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## Automating Community Charrettes: Using CommunityViz to Improve the Effectiveness of Community Charrettes, Based on a Charrette Performed in Old Orchard Beach in 2006

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Automating Community Charrettes:  
Using CommunityViz to Improve the Effectiveness of Community  
Charrettes, Based on a Charrette Performed in  
Old Orchard Beach in 2006

A Capstone presented in partial fulfillment of requirements for the Master of  
Community Planning and Development Degree

Edmund S. Muskie School of Public Service  
University of Southern Maine

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May 2010

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## **ABSTRACT:**

Public input has become an important part of the planning process for many communities and participatory design charrettes have become a frequent means for public input. More recently, Geographic Information Systems (GIS) technologies have started to be used as an interactive part of many charrettes. This Capstone project considers the impacts and opportunities of using these interactive technologies for participatory planning. It then looks at a charrette that was performed in 2006 using a traditional pencil and paper “chip” game, and demonstrates how this same process could have been conducted using the GIS extension program CommunityViz. Possible advantages of automating such charrettes are considered. Finally, this project explores what added features of the charrette could have been included by using CommunityViz, and considers future applications and adaptability of this project.

## INTRODUCTION:

Community charrettes have evolved into a very significant tool for public involvement in the planning process. Charrettes involve one or several day sessions with planners, residents, and other stakeholders in order to produce fully realized community design alternatives that have citizen endorsement (Kwartler et al. 2008). Charrettes generally focus on a small geographic area, such as neighborhoods or downtowns, and they often consist of small teams who work with planners or design professionals to develop alternatives with maps, charts and drawings (Kwartler et al. 2008). Charrettes have expanded from a focus on architectural design to a focus on patterns of land use development over larger areas. According to the National Charrette Institute, charrettes are design-based accelerated projects that harness the talents and energies of interested parties in order to create a feasible plan. The goals of charrettes are to save time and money, increase the probability of implementation, promote trust between citizens and government, and result in the best sustainable design (NCI 2010).

One activity that often occurs in land use planning-orientated charrettes is the “chip” game. Chip games designate markers to represent different land uses in a given area, which citizens can then portray on a base map and discuss. The base map will designate constraints for new land uses and opportunities to use infrastructure. During this sort of exercise, participants can discuss a range of options for how to accommodate the region’s growing needs, and make decisions about whether to continue current trends, change densities, or try other land use patterns (Kwartler et al. 2008).

More recently, emerging computer technologies have been used more frequently as a part of the public participatory process, and they have been used to automate more traditional chip games. Some of the Geographic Information Systems (GIS) technologies that have been used to

assist the public and private in making spatial land use decisions include: What if?

(<http://www.whatifinc.biz/>), CommunityViz (<http://www.communityviz.com/>), INDEX

(<http://www.crit.com/>), and Place<sup>3</sup>S (<http://www.places.energy.ca.gov/places/>).

In the late 1990s, Noel Fritzinger and Lyman Orton first envisioned a software program that would be able to make the land use planning process more accessible and visible to ordinary citizens including in the small Vermont towns of their state (Placeways 2010). The two men then formed the Orton Family Foundation to fund this vision, and teamed up with experts in order to actually create the product that they had envisioned. In 2001, they produced their first product, “CommunityViz Suite Version 1.2,” which included three separate ArcView extensions: Scenario Conductor, SiteBuilder 3D, and Policy Simulator. Since then, CommunityViz has become more sophisticated and popular within the planning community. It is currently used in over 40 countries by federal and state agencies, towns, cities, consultants, NGOs, universities, and other users (Placeways 2010).

CommunityViz plugs into ESRI’s ArcGIS software and adds extra, more specialized, functionality to the program for conducting alternative land use scenarios. This multifunctional tool ties visual simulation to GIS data in an environment where alternatives can be quickly rendered, modified, and quantified on the fly working through a user interface created to make such immediate interaction easy (Kwartler et al. 2008). This unique on the fly capability allows stakeholders to get immediate feedback on the impact of various alternative scenarios. As non-technical users change land use parameters or underlying assumptions, CommunityViz updates attributes, monitors constraints, and tracks performance indicators so the user can immediately see the impacts of their alternatives (Kwartler et al. 2008).

This program is designed to help make planning decisions by combining complex analysis tools with a simple visual presentation of maps and statistics that can be interpreted and understood by ordinary community members and readily manipulated by them once a computer project is built.

By using technologies such as CommunityViz, charrettes can be more efficient, comprehensive, and yield more immediate outputs. The objective of this capstone was to create a CommunityViz-based exercise to calculate the limited measures of fiscal impact of various land use scenarios that were used for the Old Orchard Beach ballpark property in an actual charrette in 2006. This computer-based tool could have been used instead of the pencil and construction paper "Land Use & Economic Impact Exercise" that was actually conducted in 2006 by Alan Holt's Planning Workshop (CPD 603) as a part of the Community Planning and Development curriculum at the Muskie School of Public Service.

This paper first discusses the emergence of interactive GIS technologies as a part of community charrettes, and considers their impact on the planning process, compared to more traditional methods. The paper then explains the charrette that occurred in Old Orchard Beach in 2006, and compares this to how a similar workshop using CommunityViz and the tool developed here could have occurred. A section on tool development and design then details the technical aspects of how to conduct this process with CommunityViz as a computer-based aid. The project's limitations and possible future directions are also considered in conclusion.

## **BACKGROUND:**

In order to describe the benefit of interactive technologies such as CommunityViz as a part of public participation in planning, it is important to understand its historical significance. Public participation has a long history in planning, dating back to the 1909 Plan of Chicago.

Citizens were not directly involved in the planning process, but their votes did influence which recommendations from the plan were implemented (Schlerent 1983). The 1928 Comprehensive Planning Enabling Act adopted by state legislatures was the first legal requirement for public participation. It stated that before enacting a comprehensive plan, “the (planning) commission shall hold at least one public hearing thereon, notice of the time and place of which shall be given by one publication in a newspaper of general circulation in the municipality and in the official gazette, if any, of the municipality” (Goodspeed 2008). In the 1950s and 1960s, planning professionals became intensely interested in the topic of public participation as a result of the limited participation during urban renewal. In 1969, Sherry R. Arnstein, a former professional at the U.S. Department of Housing and Urban Development, published the influential article “A Ladder of Citizen Participation.” This article ranked levels of participation into three groups: nonparticipation, tokenism, and citizen power (Arnstein 1969). She also gave anecdotal examples of both flawed and successful public participation. This piece signaled the beginning of efforts to broaden public participation in planning that continue today.

There has been extensive research on what techniques lead to a successful and informative citizen participation process. One of the strengths of traditional charrettes is their potential to be adapted to a local fit that is unique to any given community (Girling 2006). A weakness of traditional charrettes is their inability to link short-term local decisions to longer term and larger scale implications (Girling 2006). Another shortcoming of many traditional charrettes is their lack of quantitative analyses in order to measure various impacts, including traffic, market costs, and environmental implications (Girling 2006).

Although there is still much debate about the role of public participation in the planning process, it is a widely accepted and often mandatory part of the process. The American Planning



Association's statement of Ethical Principles of Planning requires that planners "recognize the rights of citizens to participate in planning decisions." Today, planners, developers and elected officials understand the importance of involving the public from the outset of a project (Kwartler et al. 2008). Given these legal, cultural and ethical requirements, planners have adopted a number of tools to help with this process, such as visioning sessions, public workshops, and design charrettes. However, digital visualization tools are just beginning to gain acceptance in the planning community because they are perceived as difficult and expensive to operate, and rapidly changing (Kwartler et al. 2008).

Despite these barriers, these digital visualization tools have enormous potential benefits for the public involvement process. Some of the shortcomings of traditional charrettes can be improved upon by introducing technologies such as CommunityViz and similar tools into the charrette process. Digital visualizations allow communities to more fully understand the impacts of various alternatives. These technologies are able to distill a large amount of data for the public in a way that is intuitive and immediate, and which can improve how the public can interact with design and land use decisions at a variety of scales. Citizens can intuitively link the visualization they can see with more quantitative planning impacts and objectively compare a variety of different scenarios in real time. This information allows the public to make sounder and more informed decisions (Kwartler et al. 2008). Examples of commonly used GIS-based digital visualization software include CommunityViz, What If?, INDEX, and Places<sup>3</sup>S.

An example of a workshop that took advantage of these technologies occurred in Portland, Oregon using INDEX. In November 2004, approximately 500 children, ages 6 to 16, attended a charrette that allowed them to design a neighborhood using INDEX Paint the Town software. The kids were able to "paint" various land uses into the area, based on their own ideas

about how a livable neighborhood should be laid out (INDEX 2004). The children were given housing and employment targets for the region, and as they used the software, they could see how close to their goal they were at any given time (INDEX 2004).

The remainder of this report focuses on how the integrating of digital visualization technologies such as CommunityViz into charrette or chip game processes can enhance public participation efforts.

## **PROJECT DESCRIPTION:**

The catalyst for this capstone project was the chip game that occurred at the Old Orchard Beach charrette in 2006. In the first part of the project description, this process is detailed in order to give context. In order to describe the benefit of CommunityViz and the tool developed here to this process, it is important to first understand what occurred at this charrette in 2006. The next part of the project description focuses on how this charrette could have been conducted and enhanced with the addition of CommunityViz as a tool. The final part of the project description discusses options for expanding this tool beyond the parameters of the original chip game.

### ***The Old Orchard Beach Ballpark Community Planning Process***

In 2006 a traditional charrette was held in Old Orchard Beach, Maine in order to determine the future of a central piece of publicly owned property. This charrette utilized several public participation tools, including a chip game, and the workshop was able to establish a number of alternative uses for this property based on these activities.

In 2005, Old Orchard Beach started to explore the idea of privately redeveloping a municipally-owned ballpark property. Some considered this property to be a prime location for a “smart growth” development involving dense residential development, mixed-use zoning, and

public spaces, within a walkable distance of town services and attractions. However, it immediately became clear that citizens had a number of concerns about the development of this property. In a November 2005 election, citizens voted to allow the town to consider potential sale of this property provided that a public planning process was conducted. The firm Holt & Lachman Architects/Planners was hired to conduct this planning process in January 2006. With the help of Alan Holt's Planning Workshop class and Jack Kartez' Citizen Involvement and Dispute Resolution in Planning class, consisting of planning students from the Muskie School of Public Service, two public forums were held, and one community design workshop was conducted. The two forums were designed to gather community opinions and discuss any potential issues or concerns regarding the property and its impact on the community (Holt 2006).

The community design workshop aimed to engage participants in reconciling two separate community preferences: 1. The desire for the redevelopment project to not impose new local property tax costs on taxpayers, and 2. The goal for the site to benefit the community and provide public amenities. In order address these two interests when considering redevelopment alternatives, a "chip" game was developed. This activity was titled the Land Use & Economic Impact Exercise. It was designed to help citizens understand the tradeoff between given land uses and their associated public costs and likely tax revenues (Holt 2006).

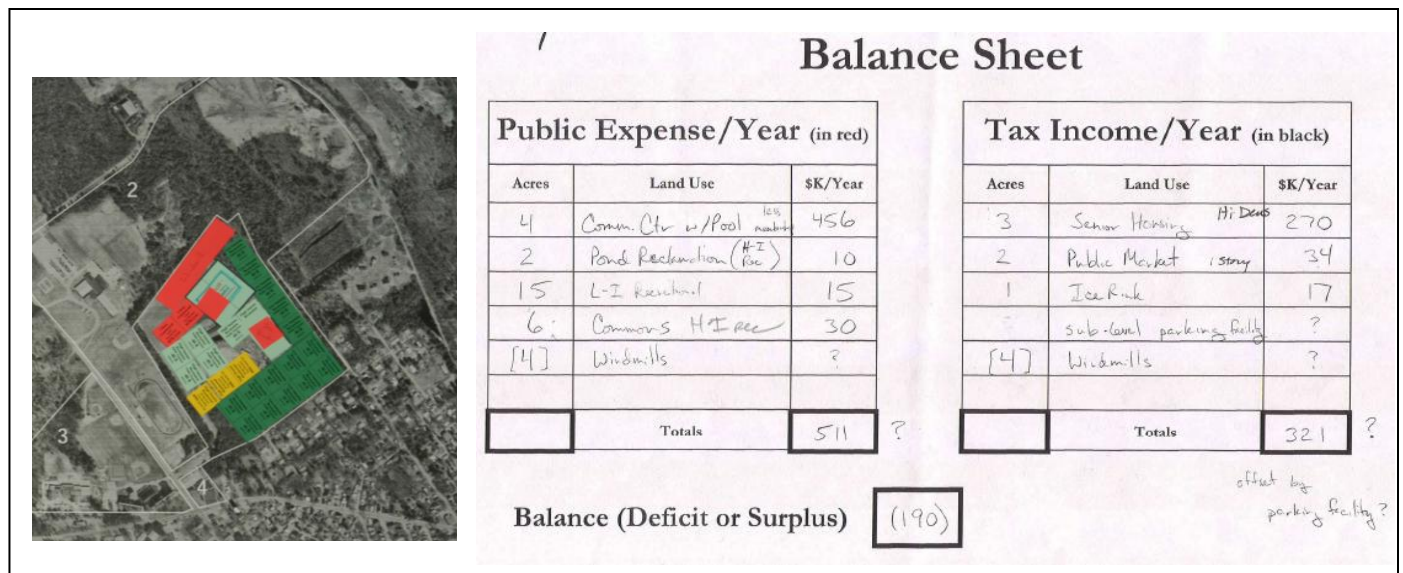
The activity applied fiscal costs information onto color-coded one-acre game chips that citizens could mix and match in order to create scenarios and understand the link between various land uses and their relative fiscal impacts. The fiscal impacts of public land uses (community center, recreation, track and field, and wetlands reclamation) were approximated by adding the estimated operational costs to the annual costs capital expenditures over 30 years at an interest rate of 4.75%, based on Old Orchard Beach's 2006 bond rate (Holt 2006). Revenue

from commercial tax generating uses (a neighborhood grocery, a two-story retail/office, and/or a one-story commercial) were calculated by estimating the total assessed value, and then estimating the annual tax revenue based on the 2006 mil rate of 13.5 per \$1,000. Residential tax revenue generation was calculated by estimating the property value of each density level based on case studies of similar densities in similar areas, and then estimating the annual tax revenue per acre based on the 2006 mil rate of 13.5 per \$1,000 (Holt 2006). All of these estimated costs and revenues were rounded and assigned to the land use chips. However, additional fiscal costs associated with residential development, such as the costs of roads, schools, and other town services were not taken into account with this activity.

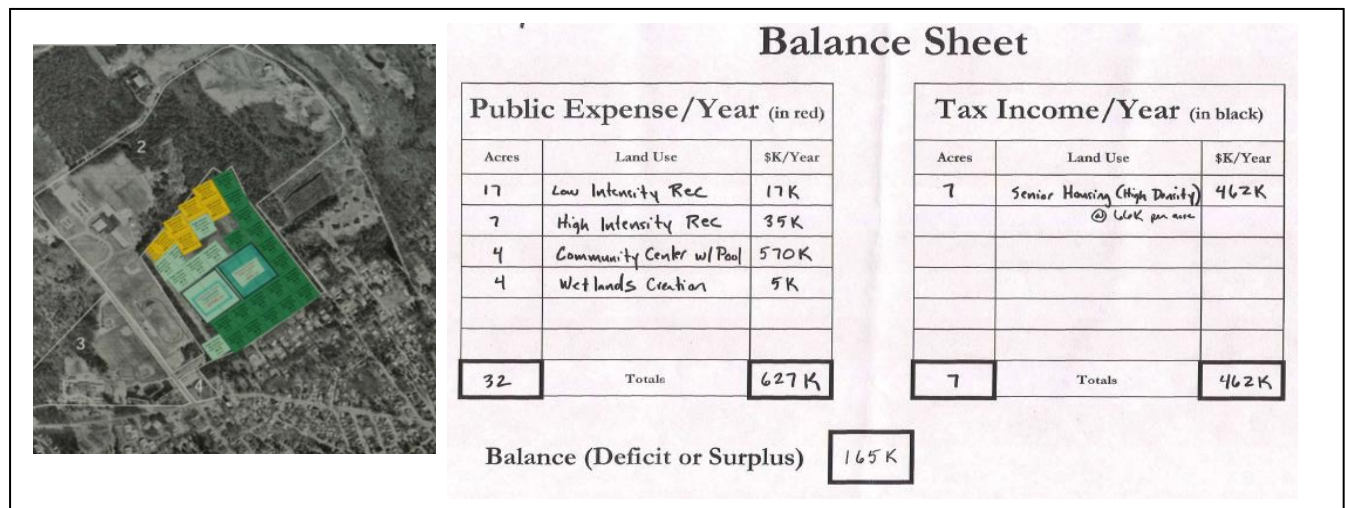
Figure 1 demonstrates two groups' resulting products from the chip game performed in 2006.

*Figure 1: Final Balance Sheets from the Land Use and Economic Impact Exercise Performed in 2006*

#### Group A



## Group B



The balance sheets in Figure 1 represent the results of the chip game for Group A and Group B. On the left is the base map with the physical chips on top of it, representing a chosen configuration of various land uses. To the right of the maps are the balance sheets, which have added up the expenses and tax income associated with each chip within the parameters set up for the game. The balance deficit or surplus for each group can be found at the bottom of the balance sheets. Note that Group A's scenario would cost the town \$190 thousand per year to maintain, while Group B's scenario would generate \$165 thousand in net revenue annually, based on the cost/expense assumptions assigned to each land use chip.

This exercise allowed participants to visualize various land use scenarios, and then make the connection between these various layouts and their associated costs. However, this connection was not immediate because after each scenario was laid out, the costs had to be calculated by hand afterward. This made it harder for community members to be aware of the impact of smaller changes, such as shifting from low density residential to medium density. By using CommunityViz to automate this process, participants would be able to immediately see the impact of major and minor land use shifts, and they would be able to compare a variety of

scenarios on the fly. This would eliminate the step of calculating the costs after deciding on the land uses, and it would create a stronger link between the participant's desires and the fiscal impacts.

After this workshop, Alan Holt returned to Old Orchard Beach as a consultant to the town to present a re-development plan for the property based on the feedback he had compiled from the chip game and other elements of the community workshops. The final recommendation presented to the town involved a four-phased solution (Holt 2006), as shown in Figure 2.

*Figure 2: Final Four-Phase Redevelopment Proposal for the Old Orchard Beach Ballpark Property*



This proposal represents a phased development plan, which could be fully completed over time, or it could stop after any of the initial 3 phases. In Phase One a Community Center would be built and there would be no development on the rest of the property. In Phase Two some mixed use and commercial development would be added around the community center. In Phase Three a few acres of high-density housing could be added. In the final phase, Phase Four, some medium density housing could be added to the property. This was meant to be an integrative process, where the town could complete as much or as little of this as they chose. Due to a variety of factors, none of these recommendations have been implemented.

### ***The Old Orchard Beach Ballpark Community Planning Process with CommunityViz***

The current project here focuses on recreating the Land Use & Economic Impact Exercise that was conducted in 2006 with CommunityViz technology in order to create an automated version of the charrette. The purpose of this is to demonstrate how the technology could be an asset to this sort of planning process. The CommunityViz model works with the same assumptions as the original Land Use & Economic Impact Exercise. The tool developed here uses the same land use options as in the original chip game, and the same fiscal impacts and residential densities are associated with each land use chip. Also, the same minimum acreage requirements for some land uses are still enforced. This tool, however, does all of the required computations automatically, which allows users to input different land uses and immediately see how it will impact cost, density, and the overall composition of the landscape. This tool also allows users to more fully compare a variety of different scenarios in real time. If each group had been equipped with a computer with CommunityViz, and the project created for this chip game, a very similar process could have occurred. The rest of the report details the development and operation of this tool using CommunityViz.



Figures 3 and 4 represent what the two charrette game examples from 2006 look like in the CommunityViz-based environment. The top portion of these figures shows the results from two groups in the original chip game, and below that is the CommunityViz-based representation of that same scenario. The bottom portion of the image is shown in a GIS CommunityViz environment, and the different GIS layers are represented on the left side of the screen in the ArcMap table of contents. Note that all of the land use (or chip) choices are represented under the Project\_area layer. Below the GIS layers are the CommunityViz tools that are part of the CommunityViz user interface. This is where assumptions, dynamic attributes, indicators, charts, and alerts are created. In the next column is the Styles guide. This toolbox allows the user to select any given land use and apply it to whichever square within the project area that they choose. In the next column are dynamic charts, which automatically adjust as the configurations of land uses are modified. Note that the red column on the Annual Costs charts represents the net annual cost of the scenario to the town. Compare this number with the Balance found on the bottom of the original Balance Sheet. Finally, the visual two-dimensional representation of the property and its land uses can be seen on the right.



Figure 3: Comparison of Original Charrette Chip Game Results with an Automated Version of the Same Scenario

Group A

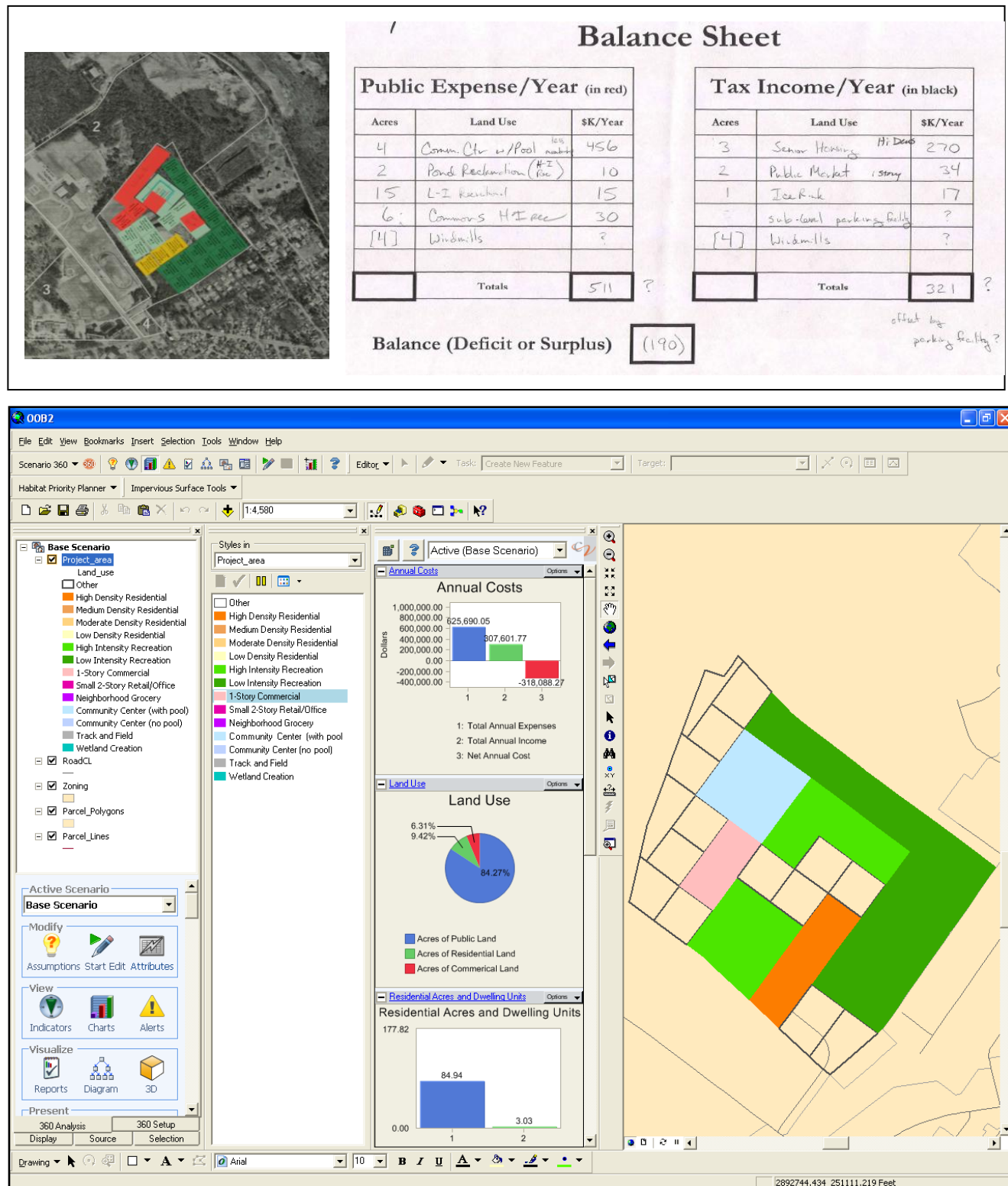
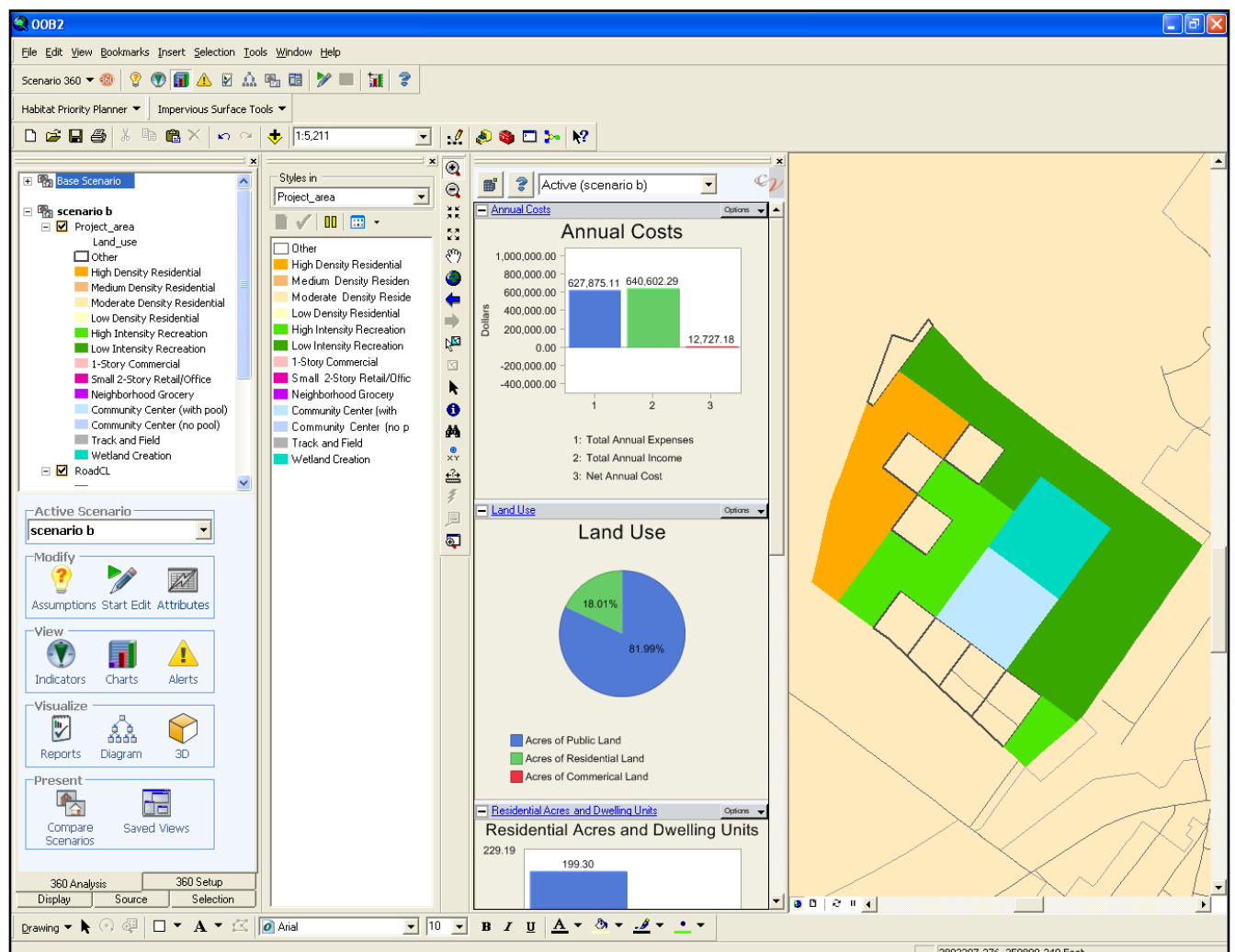
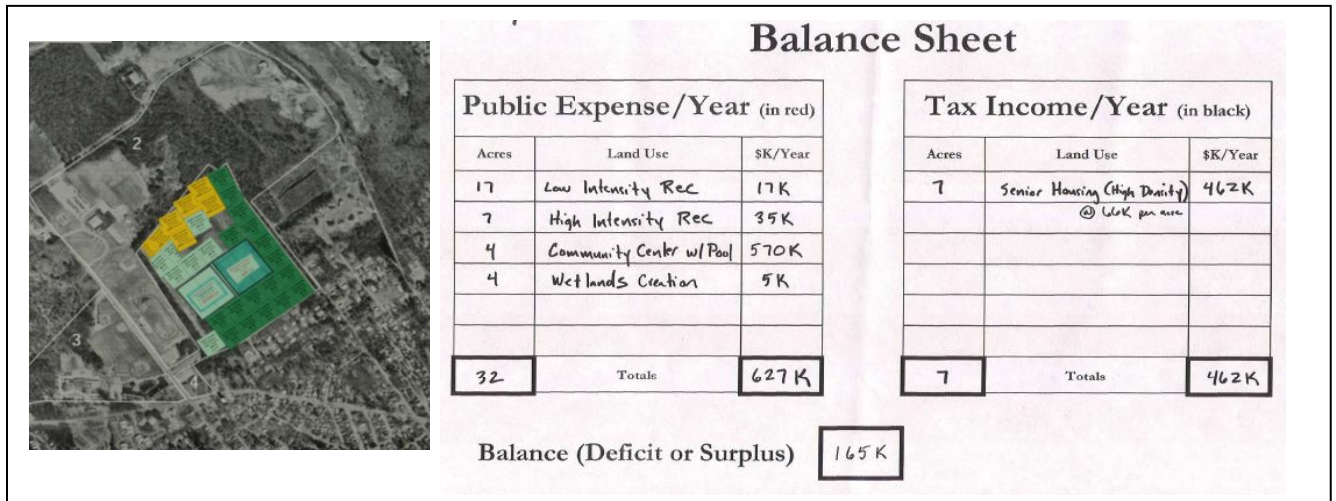


Figure 4: Comparison of Original Charrette Chip Game Results with an Automated Version of the Same Scenario

Group B:



It is important to note that the Annual Costs do not add up when comparing the chip game to the automated CommunityViz version. This is primarily because the groups did not stay within the game's original parameters. This points out that automating the charrette analysis aspect can free participants and the planning staff from the need to monitor simple mistakes.

The simple fact that this exercise can be duplicated in CommunityViz does not inherently point to any benefit. In fact, it may appear more complex, expensive, time consuming, and inflexible. However, this computing-based approach does have distinct advantages over its paper and pencil counterpart. First of all, the user is able to see how each land use decision affects the town's annual cost and land use distribution for this area as the choices are being made. This means that users can switch between high and low density residential, for example, and immediately see how this impacts not only density and the total number of residences, but also how this would affect the town's budget. This kind of immediate feedback was not available in the original exercise, and it is possible that if the calculations were done for the teams on the fly, they would have felt freer to experiment with different alternatives because it would have been easier to do. As Kwartler explains, when this "response gap" is eliminated, citizens are able to refine their alternative scenarios and review them within seconds, which allows them to produce more highly developed alternatives (2008).

### ***Expanding the Old Orchard Beach Ballpark Community Planning Process with CommunityViz***

The CommunityViz-based model for automating the 2006 charrette could be expanded using the software's functionality. Expanding this tool beyond the parameters of the original chip game would allow for a greater level of complexity, which might be difficult to apply to

more traditional pencil and paper chip games. There are a number of different ways in which this exercise could be taken further.

First, a number of assumptions were built into this tool, such as the number of dwelling units per acre for each of the four densities. The Assumptions tool in CommunityViz allows assumptions like this to be changeable on the fly. Therefore, by simply dragging a slider bar, the density of High Density Residential can be changed from 28 dwelling units per acre to 50 dwelling units per acre, for example. Another important assumption in this tool has to do with the fiscal impact assigned to each land use, particularly the residential land uses, where the associated costs of development were not included in the analysis. Using the Assumptions tool in CommunityViz, the fiscal impact of each land use can be easily adjusted on the fly based on different fiscal estimates. These assumptions are a part of an equation that is used to determine the overall fiscal impact of any scenario.

Beyond this, a further way to expand this chip game would be to create more natural shapes, rather than being confined to the construct of the grid. This can be accomplished by having an experienced CommunityViz practitioner working with each group to create more natural polygons for each proposed land use in any scenario.

Given more time and resources, the options for enhancing this type of automated chip game are vast. A lot could be done with the visual representation of the chips to make them look more lifelike, or even to make the model three-dimensional. There is also a lot that could be done with creating more complex equations for measuring the fiscal impact of each land use over time. Some additional work with this process could also increase the user friendliness of the layout, by eliminating unnecessary windows, and perhaps working with touch screen technologies to make the scenario-building process more interactive. Just like with any other

public participatory tool, there are tradeoffs that have to be made in order to create a tool that is useful, practical, time-efficient, and cost-efficient.

## **TOOL DEVELOPMENT AND DESIGN:**

This tool is intended to be used by planners and charrette facilitators. The instructions for how to create this sort of model, specific to the tool developed from the Old Orchard Beach Charrette, assume that the reader has a basic level of GIS literacy. The basic instructions for how the tool was created are outlined, and then some additional instructions for how to expand this tool are discussed further .

The steps for designing this tool are listed below, and then explained.

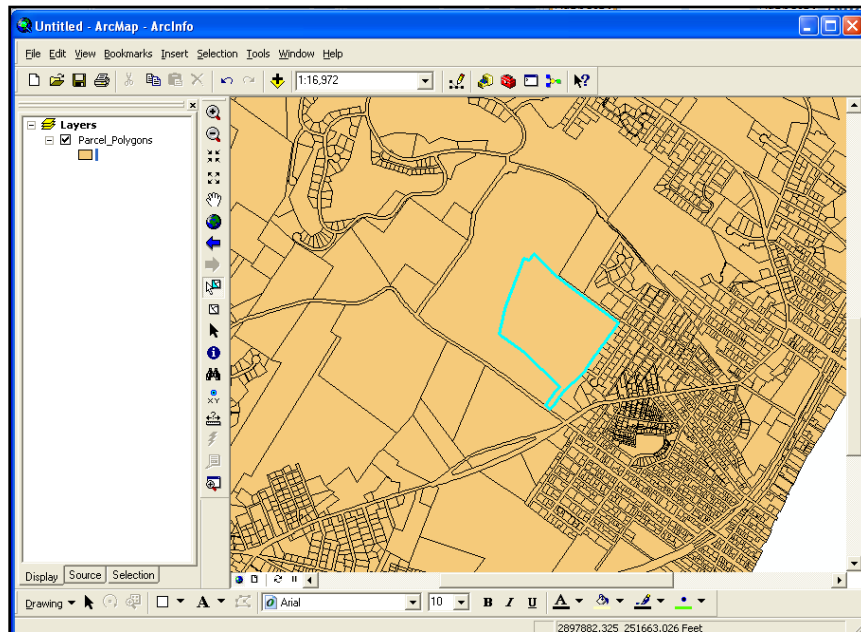
1. Locate the OOB ballpark parcel
2. Create a one-acre grid across the property
3. Assign land uses to the grid layer
4. Create dynamic attributes associated with each land use for density and fiscal impact
5. Create indicators the calculate various acreages, densities, and costs
6. Create dynamic charts based on these indicators
7. Create alerts to ensure that minimum acreage parameters are met
8. Set up the Style Manger in order to make editing land uses easier for users
9. Set up multiple scenarios for side-by-side comparison

### *Expanding the tool:*

10. Create density and fiscal impact assumptions
11. Draw more natural shapes
12. Further expansion

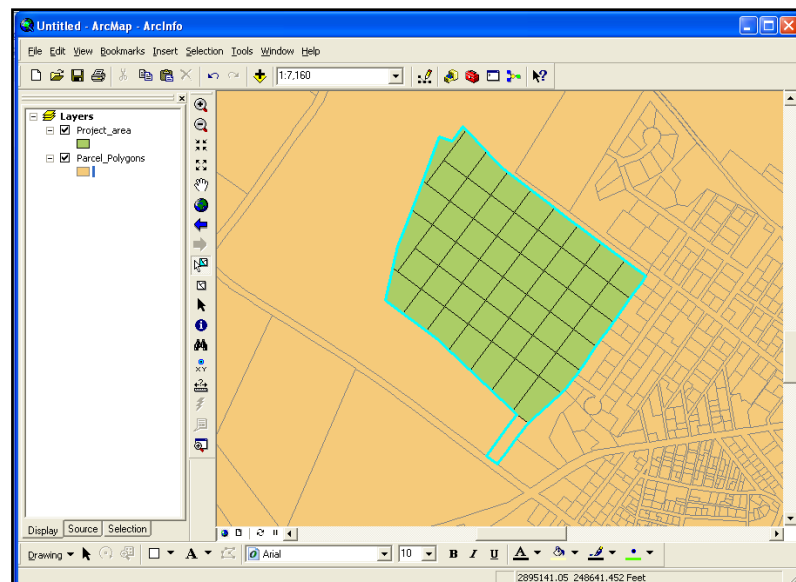
The first step of automating the chip game from the Old Orchard Beach workshop in 2006 in CommunityViz was to locate the town's land parcel data. This helps to determine the project's limits and actual geography. Figure 5 shows the Old Orchard Beach Ballpark Property in blue and surrounding parcels in grey.

*Figure 5: Old Orchard Beach Ballpark Property and Surrounding Cadastral Units*



The next step in this process was to divide up this property in a way that would help facilitate conducting a “chip game”. Since the Land Use & Economic Impact Exercise conducted in 2006 was based on one acre units, the next step was to create a new shapefile containing a grid of the ballpark property, consisting of 47 blocks of approximately an acre each. These grid units are the basis of this automated chip game, and they are represented in green in Figure 6.

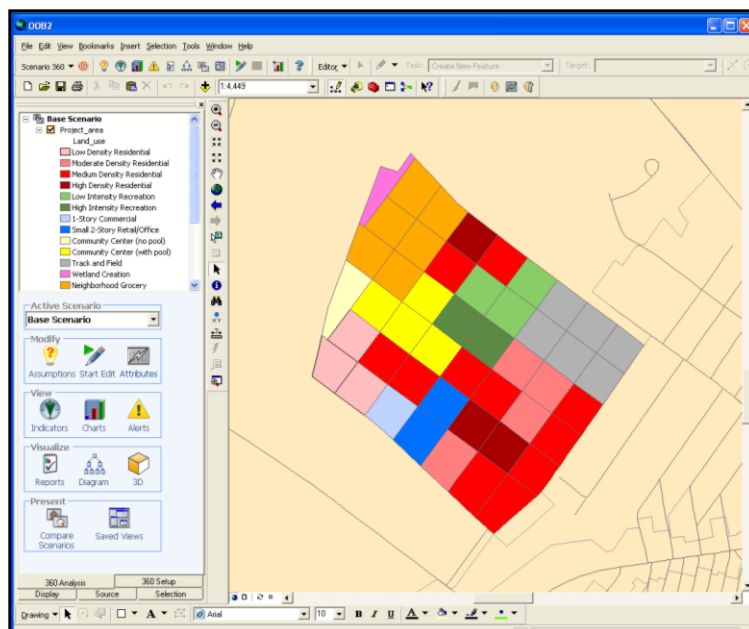
*Figure 6: Old Orchard Beach Ballpark Property Approximate One-Acre Grid*



The next step in this process was to bring these layers into CommunityViz and to transform this simple grid layer into a dynamic layer with the ability to not only symbolize various potential land uses, but also to attach associated costs and densities to these different land uses through equations for those calculations.

After creating a CommunityViz file with this grid, the next step was to create a land use field for the grid shapefile (renamed Project\_area). To start, each square was assigned a random land use from the list of 13 land uses used in the 2006 workshop: Low Density Residential, Moderate Density Residential, Medium Density Residential, High Density Residential, Low Intensity Recreation, High Intensity Recreation, 1-Story Commercial, Small 2-Story Retail/Office, Community Center (no pool), Community Center (with pool), Track and Field, Wetland Creation, and Neighborhood Grocery. This was done because in order to set up dynamic layers associated with each land use, every potential land use has to be accounted for within the existing shapefile. Once the dynamic layers have been created, there is no longer a need to display every potential land use. Figure 7 shows the Project\_area shapefile, representing each of the 13 potential land uses.

*Figure 7: Old Orchard Beach Ballpark Property Approximate One-Acre Grid Representing all 13 Potential Land Uses*





The next part of creating this project required using CommunityViz’s functionality for creating dynamic attributes. This allows one to create fields within a shapefile based on a formula. In this case, two fields were created: annual costs or expenses, and dwelling units. Both of these fields are dependent upon land use.

A step-by-step description of this process in CommunityViz can be summarized as follows:

1. Under the 360 Setup tab, click on Dynamic Attributes (Both of these buttons are circled in red on Figure 8.)
2. Next, click on the new attribute icon in the upper left hand corner.

From here, the new attribute can be named and described, and a formula can be attached.

Name this attribute “annual cost or expense,” as show on the right in Figure 8.

3. Under the formula tab, click on “Edit Formula”, and enter the following:

```

IfThenElse ( If ( [ Attribute:land_use ] = "Low Density Residential" ), Then ( 13000 * [ Attribute:Acres ] ), If ( [ Attribute:land_use ] = "Moderate Density Residential" ), Then ( 15000 * [ Attribute:Acres ] ), If ( [ Attribute:land_use ] = "Medium Density Residential" ), Then ( 30000 * [ Attribute:Acres ] ), If ( [ Attribute:land_use ] = "High Density Residential" ), Then ( 90000 * [ Attribute:Acres ] ), If ( [ Attribute:land_use ] = "High Intensity Recreation" ), Then ( -5000 * [ Attribute:Acres ] ), If ( [ Attribute:land_use ] = "Low Intensity Recreation" ), Then ( -1000 * [ Attribute:Acres ] ), If ( [ Attribute:land_use ] = "1-Story Commercial" ), Then ( 17000 * [ Attribute:Acres ] ), If ( [ Attribute:land_use ] = "Small 2-Story Retail/Office" ), Then ( 20000 * [ Attribute:Acres ] ), If ( [ Attribute:land_use ] = "Community Center (no pool)" ), Then ( -100000 ), If ( [ Attribute:land_use ] = "Community Center (with pool)" ), Then ( -142500 ), If ( [ Attribute:land_use ] = "Track and Field" ), Then ( -8333.33333 ), If ( [ Attribute:land_use ] = "Wetland Creation" ), Then ( -1250 ), If ( [ Attribute:land_use ] = "Neighborhood Grocery" ), Then ( 11666.66666 ), Else ( 0 ) )

```

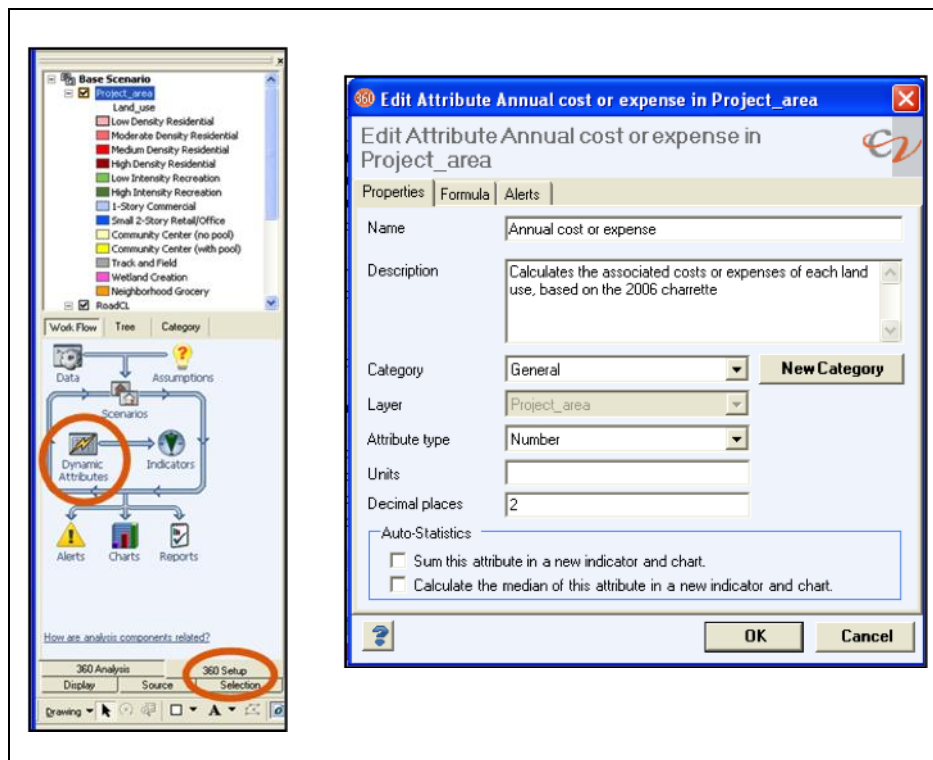
This can also be done by using the Formula Wizard. This formula simply assigns an annual cost per acre for each land use, based on the cost per acre assigned to each land use in the 2006 charrette and the total acres of that residential land use specified by the user.

4. Create another new attribute named “dwelling units”, with this formula:
5. IfThenElse ( If ( [ Attribute:land\_use ] = "Low Density Residential" ), Then ( [ Attribute:Acres ] \* 2.5 ), If ( [ Attribute:land\_use ] = "Moderate Density Residential" ), Then ( [ Attribute:Acres ] \* 4 ), If ( [ Attribute:land\_use ] = "Medium Density Residential" ), Then ( [ Attribute:Acres ] \* 8 ), If ( [ Attribute:land\_use ] = "High Density Residential" ), Then ( [ Attribute:Acres ] \* 28 ), Else ( 0 ) )



This formula simply assigns a density to all of the residential land uses, as were assigned in the 2006 charrette, and calculates the total number of dwelling units based on these densities.

*Figure 8: Creating Dynamic Attributes in CommunityViz*



Now that the Project\_area shapefile is set up to reflect various land uses and their associated costs and dwelling units, indicators and charts can be set up to reflect how changing the land use pattern on the property affects these parameters.

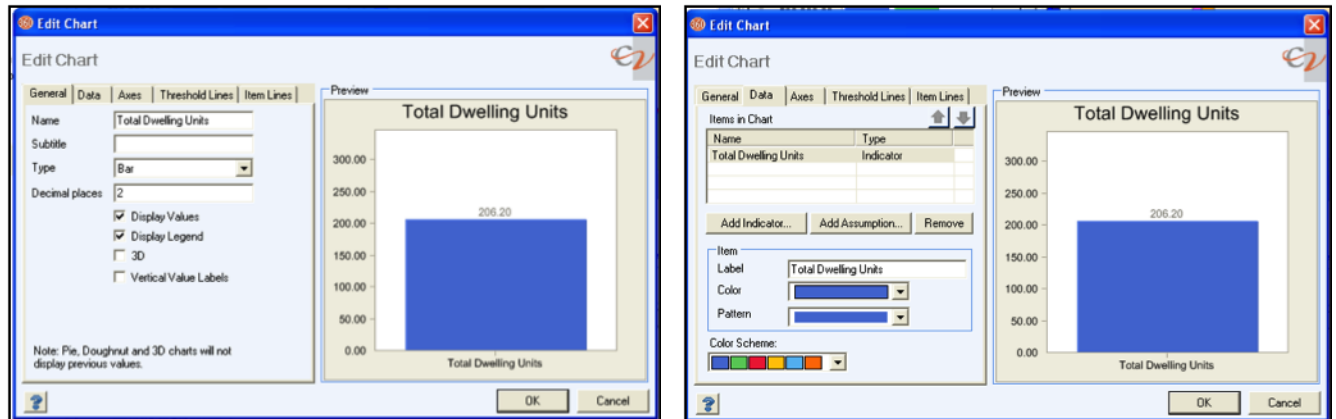
In order to set up an indicator:

1. Click on “Indicators” under the 360 setup tab.
2. Click the “New Indicator” button in the upper left hand of the window
3. From here, the indicator can be named and defined.
4. Create the following indicators, with the attached formulas:
  - a. Net Annual Cost: `Sum ([ Attribute:Project_area:Annual cost or expense ])`

- b. Total Dwelling Units: **Sum** ( [ [Attribute:Project\\_area:Dwelling\\_units](#) ] )
  - c. Total Annual Expenses: **Abs** ( **Sum** ( [ [Attribute:Project\\_area:Annual cost or expense](#) ], **Where** ( [ [Attribute:Project\\_area:Land\\_use](#) ] = "Community Center (no pool)" **Or** [ [Attribute:Project\\_area:Land\\_use](#) ] = "Community Center (with pool)" **Or** [ [Attribute:Project\\_area:Land\\_use](#) ] = "Low Intensity Recreation" **Or** [ [Attribute:Project\\_area:Land\\_use](#) ] = "High Intensity Recreation" **Or** [ [Attribute:Project\\_area:Land\\_use](#) ] = "Track and Field" **Or** [ [Attribute:Project\\_area:Land\\_use](#) ] = "Wetland Creation" ) ) )
  - d. Total Annual Income: **Sum** ( [ [Attribute:Project\\_area:Annual cost or expense](#) ], **Where** ( [ [Attribute:Project\\_area:Land\\_use](#) ] = "Neighborhood Grocery" **Or** [ [Attribute:Project\\_area:Land\\_use](#) ] = "Low Density Residential" **Or** [ [Attribute:Project\\_area:Land\\_use](#) ] = "Moderate Density Residential" **Or** [ [Attribute:Project\\_area:Land\\_use](#) ] = "Medium Density Residential" **Or** [ [Attribute:Project\\_area:Land\\_use](#) ] = "High Density Residential" **Or** [ [Attribute:Project\\_area:Land\\_use](#) ] = "1-Story Commercial" **Or** [ [Attribute:Project\\_area:Land\\_use](#) ] = "Small 2-Story Retail/Office" ) )
  - e. Acres of Public Land: **Sum** ( [ [Attribute:Project\\_area:Acres](#) ], **Where** ( [ [Attribute:Project\\_area:Land\\_use](#) ] = "Community Center (no pool)" **Or** [ [Attribute:Project\\_area:Land\\_use](#) ] = "Wetland Creation" **Or** [ [Attribute:Project\\_area:Land\\_use](#) ] = "Low Intensity Recreation" **Or** [ [Attribute:Project\\_area:Land\\_use](#) ] = "High Intensity Recreation" **Or** [ [Attribute:Project\\_area:Land\\_use](#) ] = "Community Center (with pool)" **Or** [ [Attribute:Project\\_area:Land\\_use](#) ] = "Track and Field" ) )
  - f. Acres of Residential Land: **Sum** ( [ [Attribute:Project\\_area:Acres](#) ], **Where** ( [ [Attribute:Project\\_area:Land\\_use](#) ] = "Low Density Residential" **Or** [ [Attribute:Project\\_area:Land\\_use](#) ] = "Moderate Density Residential" **Or** [ [Attribute:Project\\_area:Land\\_use](#) ] = "Medium Density Residential" **Or** [ [Attribute:Project\\_area:Land\\_use](#) ] = "High Density Residential" ) )
  - g. Acres of Commercial Land: **Sum** ( [ [Attribute:Project\\_area:Acres](#) ], **Where** ( [ [Attribute:Project\\_area:Land\\_use](#) ] = "1-Story Commercial" **Or** [ [Attribute:Project\\_area:Land\\_use](#) ] = "Small 2-Story Retail/Office" **Or** [ [Attribute:Project\\_area:Land\\_use](#) ] = "Neighborhood Grocery" ) )
  - h. Acres of Track and Field: **Count** ( [ [Layer:Project\\_area](#) ], **Where** ( [ [Attribute:Project\\_area:Land\\_use](#) ] = "Track and Field" ) )
  - i. Acres of Neighborhood Grocery: **Count** ( [ [Layer:Project\\_area](#) ], **Where** ( [ [Attribute:Project\\_area:Land\\_use](#) ] = "Neighborhood Grocery" ) )
  - j. Acres of Community Center\_no pool: **Count** ( [ [Layer:Project\\_area](#) ], **Where** ( [ [Attribute:Project\\_area:Land\\_use](#) ] = "Community Center (no pool)" ) )
  - k. Acres of Community Center\_with pool: **Count** ( [ [Layer:Project\\_area](#) ], **Where** ( [ [Attribute:Project\\_area:Land\\_use](#) ] = "Community Center (with pool)" ) )
  - l. Acres of Wetland Creation: **Count** ( [ [Layer:Project\\_area](#) ], **Where** ( [ [Attribute:Project\\_area:Land\\_use](#) ] = "Wetland Creation" ) )
5. The next step is to create charts based on these attributes. Click on the charts button under the 360 setup tab.
  6. Press the “create new chart” button in the upper left hand corner of the window.

7. In the “Edit Chart” window, enter the chart name and other associated information, as indicated by the window on the left in Figure 9.
8. Click on the “Data” tab, and click on “Add Indicator” and add the “Total Dwelling Units” indicator. This is show in the right-hand window of Figure 9.

*Figure 9: Creating Graphs in CommunityViz*



9. Repeat this process for the following charts: Annual Costs, Land Use, and Residential Acres and Dwelling Units. Note, more than one indicator can be added to any given chart when applicable.

One of the requirements in the 2006 charrette was that certain land uses were required to occupy a minimum number of acres:

- a. Track and Field: 6 acres
- b. Neighborhood Grocery: 6 acres
- c. Community Center (with or without pool): 4 acres
- d. Wetland Creation: 4 acres

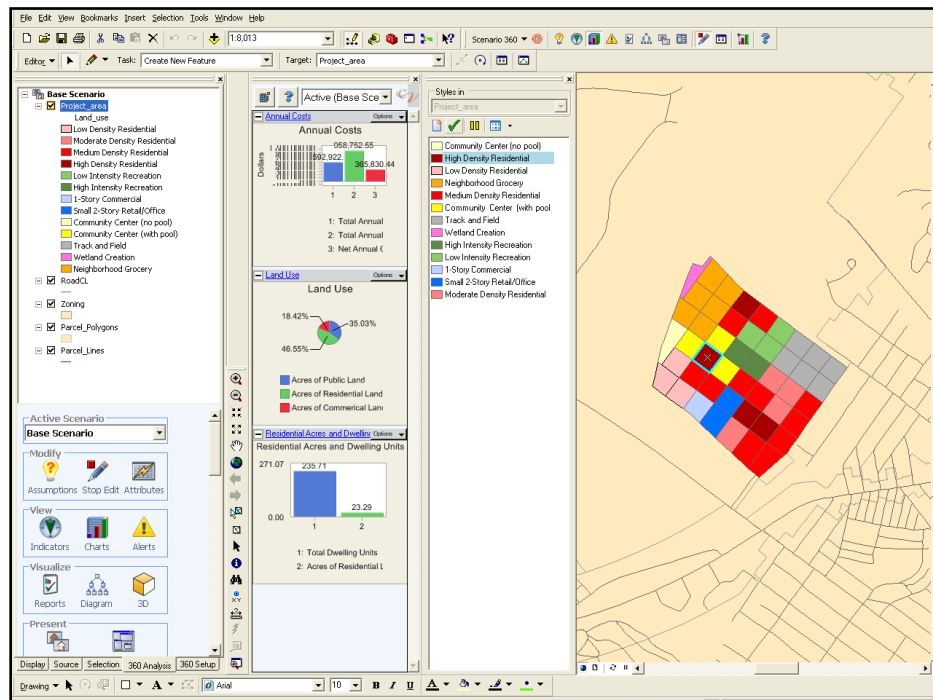
Therefore, alerts were put in place to ensure that these minimums were adhered to. This can be done as follows:

1. Click on the alerts button under the 360 setup tab.
2. In the Alerts box, click on “New Alert”.
3. Create an alert for all of the 5 land uses that have acreage minimums.
4. In “Edit Alert” name the alert and attach the relevant indicator that was previously created, as shown in Figure 10 below.
5. Under “alert conditions” set the acreage accordingly.

*Figure 10: Edit Alert Toolbox in CommunityViz*

The final step in creating this project is setting up the palette tool. This can be done by going to Scenario 360: Sketch: Style Manager. Choose the Project\_area layer, and click on Import From Table. From here, select the land\_use attribute, and select one box with each land use available. This will allow the user to easily change the land use of any given chip square. This is shown in Figure 11: High Density Residential is highlighted in the Styles toolbar. By clicking on the green arrow about the land uses, the highlighted square on the map to the right is converted to High Density Residential.

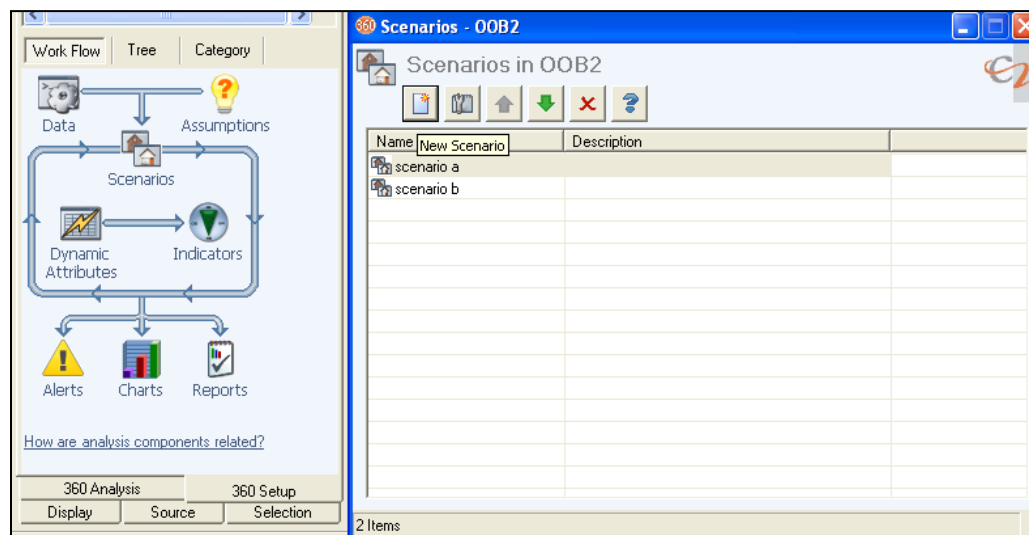
Figure 11: Editing Land Uses with the Style Toolbar in CommunityViz



If users want to compare multiple scenarios, this is easy to do as well:

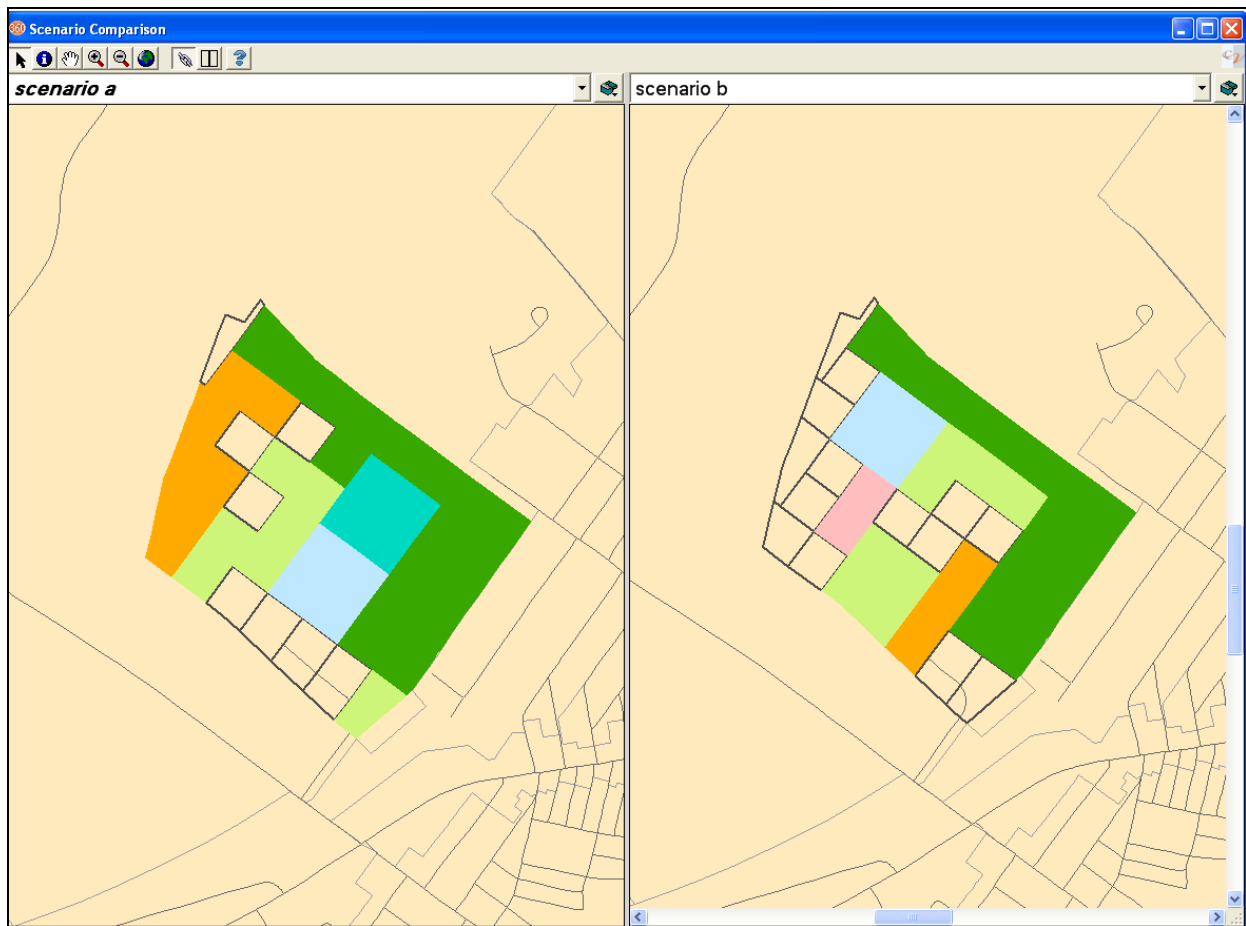
1. Click on the Scenarios button under the 360 setup tab (left side of Figure 12)
2. In the Alert box, click on New Scenario, and name the scenario.

Figure 12: Creating Multiple Scenarios in CommunityViz



Once the alternative scenario is created, it can be edited and compared to the base scenario. Under the 360 Analysis tab, the Compare Scenarios button gives a visual comparison of multiple scenarios (Figure 13), and the Reports button gives a more detailed side-by-side analysis of each scenario.

*Figure 13: Comparing Multiple Scenarios in CommunityViz*



From here, the CommunityViz file is now set up to be used in a charrette forum, in place of the paper and pencil chip game. In order to administer this activity, a facilitator will need to explain the game to the participants so that they can operate the computer, and understand how the tables, indicators, and alerts adjust according to their land use decisions. The facilitator should turn on editing and the palette tool under Scenario 360: Sketch, and should show

participants how to select the given square and change its land use to the selected use in the palette box by clicking on the green check mark. Using this process, each team can come up with a final map of how they would like to see the property developed, and get an immediate sense of the fiscal impacts (as measured) of their choice as well.

This tool can be taken further, by adding Assumptions about densities and the fiscal impacts of land uses. Assumptions can be added as per the instructions below:

1. Click on the Assumptions button under the 360 setup tab to open the Assumptions window.
2. Click on the New Assumption button in the upper left-hand corner of the window.
3. In the Edit Assumptions Window, name the assumption, set the parameters, and any relevant alerts.

For the purpose of this project, alerts were added for the residential densities of each residential category, and for the fiscal cost associated with the residential land uses. After each assumption is made, it needs to be plugged into the existing dynamic attributes in the Project\_area shapefile.

The equation that will access the proper Assumption for the “Dwelling\_units” field in the Project\_area shapefile is:

```
IfThenElse ( If ( [ Attribute:land_use ] = "Low Density Residential" ), Then ( [ Attribute:Acres ] * [ Assumption:Low Density Residential Du per acre ] ), If ( [ Attribute:land_use ] = "Moderate Density Residential" ), Then ( [ Attribute:Acres ] * [ Assumption:Moderate Density Residential Du per acre ] ), If ( [ Attribute:land_use ] = "Medium Density Residential" ), Then ( [ Attribute:Acres ] * [ Assumption:Medium Density Residential Du per acre ] ), If ( [ Attribute:land_use ] = "High Density Residential" ), Then ( [ Attribute:Acres ] * [ Assumption:High Density Residential Du per acre ] ), Else ( 0 ) )
```

Note that the assumptions are now a part of the equations, rather than having a number represent dwelling units per acre.

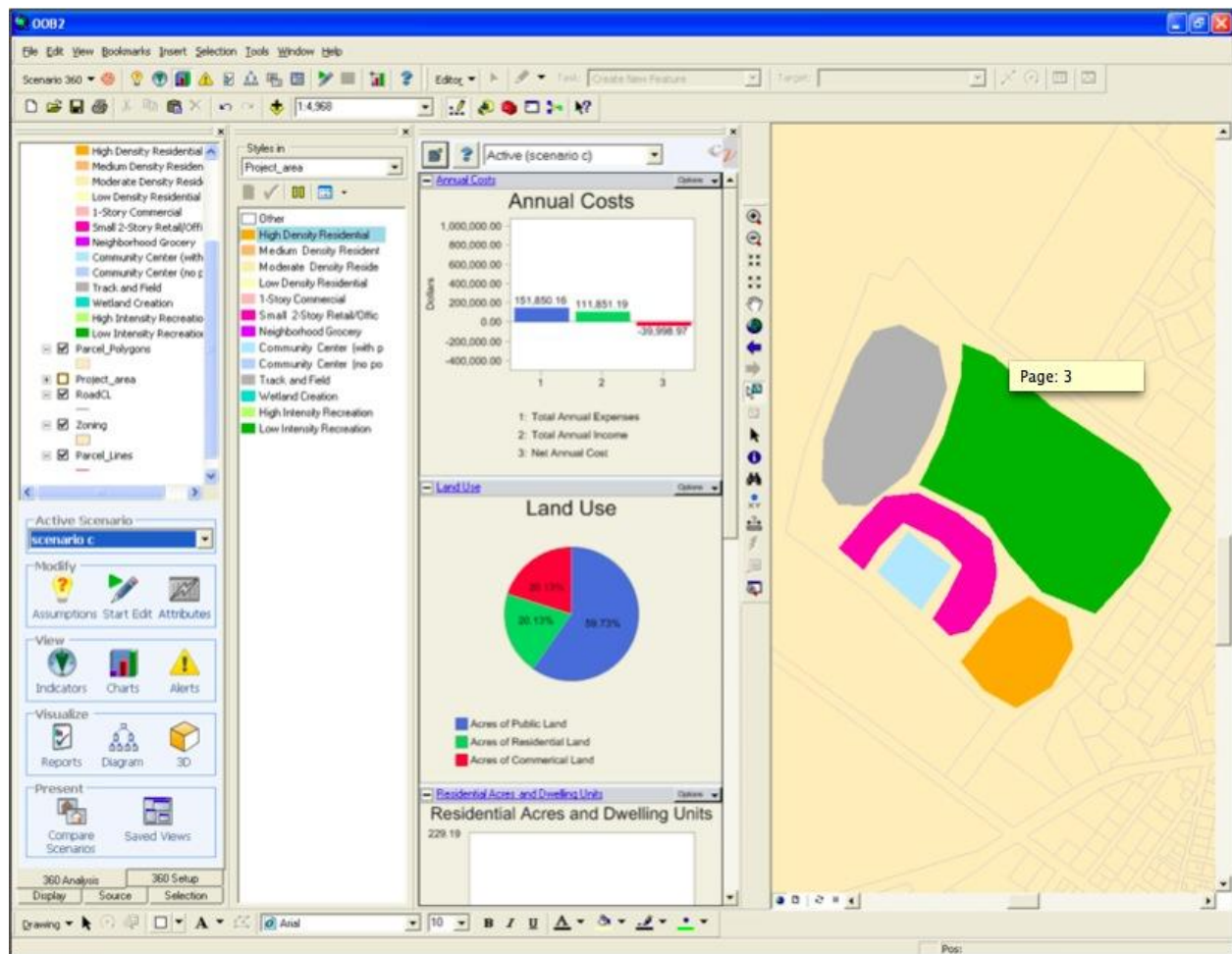
This same process was repeated for integrating Assumptions into the “annual cost or expense” field:

```
IfThenElse ( If ( [ Attribute:land_use ] = "Low Density Residential" ), Then ( [ Assumption:Annual Income or Expense per acre Low Density Res ] * [ Attribute:Acres ] ), If ( [ Attribute:land_use ] = "Moderate Density Residential" ), Then ( [ Assumption:Annual Income or Expense per acre Mod. Density Res ] * [ Attribute:Acres ] ), If ( [ Attribute:land_use ] = "Medium Density Residential" ), Then ( [ Assumption:Annual Income or Expense per acre Med. Density Res ] * [ Attribute:Acres ] ), If ( [ Attribute:land_use ] = "High Density Residential" ), Then ( [ Assumption:Annual Income or Expense per acre High Density Res ] * [ Attribute:Acres ] ), If ( [ Attribute:land_use ] = "High Intensity Recreation" ), Then ( -5000 * [ Attribute:Acres ] ), If ( [ Attribute:land_use ] = "Low Intensity Recreation" ), Then ( -1000 * [ Attribute:Acres ] ), If ( [ Attribute:land_use ] = "1-Story Commercial" ), Then ( 17000 * [ Attribute:Acres ] ), If ( [ Attribute:land_use ] = "Small 2-Story Retail/Office" ), Then ( 20000 * [ Attribute:Acres ] ), If ( [ Attribute:land_use ] = "Community Center (no pool)" ), Then ( -100000 ), If ( [ Attribute:land_use ] = "Community Center (with pool)" ), Then ( -142500 ), If ( [ Attribute:land_use ] = "Track and Field" ), Then ( -8333.33333 ), If ( [ Attribute:land_use ] = "Wetland Creation" ), Then ( -1250 ), If ( [ Attribute:land_use ] = "Neighborhood Grocery" ), Else ( 0 ) )
```

Another option for how to expand this tool would be to have trained facilitators draw in more natural shapes instead of uniform chips based on the stakeholder’s direction. This can be done by simply drawing in shapes in the Project\_area shapefile with the standard ArcGIS editor toolbar. The land use can be assigned to each shape after it is drawn with the same CommunityViz Style tool previously used. An example of what this might look like can be seen in Figure 14.



Figure 14: Automating the Old Orchard Beach Charrette with natural Shapes



## CONCLUSIONS:

Community charrettes have become an established and expected part of the planning process over the past several decades, and interactive activities, such as chip games, have become increasingly common as well. Interactive chip games allow citizens and other stakeholders to directly interact with land use decisions, and they have proven to be an effective technique. However, technologies like CommunityViz have enabled planners to take more traditional pencil and paper chip games to a higher level. These technologies allow ordinary

citizens to interact directly with land use decisions and to immediately see their impacts, as defined in the particular exercise. CommunityViz allows one to distill a lot of data on-the-fly and provide users with instant feedback, to gain a more intimate understanding of the tradeoffs that have to be made, and compare multiple scenarios in real time. As these technologies become more prevalent, there is a great opportunity in the planning profession to improve public participatory processes.

The tool created in CommunityViz for this capstone was never tested in an actual community charrette. Therefore, its impact on the public participatory process is only speculative. However, this tool was designed and documented in order to be easily duplicated by a user familiar with GIS. Therefore, this process can be readily applied to a similar project, and utilized in a public participatory process.

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