,	0,	65,	115,	,	.

2. Economic team B lends $25,000 to economic team D. The term is three rounds and the interest rate is 7%

$ LØ	D,	250,	B,	3,	70,	.

3. Economic team C is building a BG2 at 98-34. Salaries will be $2600 for low, $5100 for middle, and $10,100 for high. The charge will be $22,000 to LI1, $18,000 to HI1, and $5,000 to PH1.

$ BB	C,	9834,	BG,	2,	,	,
$	26,	51,	101,	,	,	,
$	2200,	1800,	500,	,	,	.

CHAIRMAN AND COUNCIL: Explanation of Decision Formats

Decision Description	Code	a	b	c	d	e	f
Grant Appropriations	$LB	funds for public works and safety department (in $1000's)	funds for school department (in $1000's)	funds for highway department (in $1000's)	funds for planning and zoning department (in $1000's)		
Change Tax Rate and Estimate Tax Base	$TR	tax rates for property (in tenths of a percent) estimated tax base for property (in $1000's)	tax rates for sales (in tenths of a percent) estimates tax base for sales (in $1000's)	tax rate for income (in tenths of a percent) estimated tax base for income (in $1000's)			
Transfer Cash	$CT	CI	team receiving	amount (in $100's)			
Grant Subsidy	$SB	team receiving	amount (in $100's)				

5. COMPUTER OUTPUT

Both the Chairman and Council teams receive copies of the entire county budget which includes detailed department expenditures (by individual capital and current items), summary department finances (local funds appropriated, federal-state funds used, total funds, total expenditures, and the surplus or deficit for each department), tax base, rate, and revenue by category, and the county treasury balance and county population.

****** CHAIRMAN'S REPORT OF COUNTY BUDGET FOR ROUND 1 *****

****

DEPARTMENTAL EXPENDITURES

PUBLIC WORKS AND SAFETY

CAPITAL EXPENDITURES			
CONSTRUCTION OF MS	$ 0.		
RENOVATION OF MS	56000.		
LAND PURCHASES	2500.		
UTILITY PLANT CONSTRUCTION	0.		
UTILITY LINE CONSTRUCTION	6000.		
SUBTOTAL		$ 64500.	
CURRENT EXPENDITURES			
SALARIES	40000.		
TRANSPORTATION	1400.		
UTILITY OPERATING EXPENSES	20248.		
SUBTOTAL		$ 61648.	
TOTAL			$ 126148.

SCHOOL DEPARTMENT

CAPITAL EXPENDITURES			
SCHOOL CONSTRUCTION	$ 0.		
SCHOOL RENOVATION	64200.		
LAND PURCHASES	5800.		
SUBTOTAL		$ 70000.	
CURRENT EXPENDITURES			
SALARIES	45000.		
TRANSPORTATION	22800.		
SUBTOTAL		$ 67800.	
TOTAL			$ 137800.

HIGHWAY DEPARTMENT

CAPITAL EXPENDITURES			
ROAD CONSTRUCTION AND UPGRADING	$ 48000.		
ROAD RENOVATION	39700.		
LAND PURCHASES	3600.		
TERMINAL CONSTRUCTION	0.		
SUBTOTAL		$ 91300.	
TOTAL			$ 91300.

PLANNING AND ZONING

CAPITAL EXPENDITURES			
SUBSIDIES	$ 0.		
LAND PURCHASES	9800.		
SUBTOTAL		$ 9800.	
TOTAL			$ 9800.

****

DEPARTMENTAL SUMMARY	PUBLIC WORKS AND SAFETY	SCHOOL DEPARTMENT	HIGHWAY DEPARTMENT	PLANNING AND ZONING	TOTAL
APPROPRIATIONS RECEIVED	$ 110000.	$ 80000.	$ 50000.	$ 10000.	$ 250000.
FEDERAL-STATE AID RECEIVED	21024.	45933.	60866.	1831.	129656.
TOTAL FUNDS RECEIVED	131024.	125933.	110866.	11831.	379656.
TOTAL EXPENDITURES	126148.	137800.	91300.	9800.	365048.
SURPLUS OR DEFICIT	4876.	-11866.	19566.	2031.	14608.

****

TAXES	TAX BASE	TAX RATE	TAX REVENUE
PROPERTY	$ 5790901.	2.0 PCT	$ 115818.
SALES	266510.	2.0	5330.
INCOME	600201.	1.0	6002.
TOTAL			$ 127150.

****

BALANCE REMAINING IN TREASURY $ 99.

TOTAL POPULATION 366300

B. FINANCE DEPARTMENT

1. EXPLANATION OF THE ROLE

The Finance Department is responsible for estimating the local property, sales, and income tax for the round for which the Chairman is preparing a budget. The Chairman uses Finance's estimates to determine the tax rates necessary to obtain the revenue required.

The department bases its estimates on computer output which shows last round's tax bases and its estimate of future county growth.

The Finance Department can also coordinate the budgetary process between the Chairman and the departments requesting appropriations; determine the eligibility of the departments for federal-state aid; and report to the Chairman on the status of bonding in the county.

2. FINANCE DEPARTMENT DECISIONS

Federal-State Aid

Federal-state aid is automatically allocated by the computer when the departments spend their local appropriations. The amount of this aid is based on the population of the county in the present round. Matching is at fixed ratio, as shown in the table as follows:

Department	Aid per 100 Population	Matching Ratio (Local: Federal-state)
School	$20.00	2:1
Public Works and Safety	7.00	5:1
Highway	18.00	1:2
Planning and Zoning	.50	1:1

For example, if the population of the county is assumed to be 300,000, the School Department is eligible for $60,000 in federal-state aid. Under the matching ratio requirements for the department (2:1), one dollar in federal-state aid is allocated for every two dollars of local funds that are spent. The department receives the maximum amount of federal-state aid it is eligible for if it spends at least $120,000 of its local funds.

Bonds

If the county revenue is less than county expenditures, the computer automatically allocates the necessary money from any surplus the county treasury may have from the past rounds. If treasury surpluses are insufficient to meet expenditures, the computer looks first to see whether the Chairman appropriated more than he received in revenues. If so, it floats a general bond to cover the deficit up to the difference between total revenues and total appropriations. If there is still a deficit, the computer chooses the department whose expenditures were greater than its appropriations and floats a general purpose bond in the name of that department. All bonds have a duration of four rounds and the interest rate is set by the computer. When the maximum bonding limit is reached, the computer levies a special assessment on all property to finance county expenditures. As the county floats more bonds, the interest rates increase.

The bonding limit is 13.3 percent of the assessed value of all land and developments in the county.

The Tax Base Estimate

The Finance Department has last round's actual tax bases to use as a guide in estimating future tax bases. If the game has been played for a few rounds, Finance can use previous reports as an indication of future developments.

a. Property

When property is sold, the new assessed value is a weighted average of the sale price and the previous assessed value. If the sale price is less than 75% of the previous assessed value, the new assessed value = $\frac{2 \times \text{previous assessed value} + \text{sale price}}{3}$.

The assessed value of each parcel is then calculated as the average of the value of the surrounding parcels. The property tax base is the total of the full assessed value of the parcels owned by teams in the county (see "Assessed Value Map") plus the total construction costs of the developments times their present value ratios (see "Economic Sector Master Sheets.")

b. Sales

The sales tax is placed on personal goods (PG) sales only. All residents must buy personal goods. The maximum expenditures of residences for PG are given below:

Residence	Maximum Expenditures for PG
RC	$3580 per development level
RB	$1970 per development level
RA (or RS)	$1070 per development level

In other words, if the county contains 26 levels of RC's, 30 levels of RB's, and 15 levels of RA's (or RS's), the maximum sales tax base would be 26 x 3580 plus 30 x 1970 plus 15 x 1070, or $168,230.

c. Income

The income tax is applied to the gross income of each parcel, less service charges, wage costs, and transportation costs. If this total is negative, the parcel pays no income tax. Income estimates can be obtained from economic teams.

Tax base estimates are sent to the computer on the Chairman and Council input form.

3. INPUT PROCEDURE

Since City I is a computer-assisted model, it is necessary that information be fed to the computer in a certain format. This format is quite elementary and requires no knowledge of computer programming. It merely involves filling out forms in the proper manner with the required information for each decision.

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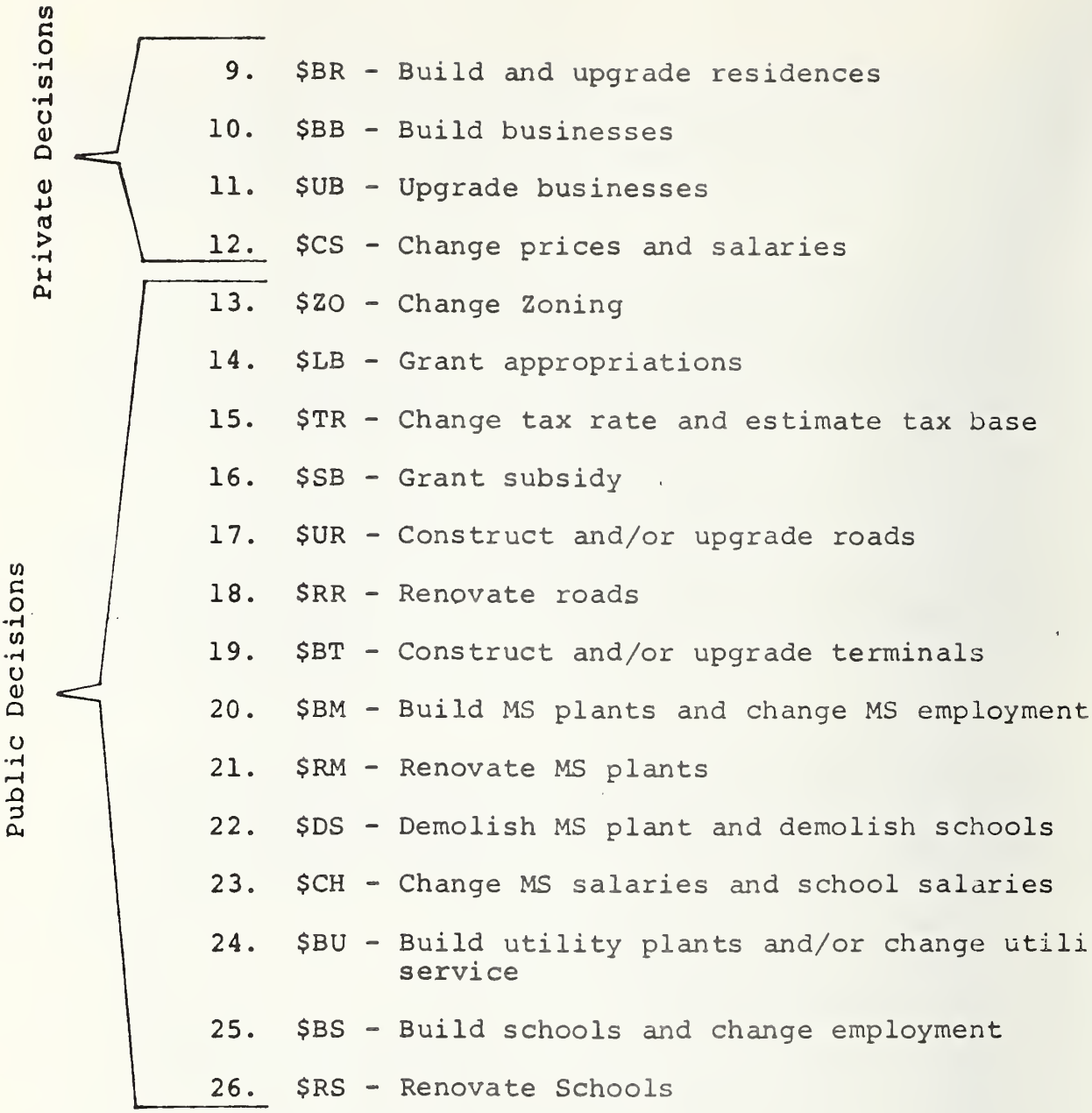
Private Decisions

1. $LO - borrow or lend money
2. $CT - transfer cash
3. $IN - Invest in speculative or conservative stocks
4. $RS - Restore slums
5. $PU - Purchase land or bid on land
6. $DR - Demolish residences
7. $DB - Demolish businesses
8. $RN - Renovate residences and businesses



b. Additional Information

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4. SAMPLE DECISIONS

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Decision Code	a	b	c	d	e	f
$	CH	SC,	0,	65,	115,	, .

2. Economic team B lends $25,000 to economic team D. The term is three rounds and the interest rate is 7%

$	LØ	D,	250,	B,	3,	70,	.

3. Economic team C is building a BG2 at 98-34. Salaries will be $2600 for low, $5100 for middle, and $10,100 for high. The charge will be $22,000 to LI1, $18,000 to HI1, and $5,000 to PH1.

$	BB	C,	9834,	BG,	2,	,	,
$		26,	51,	101,	,	,	,
$		2200,	1800,	500,	,	,	.

CHAIRMAN AND COUNCIL: Explanation of Decision Formats
(Finance Department estimates tax base on this form)

Decision Description	Code	a	b	c	d	e	f
Grant Appropriations	$LB	funds for public works and safety department (in $1000's)	funds for school department (in $1000's)	funds for highway department (in $1000's)	funds for planning and zoning department (in $1000's)		
Change Tax Rate and Estimate Tax Base	$TR	tax rates for property (in tenths of a percent) estimated tax base for property (in $1000's)	tax rates for sales (in tenths of a percent) estimates tax base for sales (in $1000's)	tax rate for income (in tenths of a percent) estimated tax base for income (in $1000's)			
Transfer Cash	$CT	CI	team receiving	amount (in $100's)			
Grant Subsidy	$SB	team receiving	amount (in $100's)				

5. COMPUTER OUTPUT

At the end of each round, the computer prints a two-page report of the county's financial transactions during the round. The tax bases estimated by the Finance Department for the round, the true tax bases, the estimated base as a percent of the true base, last round's tax rates and last round's revenue from each source are listed. Next, a list of each department's appropriations of local funds, federal-state aid available, federal-state aid used, total expenditures, and surplus or deficit. Old and new bonds floated to cover the differences between revenue and expenditures, the names of the department(s) incurring them, the interest rate, and the principal are listed.

The last part of the report gives the county's overall financial condition. Last round's cash balance (including new income from sale of public land), the income from taxes, federal-state aid, and new bonding are listed and totaled to give the total amount of funds available last round. The total department expenditures plus bond payments equal the county's expenditures last round. The new cash balance is the difference between funds available and expenditures.

The last item on the report is the new bonding limit: 13.3 percent of the assessed value of all land and developments in the county less the amount outstanding in bonds.

FINANCE DEPARTMENT REPORT, ROUND 1 *

TAXES	EST. BASE IN DOLLARS	TRUE BASE IN DOLLARS	ERROR IN EST. BASE	CURRENT TAX RATE	REVENUE IN DOLLARS
INCOME	$ 200000.	$ 600201.	-66.6 PCT	1.0 PCT	$ 6002.
SALES	200000.	266510.	-24.9	2.0	5330.
PROPERTY	6667001.	5790901.	15.1	2.0	115818.
TOTAL					$ 127150.

DEPARTMENTAL SUMMARY	FUNDS APPROPRIATED	FED.-STATE AID AVAIL.	FED.-STATE AID USED	FUNDS EXPENDED	SURPLUS OR DEFICIT
PUBLIC W + S	$ 110000.	$ 25641.	$ 21024.	$ 126148.	$ 4876.
SCHOOLS	80000.	73260.	45933.	137800.	-11866.
HIGHWAY	50000.	65934.	60866.	91300.	19566.
PLANNING AND ZONING	10000.	1831.	1831.	9800.	2031.
TOTAL	$ 250000.	$ 166666.	$ 129656.	$ 365048.	$ 14608.

NEW BONDING	DEPARTMENT INCURRING	INTEREST RATE	PRINCIPAL
	SCHOOLS	6.0 PCT	$ 11900.
	GENERAL	8.3 PCT	$ 93200.

FINANCE DEPARTMENT REPORT, ROUND 1 *

****

PREVIOUS CASH BALANCE	$ 3241.	
INCOME		
TAX REVENUES	$ 127150.	
FEDERAL-STATE AID	129656.	
NEW BONDING	105100.	
TOTAL AVAILABLE		$ 365147.
EXPENDITURES		
TOTAL DEPARTMENT EXPENDITURES	$ 365048.	
BOND PAYMENTS	0.	
TOTAL EXPENDITURES		$ 365048.
NEW CASH BALANCE		$ 99.

****

NEW BONDS MAY BE FLOATED FOR $ 1342625. NEXT ROUND

****

C. PUBLIC WORKS AND SAFETY DEPARTMENT

1. EXPLANATION OF THE ROLE

The Public Works and Safety Department is responsible for building and maintaining municipal service units which provide such services as sanitation and fire and police protection to all residences, and for providing the utility service necessary for developing a parcel.

Municipal Services

An MS unit can be built for $50,000 and is designed to serve people living in residences. The number of people living in each of the various types of residences is summarized below:

Residence	Number of People Living There
RC	3800 per development level
RB	3400 per development level
RA (or RS)	2300 per development level

a. Capacity

An MS unit with 1000 employees and a value ratio of 1.00 is designed to serve 30,000 people. The computer assigns residences to be served by MS units. The assignment is on the basis of the lowest cost for transportation. The Public Works and Safety Department pays $100 per mile on Type I roads, $200 per mile on Type II roads, and $300 per mile on Type III roads to transport service to a residence.

Since all residences must be assigned to an MS unit, it is possible that an MS unit will be forced to operate beyond capacity. As the ratio of total population/employment of MS unit increases above 30:1, the MS unit begins to become overused. The extent to which an MS unit operates at its design capacity is defined as:

$$\%\text{CAPACITY} = \frac{\text{Population Served}}{30{,}000 \times \text{value ratio} \times \frac{\text{total employment of MS}}{1000}} \times 100$$

For example, an MS unit with a value ratio of .80, a total employment of 1,000, and a population served of 60,000 people is operating at:

$$\frac{60{,}000}{30{,}000 \times .80 \times \frac{1000}{1000}} \times 100 = 250\% \text{ of capacity}$$

Maximum efficiency occurs when an MS unit is operating at 100% of capacity.

The degree of damage suffered by a residence which is struck by a natural disaster is determined by the percentage of capacity at which the MS unit serving that residence is operating.

As will be seen later, the team representing Public Works and Safety Department can increase the capacity of an MS unit by exercising one or more of the following three options:

(1) Building new MS plants to take the load off of overused MS units.

(2) Renovate (i.e., raise the value ratio) of MS units which are over capacity.

(3) Hire new employees or reallocate ones (in 100's) from other plants. Employees are essential to the operation of all MS units.

b. Employment

The Public Works and Safety Department hires low income (RA) and middle income (RB) workers only. There are 1000 workers in each group, but due to a level of aggregation in this model salaries are only paid to 1 worker per 1000. The department may request additional workers at a plant in order to increase the capacity of the plant. In the example above, if 1000 additional workers were hired for the MS unit with a value ratio of .80 serving 60,000 people, the unit would be operating at a capacity of:

$$\frac{60{,}000}{30{,}000 \times 80 \times \frac{2000}{1000}} \times 100 = 125\%$$

instead of 250%. Furthermore, increasing the value ratio to 1.00 would result in a capacity of

$$\frac{60{,}000}{30{,}000 \times 1 \times \frac{2000}{1000}} \times 100 = 100\%$$

and the unit would be operating at its design capacity and the maximum efficiency level.

MS employees are hired in groups of 1000's and allocated to individual MS units in groups of 100's.

The degree of damage suffered by a residential land use is also affected by the employment mix of a particular MS unit. The damage tends to be less great when there are more middle income workers than low-income workers employed. When the situation is reversed, the degree of damage incurred at a residential parcel increases substantially. It is therefore advisable to allocate more middle-income workers than low-income workers to each MS plant. Furthermore, there can be no more than 1500 workers of one class at each unit.

The following table summarizes the employment requirements of MS units.

If Population Served is:	Employees Required are:	To Maintain Optimal Population Served/Employment Ratio:
30,000	1,000	30:1
60,000	2,000	30:1
90,000	3,000	30:1

Utilities

All land uses require utilities. These requirements are summarized below:

Land Use	Utility Units Required
HI	10 per level of development
LI	5 per level of development
BG	1 per level of development
BS	1 per level of development
PG	2 per level of development
PS	1 per level of development
RA (or RS)	1 per level of development
RB	1 per level of development
RC	1 per level of development

Public Works and Safety provide utility service by building utility plants and installing utility units on a parcel. A utility plant costs $50,000 and must be located at an intersection. Utility plants do not require land. One utility plant can provide a maximum of 200 utility units, although operating costs increase substantially above 100 utility units. It costs the department $1,000 to install service in a parcel and $500 to transfer service on a parcel from one plant to another. The parcels served by a utility plant must always be contiguous to each other.

The cost function of operating a utility plant is given on the following page:

Units Served	Average Cost Per Unit	Total Operating Cost
20	92.00	1,840
40	81.59	3,264
60	71.19	4,272
80	63.19	5,056
100	60.00	6,000
120	63.99	7,680
140	77.59	10,864
160	103.19	16,512
180	143.19	25,776
200	200.00	40,000

2. PUBLIC WORKS AND SAFETY DEPARTMENT DECISIONS

The Public Works and Safety Department may make any or all of the following decisions during a round of play:

Purchase land

The department may purchase land for the construction of MS units. MS units may only be constructed on residential parcels or parkland. When purchasing a portion of a parcel, the computer will automatically allocate the necessary amount of land required for an MS unit. Land requirements for an MS unit are 1/5 of an RC parcel, 1/6 of an RB parcel, of an RA parcel or parkland.

When purchasing land from another team or the outside (i.e., unowned land) the department should offer a price equivalent to the amount of land which it will be using, since it cannot purchase the entire parcel.

Build MS Units

The Public Works and Safety Department can build MS units at a cost of $50,000. The department should make sure that they own sufficient land before attempting to build an MS unit.

Demolish MS Units

The department may demolish an MS unit at the cost of $10,000.

Build Utility Plants

The Public Works and Safety Departemnt can build a utility plant at a cost of $50,000. A utility plant has a capacity of 200 units. A Utility plant must be built at an intersection.

Install Utility Service

The Public Works and Safety Department can install service on undeveloped parcels which lack utility service at a cost of $1,000 per parcel. There is a cost of $500 to transfer service from one utility plant to another. All parcels which are being served by the same utility plant must be contiguous. No private development can take place on a parcel which lacks utility service.

Renovate MS Units

The value ratio of an MS unit depreciates at 5% of its original value per year. The Public Works and Safety Department may renovate (i.e., raise the value ratio) of an MS unit at a cost of $50,000 times (new value ratio minus former value ratio). The value ratio of an MS unit affects the capacity of that unit, and hence, the extent of damage that occurs when any parcel served by it is struck by natural disaster.

Change MS Employment

The Public Works and Safety Department can also increase the capacity of an MS unit and thus lower the population/employment ratio of that unit by changing the number of low and middle income employees working there. Employees must be assigned in groups of 100. Since the department pays salaries on the basis of 1,000 (i.e., "typically" $2,500 per 1000 low income workers; $5,000 per 1,000 middle income workers) it is best that the total employment requested in each class add up to multiples of 1,000. Otherwise, the department would be paying for employees which it hadn't assigned to MS units.

Change Salaries

The department can change the salaries which it offers to low and middle income workers. The "typical" salaries are $2,500 per low income worker and $5,000 per middle income worker. However, if there is a shortage of workers in the county, the department may want to raise salaries in order to assure that it will have full employment. If there is a surplus of workers, the department may wish to lower salaries. See the employment summary (page 78) for labor market conditions. Remember because of the level of aggregation in the City I model (see page 5) the department hires workers in groups of 1,000 but only pays 1 worker per 1,000 working there.

Suggestions on Expenditures and Income

Federal-state aid pays a maximum of $7 per 100 population, matching one federal-state dollar for every five dollars of local funds spent.

An MS unit costs $50,000 to construct and can serve 30,000 people. Two MS units may not be constructed on the same parcel of land.

The original value ratio (i.e., 1.00) of MS units depreciates at a rate of 5% per round. Renovation cost is defined as (proposed value ratio minus present value ratio) x $50,000.

An MS unit may only be located on a residential parcel or parkland. Land requirements are 1/5 of an RC parcel, 1/6 of an RB parcel, and 1/8 of an RA parcel or parkland.

Public Works and Safety employs low-income and middle-income residence units (1000 workers each) in MS units. Employees are assigned in groups of 100. The department sets the salary for each class of employees and competes for labor with every other employer in the system.

The department must set a salary for low-income or middle-income employees only if a salary is to be different from the last round's salary. Typical salaries are $2,500 per low-income worker (actually 1000 workers), and $5,000 per middle-income worker (1000 workers).

The computer allocates residences to MS units on the basis of least transportation costs incurred. Transportation charges are incurred by the Public Works and Safety Department to transport services from an MS unit to the residence which it serves. These charges are $100 per mile on a Type I road; $200 per mile on a Type II road; and $300 per mile on a Type III road. The department can cut the transportation costs by building and locating MS units in an optimal pattern.

Utility plants can serve up to 200 utility units, although operating costs increase sharply above 150 units. Plants are located at intersections and require no land or employees. The construction cost is $50,000. The cost to install utilities on a parcel is $1000. The cost to transfer service from one plant to another is $500.

The costs of operating a utility plant depend on the number of units served. These costs are given below:

Utility Units Served	Average Cost Per Unit	Total Operating Cost
20	$92.00	$1840
40	81.59	3264
60	71.19	4272
80	63.19	5056
100	60.00	6000
120	63.99	7680
140	77.59	10864
160	103.19	16512
180	143.19	25776
200	200.00	40000

As you can see, the per unit operating cost is least when 100 units are served, and increases substantially after 120 units are served.

3. INPUT PROCEDURE

Since City I is a computer-assisted model, it is necessary that information be fed to the computer in a certain format. This format is quite elementary and requires no knowledge of computer programming. It merely involves filling out forms in the proper manner with the required information for each decision.

In order to make a decision and feed it to the computer, participants in the City I game must fill in an input decision form with certain information. The information which is required on the input decision form varies with the type of decision being implemented. The type of information which is required is explained on the decision formats. There are six input explanation formats: one for economic teams, and one each for the Chairman and Council, School Department, Public Works and Safety Department, Highway Department, Planning and Zoning Department. An input decision form has the following components: Decision Code; (first card) and additional information (second card). Each of these components is explained below:

a. Decision Code

This indicates the type of decision that is being made. It is always a two-letter abbreviation preceded by a dollar sign ($). Essentially, the decision code describes the type of decision being made to the computer. These codes are summarized below:

Private Decisions

1. $LO - borrow or lend money
2. $CT - transfer cash
3. $IN - Invest in speculative or conservative stocks
4. $RS - Restore slums
5. $PU - Purchase land or bid on land
6. $DR - Demolish residences
7. $DB - Demolish businesses
8. $RN - Renovate residences and businesses

Private Decisions

9. $BR - Build and upgrade residences
10. $BB - Build businesses
11. $UB - Upgrade businesses
12. $CS - Change prices and salaries

Public Decisions

13. $ZO - Change Zoning
14. $LB - Grant appropriations
15. $TR - Change tax rate and estimate tax base
16. $SB - Grant subsidy
17. $UR - Construct and/or upgrade roads
18. $RR - Renovate roads
19. $BT - Construct and/or upgrade terminals
20. $BM - Build MS plants and change MS employment
21. $RM - Renovate MS plants
22. $DS - Demolish MS plant and demolish schools
23. $CH - Change MS salaries and school salaries
24. $BU - Build utility plants and/or change utility service
25. $BS - Build schools and change employment
26. $RS - Renovate Schools

b. Additional Information

The additional information concerning a decision is filled in the spaces immediately following the decision code. These spaces correspond to the columns marked (a), (b), (c), etc. on the input decision form and the input explanation form. The amount and type of additional information varies with the type of decision being made.

To clarify the procedure for filling out forms, it is suggested that participants review the sample decisions in this manual.

4. SAMPLE DECISIONS

1. The School Department wishes to change salaries to $6,500 for middle income and $11,500 for high-income teachers.

Decision Code	a	b	c	d	e	f
$ CH	SC,	0,	65,	115,	,	.

2. Economic team B lends $25,000 to economic team D. The term is three rounds and the interest rate is 7%

$ LØ	D,	250,	B,	3,	70,	.

3. Economic team C is building a BG2 at 98-34. Salaries will be $2600 for low, $5100 for middle, and $10,100 for high. The charge will be $22,000 to LI1, $18,000 to HI1, and $5,000 to PH1.

$ BB	C,	9834,	BG,	2,	,	,
$	26,	51,	101,	,	,	,
$	2200,	1800,	500,	,	,	.

PUBLIC WORKS AND SAFETY DEPARTMENT: Explanation of Decision formats

Decision Description	Code	a	b	c	d	e	f
Purchase Land	$PU	location	price (in $100's)	PW	seller	1	
Build MS Plants	$BM	location	number of low-income employees (in multiples of 100)	number of middle income employees (in multiples of 100)	0		
Change MS Employment	$BM	location	number of middle income employees	number of low income employees	1		
Renovate MS Plants	$RM	location	new value ratio (expressed as an integer 100 or less)				
Demolish MS Plant	$DS	MS	location				
Change MS Salaries	$CH	PW	new salaries to low income worker (in $100's)	new salaries to middle income worker (in $100's)			
Build Utility Plants and/or change utility service	$BU	location of plant*	1 (build) or 0 (change service)	parcels to be serviced, divided by slashes and ending with two asterisks (i.e., 8020/8022/8024/**)			

*Since Utility Plants are located at intersections, their location must be specified by odd-odd coordinates (i.e., 8121)

5. COMPUTER OUTPUT

The computer output for the Public Works and Safety Department is divided into four main parts: (a) a status report on municipal service units, employment, and utility plant operating costs, (b) a summary report on municipal services and the department budget, (c) a map of residences served by each MS unit, and (d) a map of utility service provided by each plant.

a. The status report for each MS unit lists the code number assigned to the MS unit, the location of the MS unit, its value ratio (the ratio of present value to original value), the number of people served, the number of low-income workers, the number of middle-income workers, and the ratio of the population served to employment. Under the employment heading, the location of each residence employed, the income class, and the salary paid to each residential unit are listed. Under the utility heading, the code number of each plant, the number of utility units served, and the operating cost of each plant is listed.

b. The summary report shows the local population, the average population served per MS unit, the total MS employment, and the ratio of total population served to employment.

The Public Works and Safety Department budget shows the revenue of the department, the capital and operating expenses, and the budget surplus or deficit. Revenues are comprised of local appropriations plus federal-state aid used (i.e., matched at the designated level of 5 local dollars to 1 federal-state dollar up to a maximum of $7 per 100 population). Capital expenditures are made for construction of MS units, renovation, land purchases, construction of utility plants, and construction of utility lines. Operating expenditures are made for salaries, transportation of MS services to the populations served, and utility plant operation. If total expenditures exceed total revenues, the budget has a deficit, and if revenues exceed expenditures, the budget has a surplus. The percent of revenues actually spent is listed as the final item on the summary report.

c. The Municipal Service Map shows the location of each MS unit and the location of all residential units served by each MS unit. The residences served by an MS are numbered with the code number of that MS unit.

d. On the Utility Map each parcel served with utilities is numbered with the code number of the plant serving the parcel. Parcels served by a single plant must be contiguous to each other.

PUBLIC WORKS AND SAFETY DEPARTMENT, REPORT FOR 1

M.S. SECTOR	LOCATION	VALUE RATIO	POPULATION SERVED	EMPLOYMENT LOW	EMPLOYMENT MID	POP/EMP RATIO
1	76-14	0.950	65200	600	400	65.2
2	82-12	0.810	44800	700	500	37.3
3	86-14	0.810	22000	500	400	24.4
4	72-18	0.770	19500	600	200	24.3
5	74-16	0.850	27300	400	300	39.0
6	78-18	0.685	17800	500	200	25.4
7	84-16	0.950	17400	400	300	24.8
8	78-24	0.855	35400	400	500	39.3
9	82-22	0.830	25400	500	500	25.4
10	72-26	0.865	22400	400	400	28.0
11	82-28	0.875	21600	300	500	27.0
12	96-46	0.950	40600	300	500	50.7
13	98-48	0.810	6900	400	300	9.8
TOTAL		0.846	366300	6000	5000	33.3

EMPLOYMENT

LOCATION	CLASS	SALARY
82-32	MIDL	$ 5000
70-18	MIDL	$ 5000
86-18	MIDL	$ 5000
98-42	MIDL	$ 5000
84-18	MIDL	$ 5000
84-14	LOW	$ 2500
102-46	LOW	$ 2500
76-12	LOW	$ 2500
76-12	LOW	$ 2500
76-12	LOW	$ 2500
70-20	LOW	$ 2500
		$ 40000

UTILITY PLANTS	LOCATION	UNITS SERVED	OPERATING COST
1	77-15	129	8873.
2	81-21	42	3381.
3	77-23	83	5175.
4	97-45	33	2816.
	TOTAL	287	$ 20248.

PUBLIC WORKS AND SAFETY DEPARTMENT. REPORT FOR 1

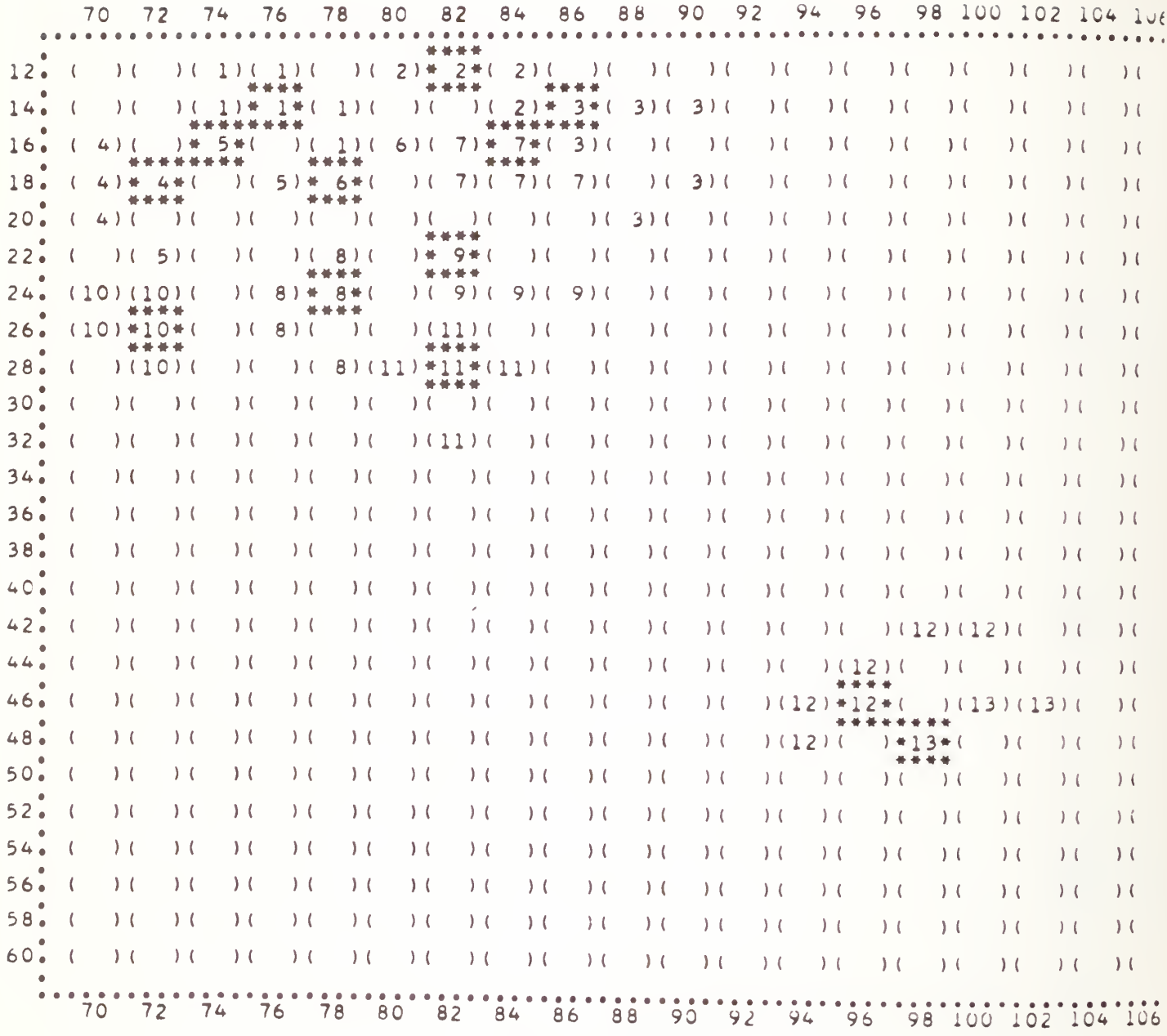
POPULATION	366300
AVERAGE POPULATION PER SERVICE	28170
TOTAL EMPLOYMENT	11000
OVERALL POPULATION/EMPLOYMENT RATIO	33.3

FINANCIAL ACCOUNTING

REVENUES			
APPROPRIATIONS	$ 110000.		
FEDERAL-STATE AID USED	$ 21024.		
TOTAL			$ 131024.
CAPITAL EXPENDITURES			
CONSTRUCTION OF M.S.	$ 0.		
RENOVATION	$ 56000.		
LAND PURCHASES	$ 2500.		
CONSTRUCTION OF UTILITY PLANT	$ 0.		
CONSTRUCTION OF UTILITY LINES	$ 6000.		
SUB-TOTAL		$ 64500.	
OPERATING EXPENSES			
SALARIES	$ 40000.		
TRANSPORTATION	$ 1400.		
UTILITY OPERATING CHARGES	$ 20248.		
SUB-TOTAL		$ 61648.	
TOTAL EXPENDITURES			$ 126148.
SURPLUS			$ 4876.

96 PERCENT OF APPROPRIATIONS WERE SPENT

MUNICIPAL SERVICES MAP FOR ROUND 1



ASTERISKS ENCIRCLE SITES OF ALL FACILITIES

UTILITY MAP, ROUND 1

	70	72	74	76	78	80	82	84	86	88	90	92	94	96	98	100	102	104	106
12	1	1	1	1	--	1	1	1	--	--	--	--	--	--	--	--	--	--	--
14	1	1	1	1	1	1	1	1	2	2	2	--	--	--	--	--	--	--	--
16	1	1	1	1	1	1	1	2	2	--	2	--	--	--	--	--	--	--	--
18	1	1	1	1	1	--	2	2	2	2	2	--	--	--	--	--	--	--	--
20	3	--	3	3	2	2	--	2	--	2	--	--	--	--	--	--	--	--	--
22	3	3	3	3	3	2	2	2	2	--	--	--	--	--	--	--	--	--	--
24	3	3	3	3	3	2	2	2	2	--	--	--	--	--	--	--	--	--	--
26	3	3	3	3	3	3	2	2	2	--	--	--	--	--	--	--	--	--	--
28	3	3	3	3	3	3	2	2	2	--	--	--	--	--	--	--	--	--	--
30	--	--	--	--	--	--	3	2	--	--	--	--	--	--	--	--	--	--	--
32	--	--	--	--	--	--	3	--	--	--	--	--	--	--	--	--	--	--	--
34	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
36	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
38	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
40	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
42	--	--	--	--	--	--	--	--	--	--	--	--	--	4	4	4	--	--	--
44	--	--	--	--	--	--	--	--	--	--	--	--	4	4	4	4	4	--	--
46	--	--	--	--	--	--	--	--	--	--	--	--	4	4	4	4	4	--	--
48	--	--	--	--	--	--	--	--	--	--	--	--	4	--	4	4	4	--	--
50	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
52	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
54	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
56	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
58	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
60	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	70	72	74	76	78	80	82	84	86	88	90	92	94	96	98	100	102	104	106

D. SCHOOL DEPARTMENT

1. EXPLANATION OF THE ROLE

The School Department is responsible for providing education facilities for the community by building and maintaining school units and by employing teachers.

The department bases its decisions on computer output describing last round's actions and the status of the school system.

The computer assigns students to school units starting with slum residences (RS) and ending with high income residences (RC). Slum and low-income (RA) students are assigned to the nearest (in terms of transportation costs) school unit which has available space. The maximum capacity of a school unit is 10,000 students and students from a residential parcel will not be assigned to a school unit if they force the school unit to exceed the maximum capacity. The school allocator assigns middle (RB) and high (RC) income students to the nearest (in terms of lowest transportation charges: $50 per residence level along Type I roads; $100 along Type II; and $150 along Type III) school unit that fulfills the following criteria:

SCHOOL ASSIGNMENT CRITERIA

Student Class	Student-Teacher Ratio	Value Ratio of School	Ratio of High/ Middle Teachers
Middle (RB)	16.0	.65	1:1
High (RC)	13.0	.85	2:1

This means that students from a middle-income residence would not attend a school with any one of the following characteristics: (1) a student-teacher ratio equal to or in excess of 16.0, (2) a value ratio equal to or less than .65, or (3) less than 1 middle-income teacher for each high-income teacher. Similarly, students from a high-income residence would not attend a school unit with (1) a student-teacher ratio equal to or in excess of 13.0, (2) a value ratio equal to or less than .85, or (3) a teacher staff with less than twice as many high-income teachers as middle-income teachers.

The number of students in each residential class is:

Residential Class	Number of Students
RC (High)	760 per development level
RB (Middle)	850 per development level
RA (Low)	690 per development level
RS (Slum)	690 per development level

For example an RA3 and an RB2 would have a total of 690 x 3 + 850 x 2 or 3770 students.

If a team has residence units whose students do not attend local public schools, it is charged $2000 per residence level for private school costs. Teams also pay for all the transportation costs to school for residence units that have more than a $500 transportation charge. If transportation costs per residential level for students is $500 or less, it is paid for by the School Department.

2. SCHOOL DEPARTMENT DECISIONS

The School Department may make any or all of the following decisions during a round of play:

Purchase Land

The department may purchase land for the construction of school units. School units may only be constructed on residential parcels or parkland. When purchasing a portion of a parcel the computer will automatically allocate the necessary amount of land needed for a school unit. Land requirements for a school unit are 1/5 of an RC parcel, 1/6 of an RB parcel, and 1/8 of an RA parcel, and 1/8 of parkland or undeveloped land.

When purchasing land either from another team or the Outside (i.e., unowned land), the department should offer a price equivalent to the amount of land which it will be using.

Build School Units

The School Department may build a school unit at a cost of $50,000. Only one school can be built on a parcel of land. A school unit has a capacity of 10,000 students.

Demolish School Units

The School Department can demolish school units at a fixed cost of $10,000.

Renovate School Units

Since the value ratio of a school depreciates at 5% of its original value each round, the department can renovate (i.e., raise the value ratio) of a school unit. The cost of renovation is $50,000 times (new value ratio minus former value ratio). The value ratio of a school affects the class of students who will attend the school.

Change School Employment

Since the department is responsible for hiring employees to create a desired mix of teachers and students, it has the option of changing employment at different school units. Employment must be changed in groups of 100. Since the department pays salaries on the basis of 1,000 (i.e., "typically" $5,000 per 1000 middle income teachers, and $10,000 per 1000 high-income teachers) it is best that the total employment add up to multiples of 1,000.

Change Teacher Salaries

The department can change the salaries which it offers to middle and high-income teachers. The typical salaries are $5,000 per middle-income teacher, and $10,000 per high-income teacher. Remember, because of the level of aggregation in the City I Model, the department hires workers in groups of 1,000 but only pays one worker per 1,000 actually employed.

Suggestions on Expenditures and Income

Federal-state aid will automatically match one dollar for every two dollars spent in local funds to a maximum of $20 per 100 population.

School units may be constructed by the School Department at a cost of $50,000. Only one school unit can be constructed per square mile parcel of land, and each school unit has a capacity of 10,000 students.

School units may only be located on residential parcels or existing parkland. Land requirements for a school unit are 1/5 of an RC parcel, 1/6 of an RB parcel and 1/8 of an RA parcel, parkland or undeveloped area.

The original value ratio (i.e., 1.00) of a school unit depreciates at the rate of five percent (5%) per round. As the value ratio declines, the quality of school services provided also declines. A low value ratio represents outdated school buildings, obsolete equipment and old textbooks. The value ratio can be raised to any desired level by an appropriate renovation payment. Renovation cost is defined as proposed value ratio minus present value ratio times $50,000.

Total salaries paid by the School Department depend on the salary level for high-income (RC) and middle-income (RB) teachers employed by the school system and the number of residential units employed. The School Department hires residence units (1000 workers in each residence unit hired) and then allocates the teachers in groups of 100 to school units in such a way as to accomplish the desired mix of teachers and students.

The total number of residence units hired by the department is determined by the number of teachers assigned to school units. For example, if the department assigns a total of 3400 high-income (RC) teachers, then the department must hire four RC residence units with a total of 4000 high income teachers. Each residence unit has 1000 workers, so any time the department assigns more than 1000 teachers of a particular income class, another residence unit must be hired.

The School Department determines the salary level of high and middle residence units employed as teachers. If the department fails to attract workers from the county, it must hire workers from the outside system at double the average salary level for each income class. Typical salaries are $5,000 per 1000 middle-income teachers and $10,000 per 1000 high income teachers.

The School Department must pay the cost of transporting students to school (up to a maximum of $500 per residence unit). The transportation charges from a residence to a school unit are $50 per mile on Type I roads; $100 per mile on Type II; $150 per mile on Type III roads. If the transportation charges for students from a residence to the nearest school unit are in excess of $2000 then the students from that residence will attend outside education facilities at their own cost.

3. INPUT PROCEDURE

Since City I is a computer-assisted model, it is necessary that information be fed to the computer in a certain format. This format is quite elementary and requires no knowledge of computer programming. It merely involves filling out forms in the proper manner with the required information for each decision.

In order to make a decision and feed it to the computer, participants in the City I game must fill in an input decision form with certain information. The information which is required on the input decision form varies with the type of decision being implemented. The type of information which is required is explained on the decision formats. There are six input explanation formats: one for economic teams, and one each for the Chairman and Council, School Department, Public Works and Safety Department, Highway Department, Planning and Zoning Department. An input decision form has the following components: Decision Code; (first card) and additional information (second card). Each of these components is explained below:

a. Decision Code

This indicates the type of decision that is being made. It is always a two-letter abbreviation preceded by a dollar sign ($). Essentially, the decision code describes the type of decision being made to the computer. These codes are summarized below:

Private Decisions

1. $LO - borrow or lend money
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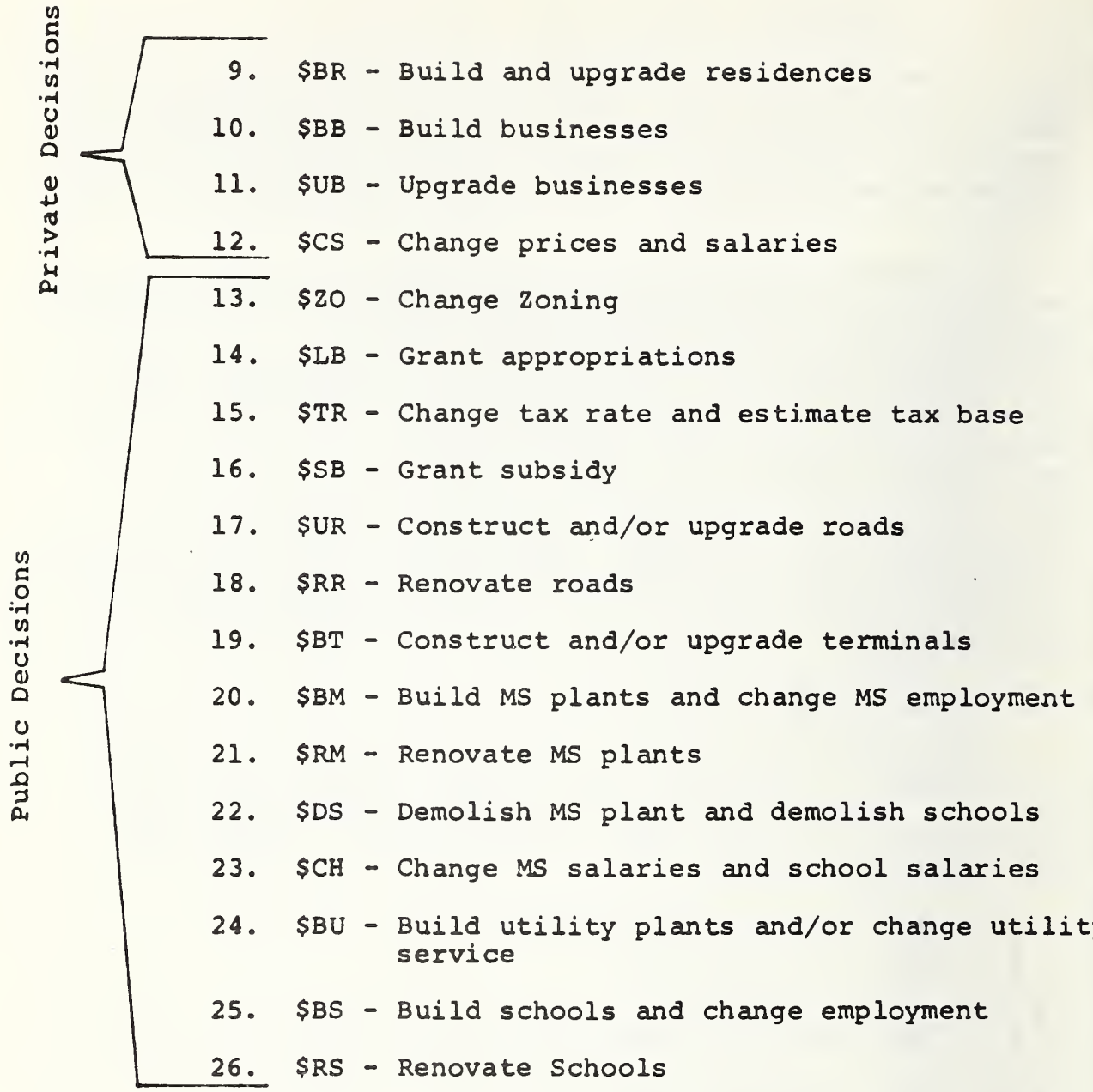
4. $RS - Restore slums
5. $PU - Purchase land or bid on land
6. $DR - Demolish residences
7. $DB - Demolish businesses
8. $RN - Renovate residences and businesses



b. Additional Information

The additional information concerning a decision is filled in the spaces immediately following the decision code. These spaces correspond to the columns marked (a), (b), (c), etc. on the input decision form and the input explanation form. The amount and type of additional information varies with the type of decision being made.

To clarify the procedure for filling out forms, it is suggested that participants review the sample decisions in this manual.

4. SAMPLE DECISIONS

1. The School Department wishes to change salaries to $6,500 for middle income and $11,500 for high-income teachers.

Decision Code	a	b	c	d	e	f
$ CH	SC,	0,	65,	115,	,	.

2. Economic team B lends $25,000 to economic team D. The term is three rounds and the interest rate is 7%

$ LØ	D,	250,	B,	3,	70,	.

3. Economic team C is building a BG2 at 98-34. Salaries will be $2600 for low, $5100 for middle, and $10,100 for high. The charge will be $22,000 to LI1, $18,000 to HI1, and $5,000 to PH1.

$ BB	C,	9834,	BG,	2,	,	,
$	26,	51,	101,	,	,	,
$	2200,	1800,	500,	,	,	.

SCHOOL DEPARTMENT: Explanation of Decision Formats

Decision Description	Code	a	b	c	d	e	f
Purchase Land	$PU	location	price (in $100's)	SC	Seller		
Build Schools	$BS	location	number of high income employees (in multiples of 100)	number of middle income employees (in multiples of 100)	0		
Change Employment	$BS	location	number of high income employees	number of middle income employees	1		
Renovate Schools	$RS	location	new value ratio (expressed as an integer 100 or less)				
Demolish Schools	$DS	SC	location				
Change Salaries	$CH	SC	0	new salary to middle income teachers	new salary to high income teachers		

5. COMPUTER OUTPUT

The computer output for the School Department is divided into three main parts: (a) a map of residence parcels served by each school unit, (b) a status report on school units and employment, and (c) a summary report on school service and the school budget.

a. The school map shows the location of each school unit. Each residential parcel has the code number of the school unit which the students attend.

b. The status report for each school unit lists the code number assigned to the school unit, the location of the school unit, its value ratio (the ratio of present value to original value), the number of students enrolled, the number of middle-income teachers, the number of high-income teachers, and the student-teacher ratio. The residential income-class, and salary paid to each residential unit employed as teachers are listed under the employment summary. Each residential unit employed by the School Department provides the school system with 1,000 teachers. These 1,000 teachers are assigned to work in school units in groups of 100.

c. The summary report shows the local school age population, the number of local students enrolled in the local school system, and the number of local school age population not enrolled in the local system, and therefore, receiving educational services from outside the local school system at additional expense to the Economic Sector. Also shown are the number of school units, the average enrollment per school unit, the total number of teachers employed, and the overall student-teacher ratio for the local school system.

The school budget shows the revenue of the School Department, the capital and operating expenses, and the surplus or deficit. Revenues are comprised of local appropriations plus federal-state aid used (i.e., matched at the designated level of two local dollars to one federal-state dollar up to a maximum of $20 per 100 population. Capital expenditures are for construction, renovation, and land purchases. Operating expenses are for salaries to teachers and transportation of students to local school units. If total expenditures exceed total revenues, the budget has a deficit and if revenues exceed expenditures the budget has a surplus. The percent of revenues actually spent is listed as the final item on the summary report.

SCHOOL DEPARTMENT REPORT FOR 1

SCHOOL	LOCATION	VALUE RATIO	STUDENTS	TEACHERS MID	TEACHERS HIGH	S/T RATIO
1	74-12	0.735	9660	500	100	16.1
2	86-18	0.855	9300	200	400	15.5
3	80-16	0.810	9720	400	400	12.1
4	84-14	0.770	3400	200	400	5.6
5	82-24	0.875	9390	200	400	15.6
6	70-18	0.810	7590	500	100	12.6
7	72-24	0.820	9350	400	400	11.6
8	80-28	0.905	9240	400	400	11.5
9	100-46	0.855	9980	200	400	16.6
TOTAL		0.826	77630	3000	3000	12.9

EMPLOYMENT

LOCATION	CLASS	SALARY
90-18	HIGH	$10000
90-14	HIGH	$10000
88-14	HIGH	$10000
94-48	MIDL	$ 5000
96-44	MIDL	$ 5000
84-28	MIDL	$ 5000
		$ 45000

SCHOOL DEPARTMENT REPORT FOR 1

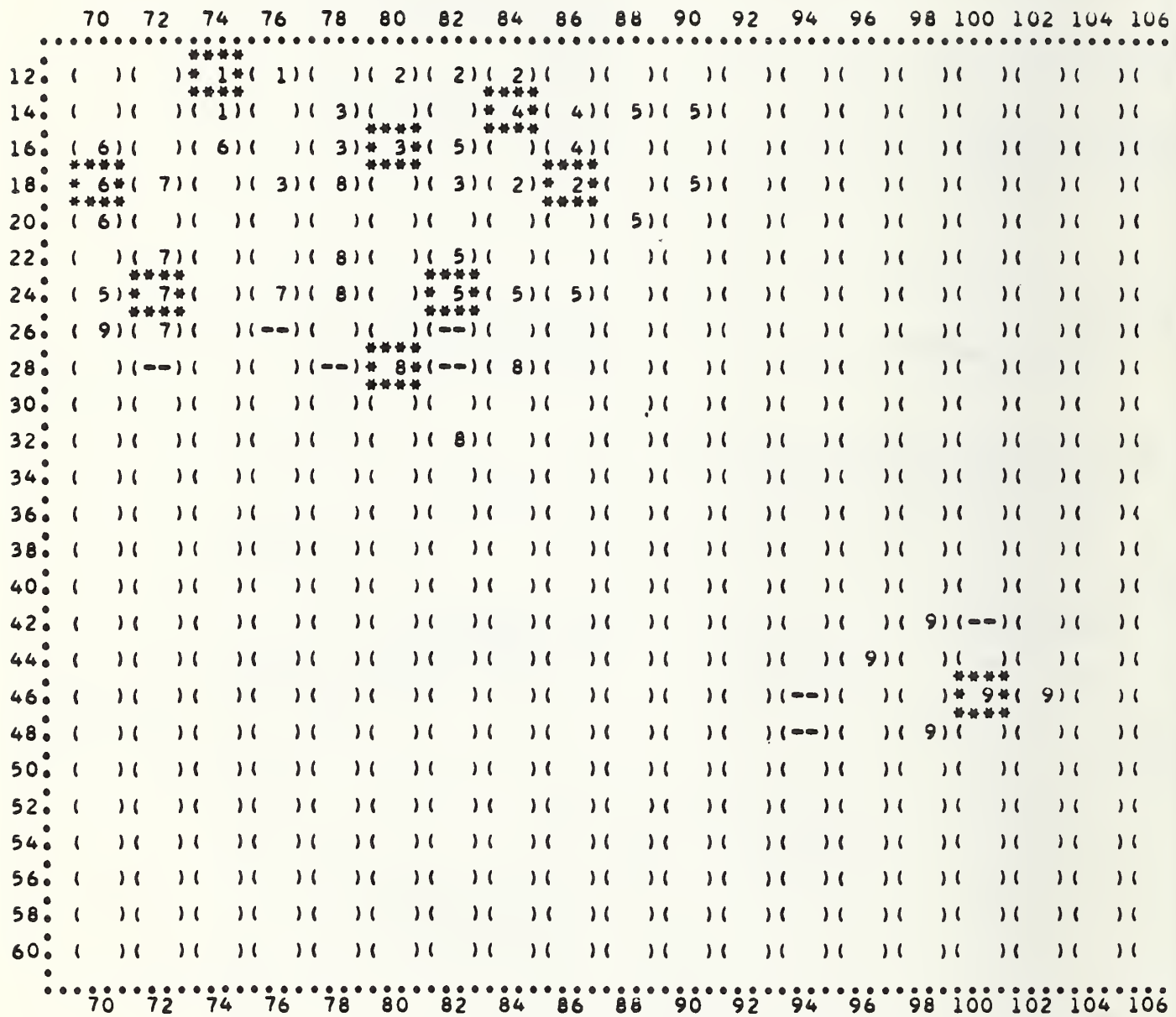
SCHOOL AGE POPULATION	89030
STUDENTS IN LOCAL SCHOOL SYSTEM	77630
STUDENTS ATTENDING OUTSIDE	11400
NUMBER OF LOCAL SCHOOLS	9
AVERAGE STUDENTS PER SCHOOL	8620
TOTAL TEACHERS	6000
OVERALL STUDENT/TEACHER RATIO	12.9

FINANCIAL ACCOUNTING

REVENUES			
APPROPRIATIONS	$ 80000.		
FEDERAL-STATE AID USED	$ 45933.		
TOTAL			$ 125933.
CAPITAL EXPENDITURES			
CONSTRUCTION	$ 0.		
RENOVATION	$ 64200.		
LAND PURCHASES	$ 5800.		
SUB-TOTAL		$ 70000.	
OPERATING EXPENSES			
SALARIES	$ 45000.		
TRANSPORTATION	$ 22800.		
SUB-TOTAL		$ 67800.	
TOTAL EXPENDITURES			$ 137800.
DEFICIT			$ 11866.

109 PERCENT OF APPROPRIATIONS WERE SPENT

SCHOOL MAP FOR ROUND 1



ASTERISKS ENCIRCLE SITES OF ALL FACILITIES

E. HIGHWAY DEPARTMENT

1. EXPLANATION OF THE ROLE

The Highway Department is responsible for constructing roads and terminals and maintaining roads. Although the private sector pays the cost of travel on roads, that cost is a function of the type and quality of roads. Basic industries ship their goods to terminals, BG establishments receive goods through a terminal, and the closer the terminal, the more profitable the business.

Highways

a. Types

There are three types of highways in City I: Tyee I, II and III. A Type I road is the largest road and Type III road is the smallest.

b. Capacity

Roads are used by employees living in residential units to travel to work (peak-hour) and to purchase personal goods and services, and by businesses to ship their goods to terminals and receive goods from each other (off-peak hour). The capacity of roads (i.e., the number of journeys on a road segment) affects peak-hour travel only.

The design capacities of the roads in City I are Type I - 6 (worker) journeys; Type II - 4 (worker) journeys; and Type III - 2 (worker) journeys.

c. Depreciation

The design capacity of a road depreciates at a rate of .05 times number of journeys to work/design capacity of segment. In other words, if there is a Type I road being used by 12 workers it would depreciate at the rate of .05 x 12/6 or .10.

If the former value ratio of this road segment was 1.00, its new value ratio would be .90, and the effective capacity (capacity due to depreciation) of the segment would be .90 times 6 (design capacity) or 5.4 (rounded off to 5 journeys).

d. Congestion

Congestion occurs on a road when the number of workers using it exceeds the effective capacity of the road. Workers who travel on congested roads must pay additional transportation costs in proportion to the amount of congestion that occurs. For example, if a road is overcrowded by a factor of 20%, the workers using the road must pay 20% additional transportation costs.

e. Land Requirements

A Type III road requires no land. A Type II road requires 1/5 of an RC parcel, 1/6 of an RB parcel, or 1/8 of an RA parcel from either side of the road. A Type I road has the same requirements as a Type II road, but from both sides of the road.

Land requirements apply only when the parcels adjoining a road are developed as residences. All land must be purchased before construction of a road. Any parkland can fulfill the land requirements for road construction.

Terminals

Terminals are used by basic industries (HI and LI) to ship their goods to and by BG to receive its goods from the Outside economy. There are three types of terminals (I, II, and III). Type III is the smallest and Type I is the largest. Terminals must be located at the intersections of roads and require no land. Different types of terminals can serve different maximum industry levels.

The information is summarized below:

Terminal	Minimum Required Road Intersection	Maximum Industry Level Service*
Type I	Four Type I roads	Level of Development :3
Type II	Two Type I roads Two Type II roads	Level of Development :2
Type III	Four Type II roads	Level of Development :1

*For example, a Type I terminal can serve any level of BG, HI or LI, but a Type II terminal cannot serve a BG3, HI3, or LI3. A Type III terminal can serve only a BG1, HI1, or LI1.

2. HIGHWAY DEPARTMENT DECISIONS

The Highway Department may make any or all of the following decisions during a round of play:

Purchase Land

Land is required for all proposed new roads (except Type III) which adjoin a residential parcel. A Type II road requires 1/5 of an RC parcel, 1/6 of an RB parcel or 1/8 of an RA parcel from either side of the road. A Type I road has the same requirements as a Type II road, but from both sides of the road.

When purchasing land from a team owning a residence, the computer will automatically allocate the amount required, but the purchase price is agreed upon by the teams involved.

Terminals do not require land.

Build or Upgrade Roads

The department may build new roads or upgrade existing ones from one type to another. New roads may be constructed on any horizontal or vertical coordinate (roadbeds) on the map. The costs for constructing new roads or upgrading existing ones are:

Type of Road	Construction Cost	Upgrade to Type I	Upgrade to Type II
I	$30,000	$ ---	$---
II	25,000	5,000	---
III	17,000	13,000	10,000

Renovate Roads

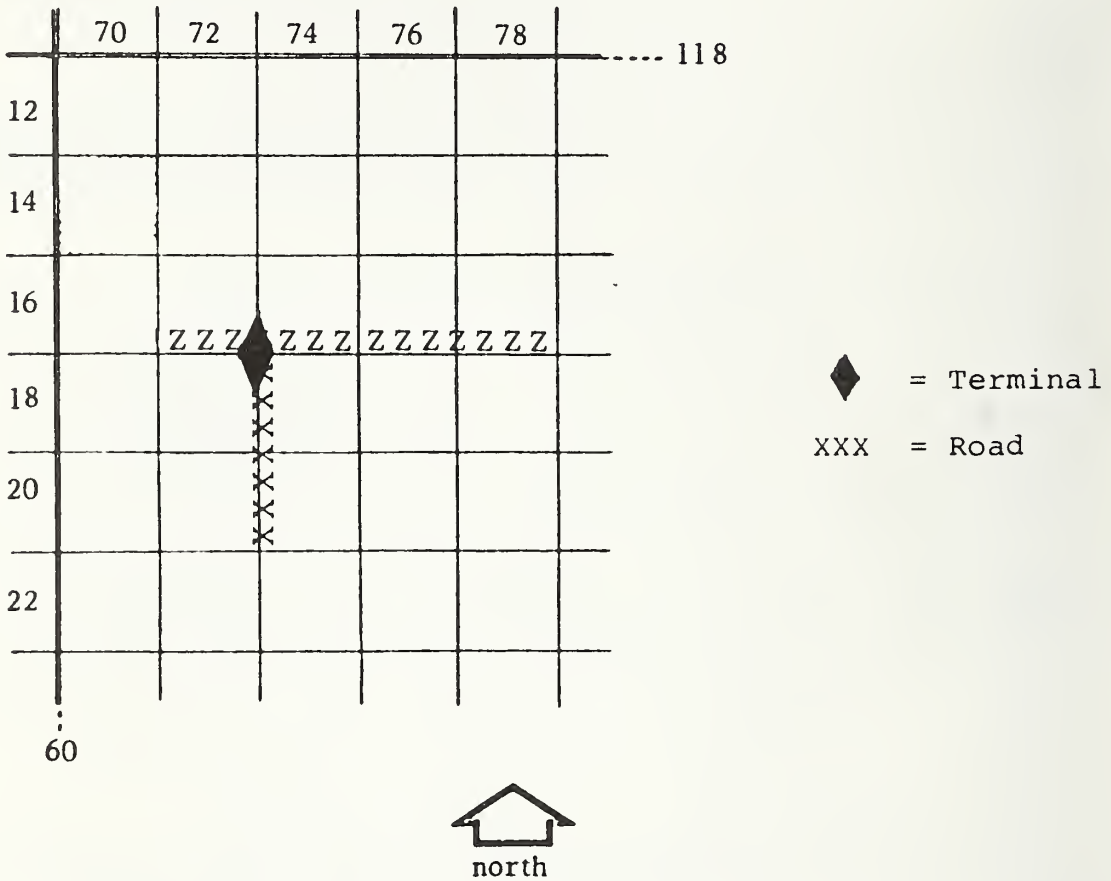
The Highway Department may counter depreciation and its effects -- congestion and greater transportation costs -- by renovating (i.e., raising the value ratio) existing roads in the simulated area. The cost of renovation is defined as the original construction cost of a road times (proposed value ratio minus former value ratio). The original construction costs of roads are $30,000 (Type I), $25,000 (Type II), and $17,000 (Type III).

Build or Upgrade Terminals

The Highway Department may build or upgrade terminals.

The construction costs are $40,000 (Type I), $30,000 (Type II) and $20,000 (Type III). Remember that terminals must be located at intersections.

NOTE: When specifying the location of highway segments on decision forms, the department must always use either odd-even (north-south) or even-odd (east-west) coordinates. Since terminals are located at intersections, they are identified by odd-odd coordinates.



In the example above, the east-west road segments are identified as 7217, 7417, 7617, and 7817 and the north-south road segments are identified as 7318 and 7320. The terminal is located at 7317.

Suggestions on Expenditures and Income

Federal-State aid is automatically granted in the amount of two Federal-state dollars for every one local dollar spent on highway construction up to a maximum of $18 per 100 population.

Construction includes both upgrading existing roads (i.e., going from a Type III to a Type I or II) and building new roads on roadbeds. The department should base its decisions on the value ratio and congestion maps for existing roads and on anticipated development for new roads.

Construction costs are:

Type	Cost	Upgrade to:	Type I	Type II
I	$30,000		---	---
II	25,000		$5,000	---
III	17,000		13,000	$10,000

Renovation (i.e., raising the value ratio) as: (proposed value ratio - present value ratio) x original cost. Original costs are: Type I - $30,000; Type II - $25,000; Type III - $17,000.

A Type I terminal costs $40,000, a Type II terminal costs $30,000 and a Type III terminal costs $20,000. The cost to upgrade a terminal from one type to another is the difference between their original costs.

3. INPUT PROCEDURE

Since City I is a computer-assisted model, it is necessary that information be fed to the computer in a certain format. This format is quite elementary and requires no knowledge of computer programming. It merely involves filling out forms in the proper manner with the required information for each decision.

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This indicates the type of decision that is being made. It is always a two-letter abbreviation preceded by a dollar sign ($). Essentially, the decision code describes the type of decision being made to the computer. These codes are summarized below:

Private Decisions

1. $LO - borrow or lend money
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4. $RS - Restore slums
5. $PU - Purchase land or bid on land
6. $DR - Demolish residences
7. $DB - Demolish businesses
8. $RN - Renovate residences and businesses

Private Decisions

9. $BR - Build and upgrade residences
10. $BB - Build businesses
11. $UB - Upgrade businesses
12. $CS - Change prices and salaries

Public Decisions

13. $ZO - Change Zoning
14. $LB - Grant appropriations
15. $TR - Change tax rate and estimate tax base
16. $SB - Grant subsidy
17. $UR - Construct and/or upgrade roads
18. $RR - Renovate roads
19. $BT - Construct and/or upgrade terminals
20. $BM - Build MS plants and change MS employment
21. $RM - Renovate MS plants
22. $DS - Demolish MS plant and demolish schools
23. $CH - Change MS salaries and school salaries
24. $BU - Build utility plants and/or change utility service
25. $BS - Build schools and change employment
26. $RS - Renovate Schools

b. Additional Information

The additional information concerning a decision is filled in the spaces immediately following the decision code. These spaces correspond to the columns marked (a), (b), (c), etc. on the input decision form and the input explanation form. The amount and type of additional information varies with the type of decision being made.

To clarify the procedure for filling out forms, it is suggested that participants review the sample decisions in this manual.

4. SAMPLE DECISIONS

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2. Economic team B lends $25,000 to economic team D. The term is three rounds and the interest rate is 7%

$	LØ	D,	250,	B,	3,	70,	.

3. Economic team C is building a BG2 at 98-34. Salaries will be $2600 for low, $5100 for middle, and $10,100 for high. The charge will be $22,000 to LI1, $18,000 to HI1, and $5,000 to PH1.

$	BB	C,	9834,	BG,	2,	,	,
$		26,	51,	101,	,	,	,
$		2200,	1800,	500,	,	,	.

HIGHWAY DEPARTMENT: Explanation of Decision Formats

Decision Description	Code	a	b	c	d	e	f
Purchase Land	$PU	location	price (in $100's)	HY	seller	1	
Construct and/ or upgrade roads	$UR	location*	new type (1, 2, or 3)				
Renovate roads	$RR	location*	new value ratio				
Construct and/ or upgrade terminals	$BT	location**	new type				

*The location of a road is specified in odd-even coordinates (i.e., 7718) for north-south roads, and even-odd coordinates (i.e., 7817) for east-west roads

** The location of a terminal is specified by its odd-odd intersection coordinates (i.e., 7719).

5. COMPUTER OUTPUT

The computer output for the Highway Department consists of four main parts: (a) a summary report on expenditures last round; (b) a highway map of the county; (c) a summary listing of the condition of roads; and (d) three maps of the condition and cost to travel on each road segment.

a. The Summary Budget Report shows the revenue and expenditures last round. Revenues include funds appropriated by the Chairman and federal-state aid used. Federal-state aid is granted to the department in the ratio of $2 federal-state aid for every $1 in local funds up to the maximum of $18.00 per 100 population. Expenditures are for road construction, road renovation, land purchase, and terminal construction. If total expenditures exceed total revenues, there is a deficit; if revenues exceed expenditures, there is a surplus. The percent of revenues actually spent is listed as the final item on the Summary Report.

b. The Highway Map shows the type of each terminal and road segment, including roadbeds (undeveloped roads). The symbols for terminals and road types are at the bottom of the sheet.

c. The summary listing of road conditions lists the number and location of roads with low value ratios and high congestion. As mentioned before, roads have varying capacities: Type I - 6 journeys to work; Type II - 4 journeys to work; Type III - 2 journeys to work. A road segment depreciates at a rate of:

$$\left(\frac{.05 \times \text{number of journeys to work}}{\text{design capacity of segment}}\right)$$

per round. Depreciation may be offset by expenditures for renovation.

The ratio of the number of journeys to work to the design capacity is the amount of congestion on a road. The congestion cost, paid by those who travel to work along a road is expressed as an average percent above normal cost to travel on the road.

d. The Value Ratio map shows the value ratio of each road in the county. No value ratio is printed for roads with a value ratio of 1.00.

The congestion map prints the additional cost (percent above normal cost) to travel on congested roads.

The total cost increment map prints the total percent above normal cost to travel on roads which are deteriorated and/or congested. The total cost to travel to work on a road is a function of normal cost on the road, the value ratio, and the congestion. No cost increment is printed for roads with normal cost.

HIGHWAY DEPARTMENT REPORT FOR 1

FUNDS AVAILABLE		
APPROPRIATIONS	$	50000.
FEDERAL-STATE AID	$	60866.
TOTAL	$	110866.
EXPENDITURES		
ROAD UPGRADING	$	48000.
ROAD MAINTENANCE	$	39700.
LAND PURCHASES	$	3600.
TERMINAL CONSTRUCTION	$	0.
TOTAL	$	91300.

SURPLUS	$ 19566.
PERCENT OF APPROPRIATION SPENT	82.3

HIGHWAY DEPARTMENT REPORT FOR 1

THERE ARE 0 ROAD(S) WITH A VALUE RATIO LESS THAN .80

THERE ARE 0 ROAD(S) WITH A VALUE RATIO LESS THAN .75

THERE ARE 2 ROAD(S) WITH CONGESTION COSTS GREATER THAN 56 PERCENT

7413 7813

THERE ARE 1 ROAD(S) WITH CONGESTION COSTS GREATER THAN 96 PERCENT

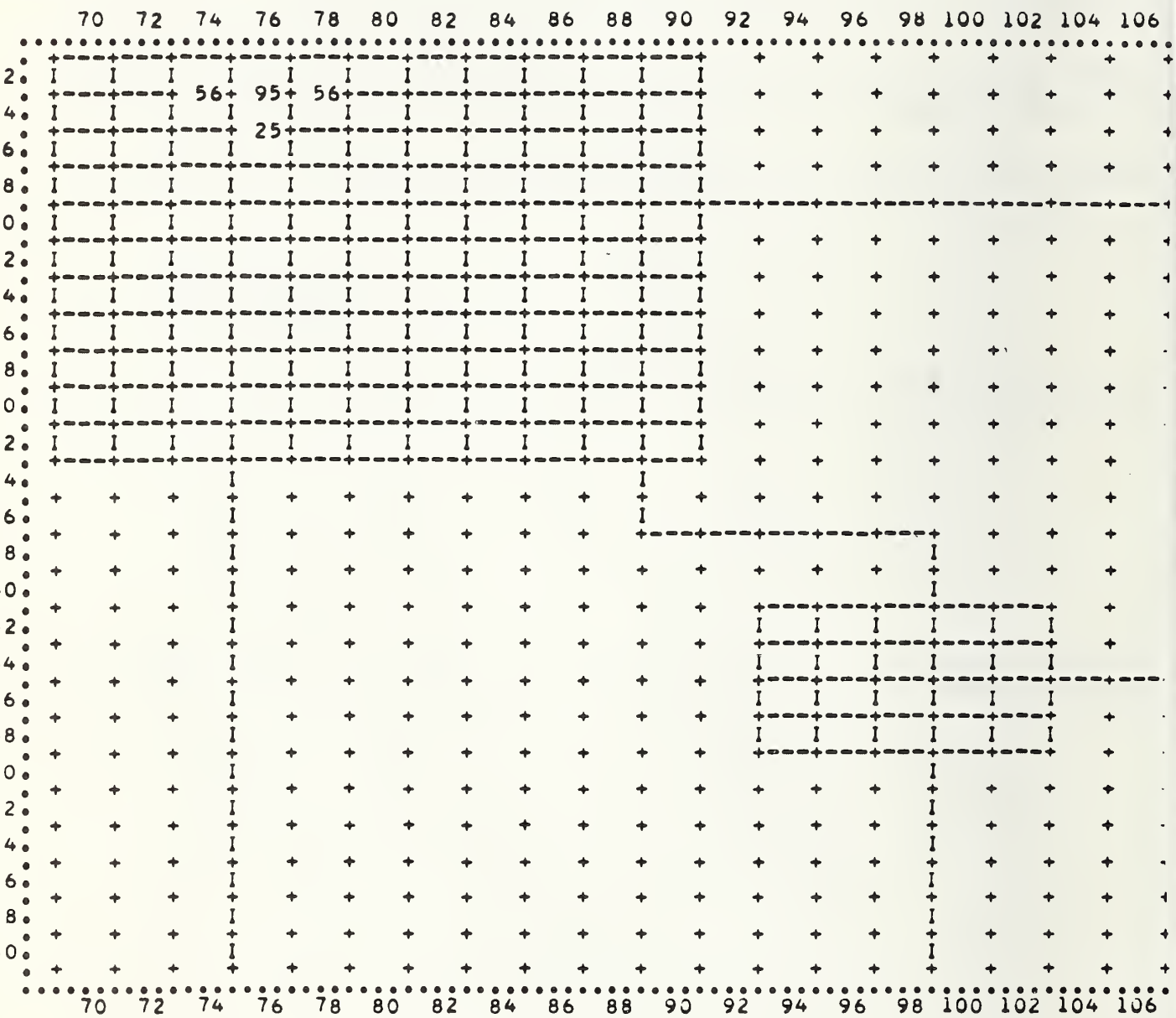
7613

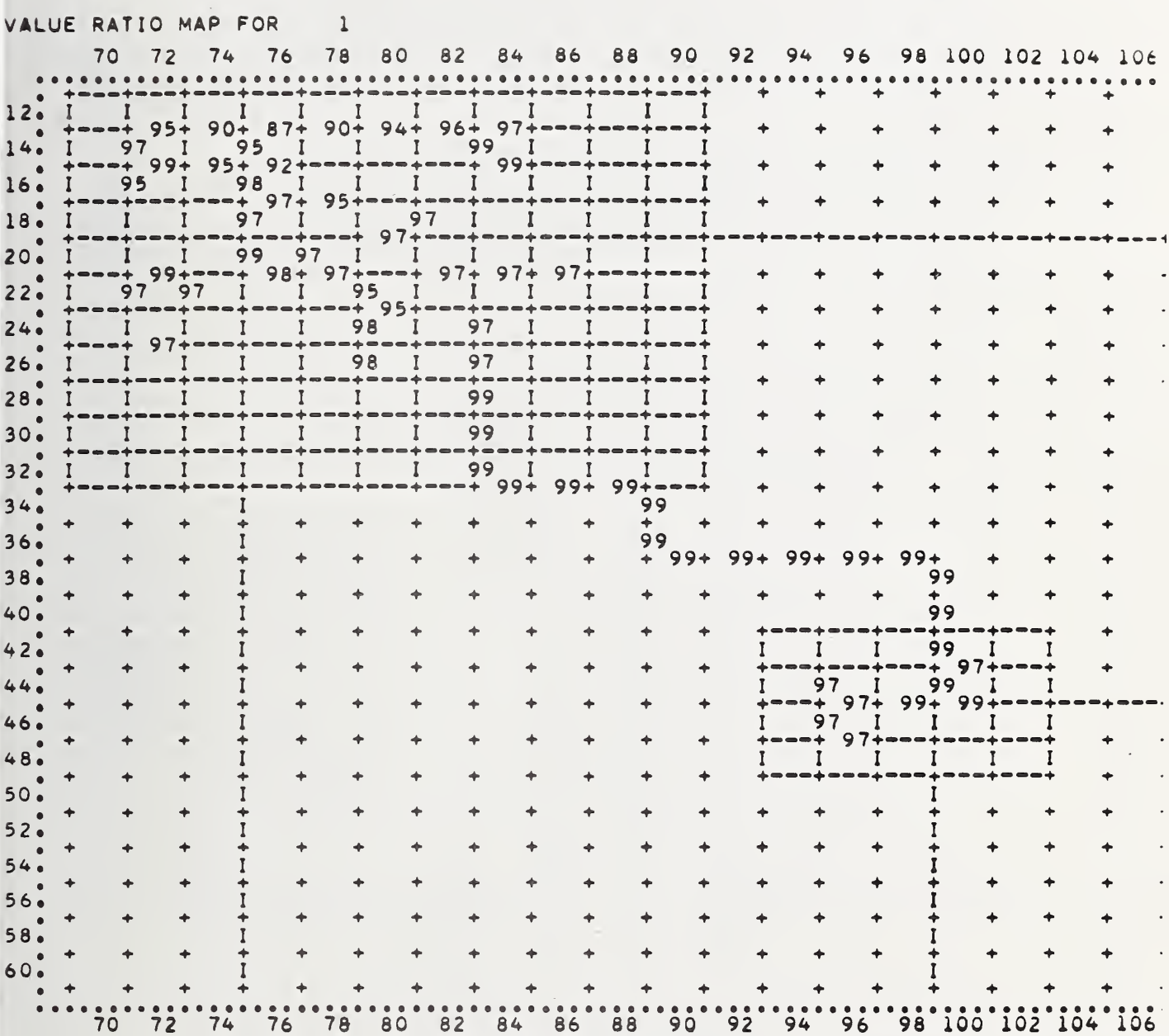
NUMBERS OF ROADS

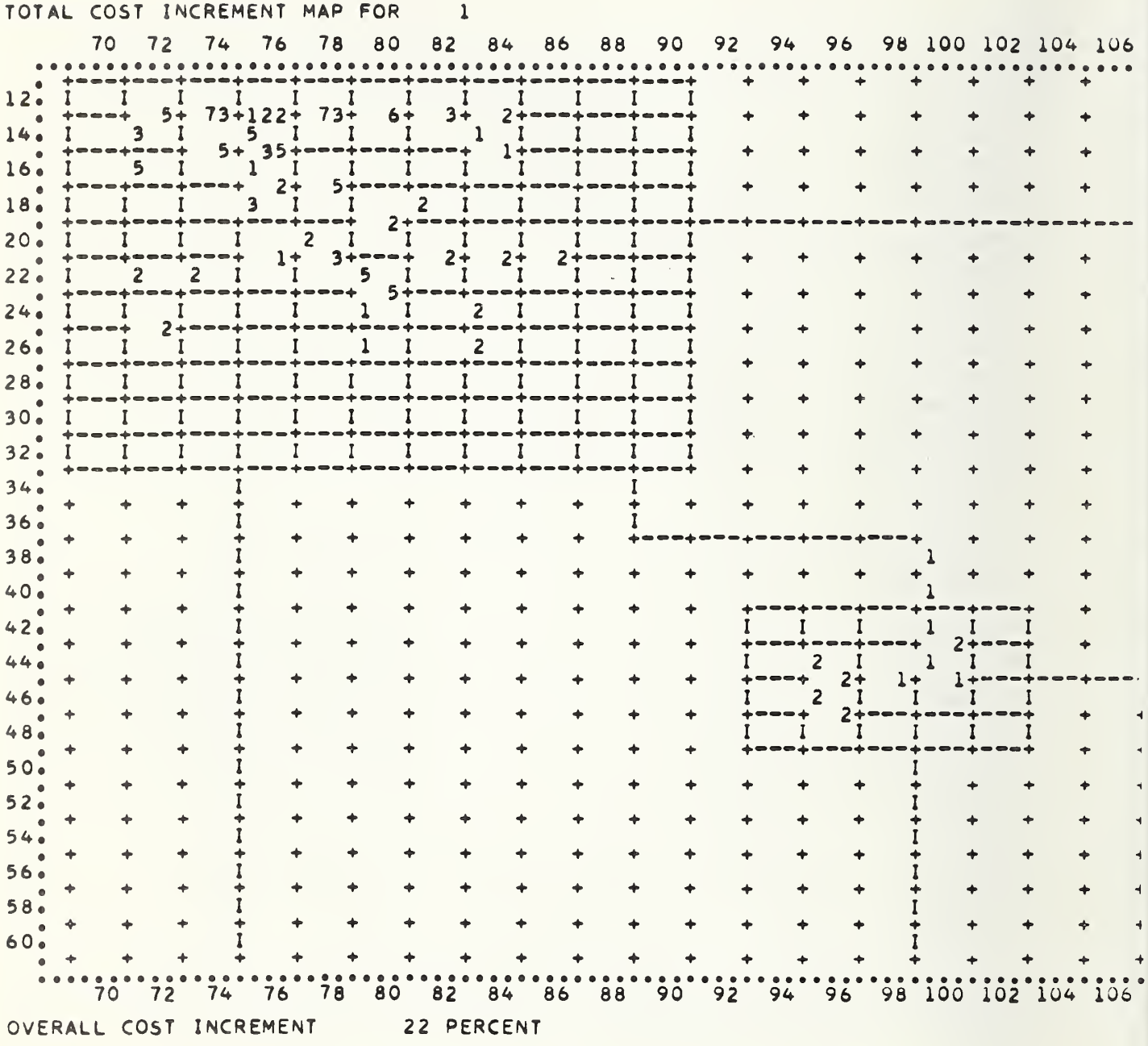
VALUE RATIO...	1.0-0.9	0.9-0.8	0.8-0.75	0.75-0
ROAD TYPE				
1	33	0	0	0
2	64	3	0	0
3	263	0	0	0

CONGEST. COST...	0	25	56	96 AND UP.
ROAD TYPE				
1	33	0	0	0
2	64	0	2	1
3	262	1	0	0

CONGESTION MAP FOR 1




VALUE RATIO MAP FOR 1
70 72 74 76 78 80 82 84 86 88 90 92 94 96 98 100 102 104 106
12. 14. 16. 18. 20. 22. 24. 26. 28. 30. 32. 34. 36. 38. 40. 42. 44. 46. 48. 50. 52. 54. 56. 58. 60.


TOTAL COST INCREMENT MAP FOR 1
70 72 74 76 78 80 82 84 86 88 90 92 94 96 98 100 102 104 106
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OVERALL COST INCREMENT 22 PERCENT

F. PLANNING AND ZONING DEPARTMENT

1. EXPLANATION OF THE ROLE

The Planning and Zoning Department is responsible for the acquisition of parkland and the administration of the zoning process. Although Public Works and Safety, Schools, and Highways may purchase land, their purchases are classified as parkland until developed. This means that all public land is controlled by Planning and Zoning. All private developments must meet the zoning requirements, so Planning and Zoning can in effect control the development of the county.

The department bases its decisions on computer output listing the previous year's expenditures; the amount of parkland, and the present zoning classifications; team request for zoning changes; and whatever other criteria it may establish.

Zoning Codes

The Planning and Zoning Department in City I can specify zoning codes which limit not only the type of land use on a parcel, but also the density (i.e., level of development) on a parcel. The zoning codes are:

10 - Any Industrial
11 - LI only
20 - Any Commercial (BG, BS, PG, PS)
21 - BS or BG
22 - PS or PG
23 - BS only
24 - PS only
25 - BS or PS
30 - Any Residential (RA, RB, RC)
31 - Any residential, maximum development level - 1
32 - Any residential, development levels 1, 2
32 - Any residential, development levels 1, 2
33 - Any residential, development levels 3, 4, 5
34 - Any residential, development levels 1,2,3, ,5
35 - Any residential, development levels 1,2,3,4,5,6
36 - Any residential, development levels 6,7,8
37 - Any residential, development levels 5,6,7,8
40 - Parkland
50 - Any commercial or LI
51 - Any residential, development levels 3,4,5, or BS, PS
60 - Any use

2. PLANNING AND ZONING DEPARTMENT DECISIONS

The Planning and Zoning Department may make any or all of the following decisions during a round of play. The department may purchase an entire parcel from another team or the Outside Economy. When purchasing a portion of a parcel, the department may only purchase land on parcels where residences are located. In such a case the computer will allocate 1/5 of an RC parcel, 1/6 of an RB parcel, and 1/8 of an RA parcel.

A recommended ratio of population per square mile of parkland is 30,000 to 1. (See "Socio-Economic Parameters," page).

The Planning and Zoning Department may change the zoning codes on a maximum of five parcels during a round.

3. INPUT PROCEDURE

Since City I is a computer-assisted model, it is necessary that information be fed to the computer in a certain format. This format is quite elementary and requires no knowledge of computer programming. It merely involves filling out forms in the proper manner with the required information for each decision.

In order to make a decision and feed it to the computer, participants in the City I game must fill in an input decision form with certain information. The information which is required on the input decision form varies with the type of decision being implemented. The type of information which is required is explained on the decision formats. There are six input explanation formats: one for economic teams, and one each for the Chairman and Council, School Department, Public Works and Safety Department, Highway Department, Planning and Zoning Department. An input decision form has the following components: Decision Code; (first card) and additional information (second card). Each of these components is explained below:

a. Decision Code

This indicates the type of decision that is being made. It is always a two-letter abbreviation preceded by a dollar sign ($). Essentially, the decision code describes the type of decision being made to the computer. These codes are summarized below:

Private Decisions

1. $LO - borrow or lend money
2. $CT - transfer cash
3. $IN - Invest in speculative or conservative stocks
4. $RS - Restore slums
5. $PU - Purchase land or bid on land
6. $DR - Demolish residences
7. $DB - Demolish businesses
8. $RN - Renovate residences and businesses

Private Decisions

9. $BR - Build and upgrade residences
10. $BB - Build businesses
11. $UB - Upgrade businesses
12. $CS - Change prices and salaries

Public Decisions

13. $ZO - Change Zoning
14. $LB - Grant appropriations
15. $TR - Change tax rate and estimate tax base
16. $SB - Grant subsidy
17. $UR - Construct and/or upgrade roads
18. $RR - Renovate roads
19. $BT - Construct and/or upgrade terminals
20. $BM - Build MS plants and change MS employment
21. $RM - Renovate MS plants
22. $DS - Demolish MS plant and demolish schools
23. $CH - Change MS salaries and school salaries
24. $BU - Build utility plants and/or change utility service
25. $BS - Build schools and change employment
26. $RS - Renovate Schools

b. Additional Information

The additional information concerning a decision is filled in the spaces immediately following the decision code. These spaces correspond to the columns marked (a), (b), (c), etc. on the input decision form and the input explanation form. The amount and type of additional information varies with the type of decision being made.

To clarify the procedure for filling out forms, it is suggested that participants review the sample decisions in this manual.

4. SAMPLE DECISIONS

1. The School Department wishes to change salaries to $6,500 for middle income and $11,500 for high-income teachers.

Decision Code	a	b	c	d	e	f
$ CH	SC,	0,	65,	115,	,	.

2. Economic team B lends $25,000 to economic team D. The term is three rounds and the interest rate is 7%

$	LØ	D,	250,	B,	3,	70,	.

3. Economic team C is building a BG2 at 98-34. Salaries will be $2600 for low, $5100 for middle, and $10,100 for high. The charge will be $22,000 to LI1, $18,000 to HI1, and $5,000 to PH1.

$	BB	C,	9834,	BG,	2,	,	,
$		26,	51,	101,	,	,	,
$		2200,	1800,	500,	,	,	.

PLANNING AND ZONING DEPARTMENT: Explanation of Decision Format

Decision Description	Code	a	b	c	d	e	f
Purchase Land	$PU	location	price (in $100's)	PZ	seller, or OU if bid	1 if purchase portion of parcel	
Change Zoning	$ZO	location	new zoning code				

5. COMPUTER OUTPUT

The computer output for the Planning and Zoning Department is divided into three main parts: (a) a map of parkland; (b) a summary report; and (c) a map of existing zoning.

a. The parkland map shows the fraction of each residential or undeveloped land parcel that is devoted to parkland. Parkland represents recreational land that is used by the local population. The fraction represents the proportion of a square mile that is parkland, and therefore, available for recreational use by the local population.

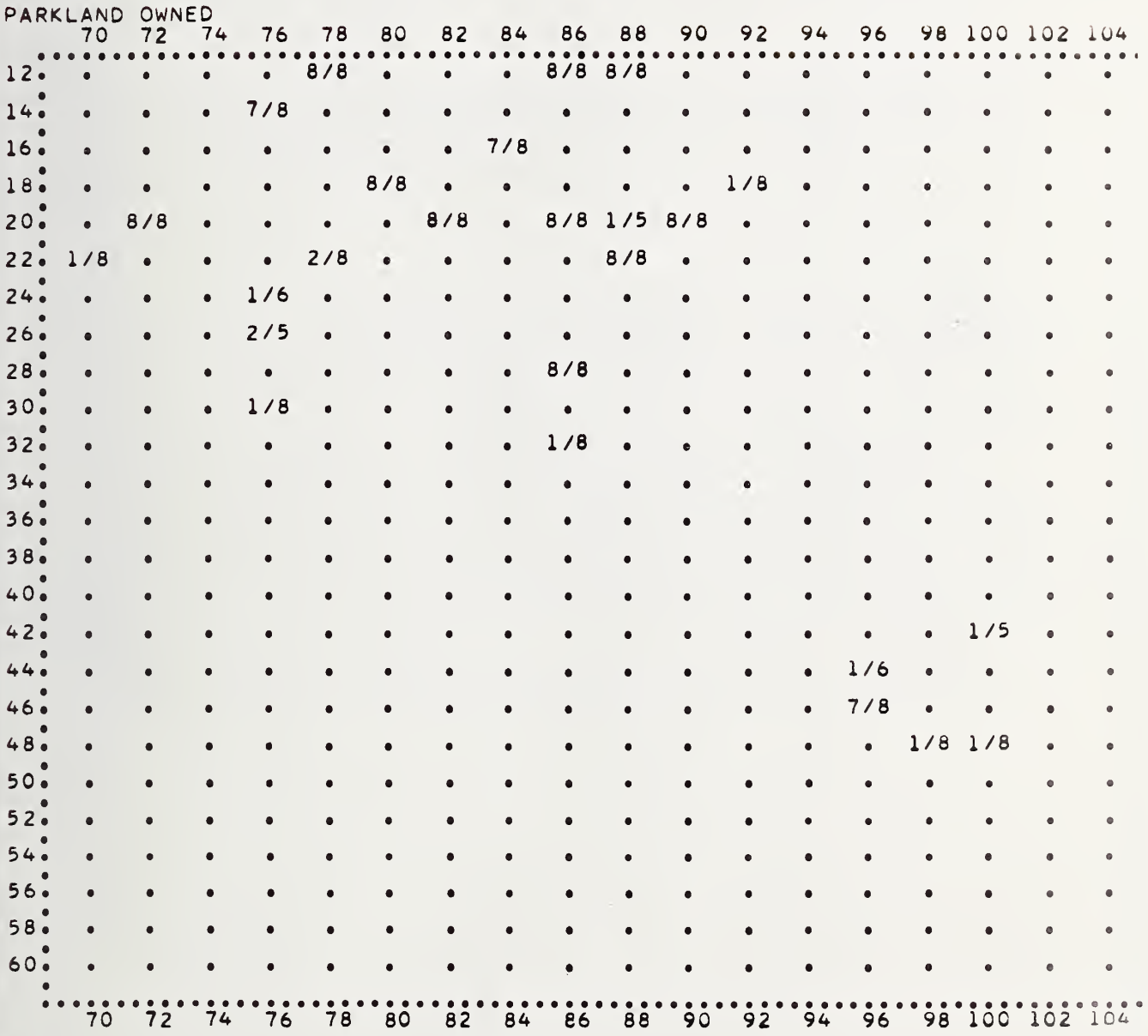
b. The summary report shows the local population, the number of square miles of parkland, and the population per square mile of parkland. Also shown are the zoning changes made during the past round. The department budget shows the local appropriations for the last round, the amount of federal-state aid received, and the actual expenditures for parkland and subsidies.

c. The zoning map indicates the existing zoning for the city. All construction just be in accordance with these codes, unless changed.

PLANNING AND ZONING DEPARTMENT REPORT FOR 1

POPULATION	366300	
SQUARE MILES OF PARK	14.75	
POPULATION PER SQUARE MILE	24819	
FUNDS AVAILABLE		
LOCAL APPROPRATIONS	$ 10000.	
FEDERAL-STATE AID	$ 1831.	
TOTAL	$ 11831.	
EXPENDITURES		
LAND PURCHASES	$ 9800.	
SUBSIDIES	$ 0.	
TOTAL	$ 9800.	
SURPLUS		$ 2031.
PERCENT OF APPROPRATIONS SPENT		82

PLANNING AND ZONING DEPARTMENT REPORT FOR 1



PLANNING AND ZONING DEPARTMENT REPORT FOR 1

ZONING MAP

	70	72	74	76	78	80	82	84	86	88	90	92	94	96	98	100	102	104	106
12.	10	10	36	35	40	34	34	32	40	40	32	32	32	32	32	32	32	32	32
14.	10	21	37	40	34	11	22	34	32	32	32	32	32	32	32	32	32	32	32
16.	37	--	34	22	33	34	34	40	32	32	32	32	32	32	32	32	32	32	32
18.	35	34	22	33	33	40	34	32	32	32	32	32	32	32	32	32	32	32	32
20.	34	40	10	10	21	--	40	--	40	32	40	32	32	32	32	32	32	32	32
22.	32	20	21	--	11	11	33	22	--	40	32	32	32	32	32	32	32	32	32
24.	32	33	22	36	34	20	34	32	32	32	32	32	32	32	32	32	32	32	32
26.	32	32	11	34	21	--	32	--	--	32	32	32	32	32	32	32	32	32	32
28.	--	32	--	--	34	34	34	32	40	--	--	--	--	--	--	--	--	--	--
30.	--	--	--	34	--	--	11	--	--	--	--	--	--	--	--	--	--	--	--
32.	--	--	--	--	--	--	--	--	20	--	--	--	--	--	--	--	--	--	--
34.	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
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38.	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
40.	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
42.	--	--	--	--	--	--	--	--	--	--	--	--	--	20	35	35	--	--	--
44.	--	--	--	--	--	--	--	--	--	--	--	--	--	35	10	--	11	--	--
46.	--	--	--	--	--	--	--	--	--	--	--	--	20	40	--	20	21	--	--
48.	--	--	--	--	--	--	--	--	--	--	--	--	30	--	20	20	--	--	--
50.	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
52.	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
54.	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
56.	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
58.	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
60.	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	70	72	74	76	78	80	82	84	86	88	90	92	94	96	98	100	102	104	106

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12. Sponsoring Organization Name and Address National Technical Information Service 5285 Port Royal Road Springfield, Virginia 22151			13. Type of Report & Period Covered Final 14.

15. Supplementary Notes

16. Abstracts

City I is an operational simulation game in which participants make economic, government, and social decisions affecting a hypothetical metropolitan area. Through the use of a computer, the simulated urban system responds to the participant's decisions as any real city would. Each player in City I is assigned to a team which shares an economic and governmental role. This manual describes the player details for the economic and government sectors along with general information required for game play. It is one of three manuals necessary for game play. (Player's Manual, Director's Manual, Computer Operator's Manual). Each of these manuals are designed to be used for reference and by themselves will not describe enough details for a complete game play. The game is run on an IBM 1130 computer with 8K core and single disc.

17. Key Words and Document Analysis. 17a. Descriptors

City; computer; directors; economic; games government; metropolitan; players; sectors; simulation; social; urban.

17b. Identifiers/Open-Ended Terms

17c. COSATI Field/Group

18. Availability Statement	19. Security Class (This Report) UNCLASSIFIED	21. No. of Pages 150
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