Superstition Vistas
White Paper: Land Use Scenario Development
Fregonese Associates

Overview of Scenario Modeling Process

This white paper describes an approach to modeling land use decisions at a range of scales and the results of this modeling, particularly related to sustainability in Superstition Vistas. At the site level, Envision Tomorrow was used to identify physically and financially feasible development. At the neighborhood scale, various mixes of buildings and other attributes (e.g. streets, parkland, etc.) can be compiled to understand and evaluate the implications of different styles of development. These buildings and development types were used at the regional scale to create multiple land use scenarios for Superstition Vistas. These land use tools provided the foundation for the modeling of energy use, water use, carbon footprint, and transportation of potential development in Superstition Vistas.

The Envision Tomorrow Methodology

The first step is to develop as close as possible an approximation of the area as it is today. The actual data may in fact represent the area two or three years ago, but it is important that most of the data is geographically and temporally consistent. Since this data set is the base upon which the development and analysis of alternatives is made it is important that it include the full range of data that will be used in the development of alternatives.

Envision Tomorrow is an extension within the ArcGIS framework that can be used to create and analyze land use growth scenarios. It does this by integrating a formatted Excel spreadsheet with a GIS data layer. This integration allows the user to create customized scalable scenarios that can be altered to best plan for varying geographic extents and topologies.

There are several main processes that are used to create growth scenarios. The first step is a process that consists of data preparation and the creation of an environmental constraint layer. Two types of constraints are taken into consideration during the preparation. Hard constraints are considered to be completely non-buildable areas, while soft constraints may have some development potential but should be subject to planning decisions. Both constraints are based on the specific environmental conditions and analysis.

In Superstition Vistas, the hard environmental constraints were:

- Roads buffered to adjust for development (highways 200' buffer, major roads 150' buffer, and local roads and rail 100' buffer.
- FEMA Floodzones
- Level 3 Washes

- Central Arizona Project (CAP) has a 400' buffer
- Slopes above 25%

The Soft Environmental Constraints consisted of:

- Level 1 Washes in high species richness zones
- Stormwater and wastewater zones
- Floodzones east of the CAP
- Channel and basin system along CAP
- Slopes between 15% and 25%
- Open space corridors and flood control features, or adjacent to sensitive ecological areas
- Wildlife preserves and protected ecological areas

Each environmental constraint layer is converted to a grid with cells measuring 210/210 feet with an area of 1.0124 acres using the ArcGIS Spatial Analyst extension. These grids are then merged together to form the project Constraints Grid.

The next step in scenario development process is to determine which lands are buildable and the existing land use of these areas. After the land uses are determined, these areas where then turned into raster grids with the same cell size as the Environmental Constraints grid. Next an analysis mask of the Environmental Constraints grid was used to create an Unconstrained Lands grid. As the final step, we use the Vacant and Redevelopable grids to identify Buildable Lands based on the unconstrained areas.

We then use the data that we have developed to create a Polygrid. First, we convert the project boundary into a grid using the same cell size as above. Next we converted the raster to a point file so that each entry has a sequential unique ID. This was done by using the unique ID field when reconverting the boundary points to raster grid. The result is a grid file with unique IDs for each cell. Next we set the Analysis Mask in the Spatial Analyst extension and ran the Redevelopment grid through the Raster Calculator to make a Redevelopment grid file with unique IDs, and then repeated this process for the Vacant grid. Both Redevelopment and Vacant grids where then converted to polygon. The area in acres was then calculated for both polygon shapefiles in a new field named "redev" and "vacant' respectively. The Boundary grid was then converted to a polygon, and the fields NEWZONING, vacant, and redev were all added to the attribute table. The NEWZONING field is used later when applying development to the scenario polygrid. The Boundary polygon was then joined to the Redevelopment and Vacant polygons using the unique ID that was created in the earlier step. Next, the Boundary polygon's redev and vacant fields are calculated to matched the joined Redevelopment and Vacant polygon values for the respective polygons. Lastly, we undid the joins and selected by attributing all of the cells in the Boundary polygon that have either vacant or redev acreages of 0 and exported the selected features as the final Polygrid. The Polygrid cells contain a value in acres of how much of that gridcell can be redeveloped or how much is vacant. When applying Development types later on in the analysis these values are automatically accounted for as the scenario is built.

Once the Polygrid was created we used the Envision Tomorrow Scenario Builder to build scenarios based on the development types described below and the housing and employment forecasts. When using the Scenario Builder, the program sends the acreages of each development type to Excel where the planners designing the scenario can monitor the progress against a series of control totals (based on the forecast). The building-, development-type and scenario-scale processes are described in further detail below.

Building Prototypes

We began by creating prototypical buildings using the Envision Tomorrow Return on Investment (ROI) model. The ROI Model incorporates a simplified pro forma with the same financial inputs that a developer would use to evaluate a project, including construction, land and other expenses, as well as expected rents and sales prices. It can also test the sensitivity of design variables such as unit size, height, parking ratios and types. It creates physical, parking and financial outputs which include an Internal Rate of Return (IRR), Return on Investment (ROI), developer profit (as a percentage of project costs and in dollars), and a full range of building envelope- and parking-related data. We developed a set of prototype buildings that could be used in regional and other large-scale plan modeling in Superstition Vistas.

The model is designed to test both the physical and financial feasibility of hypothetical development projects. We can model a range of building types, from single-family homes, to mixed-use buildings, to regional retail malls. Housing and employment densities, floor-area ratios, impervious surface, and other key measures are included in each ROI model run.

We created twelve building prototypes for the Superstition Vistas project:

Prototype Name	Dwelling Units/Acre	Jobs/Acre
8 Story Mixed-Use Retail/Office	0	333
8 Story Mixed-Use Retail/Residential	68	32
3 Story Mixed-Use Retail/Office	0	92
3 Story Mixed-Use Retail/Residential	34.3	32
8 Story Residential	65.4	12
3 Story Residential	29.2	3
Townhome (2 Story)	13.8	0
Single Family (2 Story)	8.1	0
Large Lot Single Family (2 Story)	3.5	0
Office Park (2 Story)	0	43
Retail (1 Story)	0	27
Industrial (1 Story)	0	11

These buildings were designed to reflect a range of different types and reflect the foundation for the development types and the land use scenarios.

Our consulting team partners, AECOM-EDAW, evaluated the energy performance of each. AECOM-EDAW developed a “base” energy use assumption along with three levels of improvement, representing 25%, 50% and 80% reductions in energy use. They developed estimates of carbon dioxide emissions, as well as energy use from electricity and natural gas. In each case the additional cost was estimated, as well as the savings in energy use. This allows for extensive cost benefit analysis of the resulting scenarios.

Development Types

These building types, when aggregated, form what we call “development types”, or collections of buildings, streets, parks, and civic areas that can then be “painted” onto the landscape.

For Superstition Vistas, we created 12 development types to comprise the ingredients for scenarios that we created using the Envision Tomorrow Scenario Builder. The 12 development types:

Development Type	Net Residential Density	Net Employment Density
Urban Core	24.3	68.8
Traditional Downtown	19.4	21.3
Town Center	16.5	7.9
Business Park	N/A	23.9
Industrial	N/A	9.9
Neighborhood Retail	N/A	24.0
Power Retail	N/A	23.7
Regional Retail	N/A	23.0
Lifestyle	2.1	21.2
Master Planned Community	7.2	0.2
Traditional Neighborhood (TND)	9.8	0.4
Residential Subdivision	4.7	N/A

Scenario Development

We used the Envision Tomorrow Scenario Builder to create 4 scenarios using these development types. In our approach, scenarios are stories about what might be; they are not forecasts and they are not predictions. They are possible futures that are based on what already exists, on trends that are evident, and on the values and preferences of the participants. The essential requirement of any scenario is that it be plausible, within the realm of what exists and what is now known or can be reasonably conceived.

The first step in the scenario building process in GIS was to make a layer of grid cells over the region that could be selected to place new growth. Each grid that can be selected to “paint” a development type represents a 1.0124 acre area of land. Grid cells where environmental constraints occur within their boundaries were masked out, meaning these cells could not be selected and were considered off limits for placing any new growth.

After masking out the environmental constraints, we developed four scenarios for Superstition Vistas. Each scenario took a different direction in order to test options for the project area:

Scenario A

The first scenario was a scenario based on current Phoenix-area trends. In this scenario, development in Superstition Vistas would be more ad hoc and based on access and commuting to existing cities in the region like Chandler, Gilbert, Mesa, Tempe and Phoenix. Highway and road allocation were based on expected alignments under current conditions and the expansion of existing right-of-ways. Residential development, as in surrounding communities, would be low-density and dispersed. The dependence of Superstition Vistas in this scenario on access to jobs in neighboring cities results in a low number of jobs compared to housing units. Employment in the area would be comprised primarily of auto-centric strip malls, office parks, and industrial parks. The majority of the land would be made up of residential subdivisions and housing on large lots with little preserved open space. Development prototypes in this scenario included only conventional building types without green features. The transportation system is focused on roads and travel by auto rather than alternative modes.

Scenario B

The second scenario was an economic catalyst scenario based on RCLCO's projections for the region. In this scenario, Superstition Vistas would have a higher jobs-to-household ratio than the region as a whole. Business development would occur in three phases based on regional comparative advantage. Each phase of business development would be supplemented by associated service sector employment and requisite housing units. New businesses would first develop in areas easily accessible to the rest of the region in the northwestern quadrant. This first phase would feature economic development in areas where Superstition Vistas has significant comparative advantage, such as film production, energy generation, warehouse distribution, higher education, advanced manufacturing, and resort development. Housing and secondary jobs associated with the siting of these industries would occur simultaneously. Road and transit alignments in this scenario were based on Arizona state transportation plans for the region. Many of the new industries are sited along major routes, while supportive jobs and housing is focused in and around new urban and town centers served by transit. The housing types would be denser than those currently under construction in the area. There would also be more mixed-use development. The design is transit-oriented and development types provide on-site open space. Sensitive land near the periphery would be preserved for open space as well.

Scenario C

The third scenario was based on feedback from the stakeholder workshop. This scenario includes the higher jobs/housing ratio of the second scenario with higher housing densities and more open space. Compared with the second scenario, this scenario focuses development more intensively around urban and town centers served by transit. Housing consists of much more multi-family housing, townhouses, and small-lot homes than the second scenario, resulting in significant open space preservation. Jobs are located in more urban environments. Waterfronts, wetlands, and hilly areas are left undeveloped. There are also supplemental transit lines along freeways and in residential areas in this scenario.

Scenario D

The fourth scenario goes one step further than the third scenario, representing a super sustainable development model that features compact, dense development, strong transit, and even more open space. Job and housing development is strongly focused in four urban centers. Roughly only half of the area is developed, leaving large expanses in the south and east open. There are substantially fewer single-family homes; housing is primarily attached or multi-family. This scenario features the most innovative green technologies in building construction and design, energy production, and transportation. Residents and employees can easily get around on foot, by bike, or using rail and bus transit. The smaller area of development also results in reduced highway and rail construction for auto and transit travel.

The final scenarios were then subjected to a series of tests to evaluate their individual impact on the study area's housing mix, transportation network, environmental features, open space, natural areas, and economic development impact. A summary table of indicators from the scenarios is attached to this document. These indicators include:

- General summary (households, population, employment, buildable acres etc.)
- Economy (employment mix, jobs-housing balance etc.)
- Equity and Opportunity (to be calculated)
- Environment (building and transportation energy, emissions, carbon footprint, water indicators, open space etc.)
- Community and Housing (housing mix, comparison with balanced housing supply, density etc.)

Housing Analysis

The housing needs analysis was conducted using a model to determine housing needs for the Phoenix MSA and the potential role of Superstition Vistas in meeting this need. The model's results are driven by current and projected demographics and regional tenure choices. The model's outputs include needed housing units by tenure (ownership versus rental) by income range. We use the model to find gaps that may represent current unmet needs and future housing needs. In this project, the model has been used to identify regional housing needs and market opportunities.

How does the model work?

The housing needs for the region are driven by the current housing choices in the region and the projected future demographic trends. In many areas around the country, the standard practice for estimating future housing need has been to extrapolate forward the past to determine future housing requirements. While this market or demand driven approach was commonly used to define the housing "needs" for an area, the true housing "needs" of that area's population may not have been addressed. Using Fregonese Associates' Balanced Housing Model, tenure choices and incomes determine housing "need." In this model, "affordable" is not referring to low-income housing, but rather to the relationship between incomes and housing costs. The "30% rule" assumes that housing is only affordable for a household if it spends less than 30% of its gross income on housing expenses.

Our model approach was designed based on research showing that two variables—**a**ge of head of household (Age—A) and household **i**ncome (Income—I)—demonstrated significantly stronger correlation with housing tenure than other variables, including household size. These two variables were selected as the primary demographic variables for the model. In addition, household income is another key variable used to help determine the affordability component of housing needs. As expected, data gathered during research on model development showed that different Age/Income (AI) cohorts make significantly different housing tenure choices. For example, a household headed by a 53 year-old and earning $126,000 is likely to make a different housing choice than one headed by a 29 year-old and earning $43,000.

The model is first used to calculate the total number of housing units needed for the planning period based on:

- Phoenix MSA forecast,
- number of people in group quarters,
- number of occupied housing units (number of households),
- average household size, and
- assumed vacancy rate for the study area.

The data sources for the population estimate, people in group quarters, and occupied housing units were taken from 2007 American Community Survey (ACS) of the Census Bureau. The number of households in each ***AI*** cohort for the Phoenix MSA was calculated by utilizing Census data to determine the percentages of households that are in the 28 ***AI*** cohorts (4 age cohorts and 7 income cohorts):

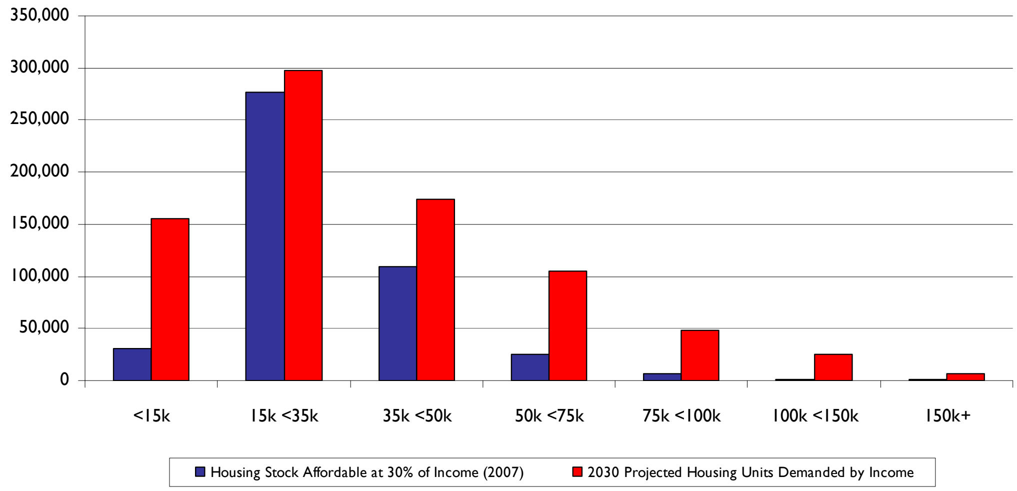
Income Ranges
<15k
15k <35k
35k <50k
50k <75k
75k <100k
100k <150k
150k+

Age Ranges
<25
25-44
45-64
65+

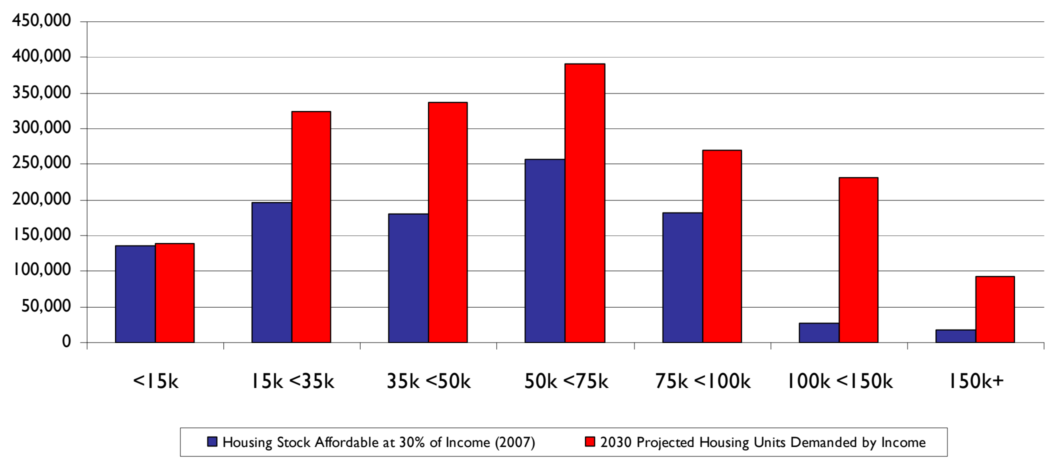
The Census-generated tenure parameters used in the model represent the probabilities of being a renter or homeowner for each of the 28 ***AI*** cohorts. Based on these tenure parameters, the model allocates those households in each ***AI*** cohort to an indicated number of rental and ownership units that is affordable for the **Income** range for that cohort. The model then aggregates the units demanded within each income range to show the total units that could be afforded at each income range by tenure.

To estimate the future AI cohorts, the current AI percentages were adjusted to reflect demographic forecasts for Arizona by the US Census Bureau. The following charts show the comparison for the Phoenix MSA by tenure:

2030 Rental Demand Compared to Current Housing Stock



2030 Ownership Demand Compared to Current Housing Stock



The Superstition Vistas area was allocated a proportion of the region's housing need to estimate the potential need for rental and owner housing at a range of income levels. This proportion was based on the 405,000 unit forecast, which also provided the basis for the regional scenario development. The advantage of using prototype buildings in this approach is that we were able to convert each of the units in the prototypes to an assumed rent or for sale price range, and compare this affordability range with the regional need.

Superstition Vistas
Scenario Indicators

3/20/2009

	Scenario A		Scenario B		Scenario C		Scenario D	
	Total	Percent	Total	Percent	Total	Percent	Total	Percent
Basics								
HH	419,392		414,782		416,478		396,935	
PPL	1,228,819		1,215,311		1,220,280		1,163,019	
EMP	403,446		490,717		489,437		531,328	
Study Area Acres	168,549		168,549		168,549		168,549	
Buildable Acres	134,546		134,546		134,546		134,546	
Economy								
Employment Mix (Jobs)								
Retail	115,444	29%	120,737	25%	128,223	26%	122,913	23%
Office	240,443	60%	267,976	55%	287,729	59%	336,135	63%
Industrial	47,559	12%	102,004	21%	73,485	15%	72,280	14%
Employment Mix (Sq Ft)								
Retail	51,949,855		54,331,443		59,338,886		55,310,718	
Office	84,154,988		93,791,732		100,705,122		117,647,255	
Industrial	47,558,644		102,004,352		73,484,711		68,666,025	
Subarea Jobs-Housing Balance	0.96		1.18		1.18		1.34	
Area-wide Jobs-Housing Balance								
Share of region's jobs that are in SV Urban Centers	TBD		TBD		TBD		TBD	
Wage Levels of New Jobs	TBD		TBD		TBD		TBD	
Average Educational Requirements of new workforce	TBD		TBD		TBD		TBD	
Net Present Value of the Scenarios	TBD		TBD		TBD		TBD	
Economic Feasibility of Scenarios	TBD		TBD		TBD		TBD	

	Scenario A		Scenario B		Scenario C		Scenario D	
	Total	Percent	Total	Percent	Total	Percent	Total	Percent
Equity and Opportunity								
Walkability scores within 1-mile of public schools	TBD		TBD		TBD		TBD	
Affordability of housing for future demographics by area	TBD		TBD		TBD		TBD	
Demographic mix, housing profile, new permits	TBD		TBD		TBD		TBD	
Access to alternative transportation by demographic area	TBD		TBD		TBD		TBD	
Match of household make-up and income to housing type	TBD		TBD		TBD		TBD	
Percent of new jobs in affordable areas	TBD		TBD		TBD		TBD	
Environment								
Transportation Energy Indicators								
Transportation Energy Usage								
Gallons of Gas per day								
Fleet 1: 22.5 MPG, 0% Electric	733,333		524,444		520,000		404,444	
Fleet 2: 35 MPG, 10% 10% Electric or Renewable Fuel	424,286		303,429		300,857		234,000	
Fleet 3: 49 MPG, 10% Electric or Renewable Fuel	269,388		192,653		191,020		148,571	
Fleet 4: 60 MPG, 20% Electric or Renewable Fuel	165,000		118,000		117,000		91,000	
Transportation Emissions (CO2)								
Tons of CO2 per Year								
Fleet 1: 22.5 MPG, 0% Electric	2,596,367		1,856,796		1,841,060		1,431,936	
Fleet 2: 35 MPG, 10% 10% Electric or Renewable Fuel	1,502,184		1,074,289		1,065,185		828,477	
Fleet 3: 49 MPG, 10% Electric or Renewable Fuel	953,767		682,088		676,308		526,017	
Fleet 4: 60 MPG, 20% Electric or Renewable Fuel	584,183		417,779		414,239		322,186	

Superstition Vistas
Scenario Indicators

	Scenario A		Scenario B		Scenario C		Scenario D	
	Total	Percent	Total	Percent	Total	Percent	Total	Percent
Building Energy Indicators								
Building Energy Usage								
Annual Electrical Requirement (kWhr/yr)								
Baseline	10,913,048,145		11,231,883,319		8,505,752,958		6,699,390,235	
Good	7,701,295,554		7,906,216,060		5,929,667,718		4,659,032,625	
Better	5,168,969,715		5,305,008,099		4,098,615,745		3,356,691,047	
Best	1,819,231,393		2,252,188,103		1,802,201,875		1,646,321,936	
Annual Gas Requirement (Therms/yr)								
Baseline	300,832,081		277,139,708		211,119,639		159,388,366	
Good	217,244,630		207,922,031		163,995,699		124,527,541	
Better	173,803,725		168,984,931		130,137,409		97,230,024	
Best	117,894,645		99,239,366		78,461,810		60,407,279	
Building Emissions (CO2)								
Annual CO2 (ton/yr)								
Baseline	6,849,963		6,432,108		4,979,872		3,946,321	
Good	4,857,101		4,574,143		3,542,903		2,797,772	
Better	3,411,627		3,251,780		2,556,985		2,046,724	
Best	1,437,773		1,414,298		1,159,182		964,222	
Building Energy Costs								
Annual Energy Costs								
Baseline	$ 1,493,535,629		$ 1,517,102,290		$ 1,145,803,160		$ 891,765,906	
Good	$ 1,058,401,936		$ 1,082,055,138		$ 818,264,057		$ 636,594,670	
Better	$ 741,690,706		$ 756,203,103		$ 582,339,834		$ 466,317,077	
Best	$ 338,742,440		$ 369,623,175		$ 292,640,567		$ 255,667,129	
Incremental Costs								
Baseline	0		$ -		$ -		$ -	
Good	$ 2,032,216,559		$ 2,336,889,022		$ 1,730,440,874		$ 1,301,717,310	
Better	$ 7,380,322,607		$ 8,705,440,633		$ 6,476,717,527		$ 4,652,495,109	
Best	$ 18,169,376,063		$ 19,149,888,609		$ 14,563,728,387		$ 10,355,098,583	
Total Carbon Footprint (Building and Transportation Emissions)								
Baseline	9,446,329		8,288,903		6,820,932		5,378,257	
Good	6,359,284		5,648,432		4,608,088		3,626,249	
Better	4,365,394		3,933,868		3,233,293		2,572,741	
Best	2,021,955		1,832,077		1,573,420		1,286,407	

Superstition Vistas
Scenario Indicators

	Scenario A		Scenario B		Scenario C		Scenario D	
	Total	Percent	Total	Percent	Total	Percent	Total	Percent
Water Indicators								
Residential Water Demand								
Gallons/capita/day								
Baseline	59,436,371		59,024,605		59,265,945		56,484,938	
Good	43,998,273		43,693,460		43,872,114		41,813,450	
Better	38,261,763		37,996,691		38,152,052		36,361,797	
Best	28,495,926		28,298,511		28,414,218		27,080,904	
Total Residential fixture cost per capita ($)								
Baseline	$ 895,178,977		$ 888,977,308		$ 892,612,168		$ 850,727,052	
Good	$ 1,087,812,428		$ 1,080,276,222		$ 1,084,693,268		$ 1,033,794,899	
Better	$ 1,427,753,812		$ 1,417,862,541		$ 1,423,659,914		$ 1,356,855,805	
Best	$ 3,104,797,972		$ 3,083,288,384		$ 3,095,895,369		$ 2,950,622,942	
Commercial Water Demand								
Gallons/sf/day								
Baseline	*12,246,620*		*13,328,021*		*14,400,650*		*15,562,639*	
Good	*8,435,684*		*9,180,572*		*9,919,417*		*10,719,816*	
Better	*5,944,285*		*6,469,178*		*6,989,812*		*7,553,820*	
Best	*5,482,209*		*5,966,299*		*6,446,462*		*6,966,628*	
Total Commercial fixture cost per sf ($)								
Baseline	$ 15,878,898		$ 17,281,037		$ 18,671,801		$ 20,178,430	
Good	$ 39,470,404		$ 42,955,721		$ 46,412,762		$ 50,157,812	
Better	$ 47,636,695		$ 51,843,111		$ 56,015,403		$ 60,535,291	
Best	$ 54,441,937		$ 59,249,270		$ 64,017,603		$ 69,183,189	
Total Internal Building Water Demand								
Gallons/capita/day								
Baseline	71,682,991		72,352,626		73,666,595		72,047,577	
Good	52,433,958		52,874,032		53,791,531		52,533,266	
Better	44,206,048		44,465,868		45,141,864		43,915,617	
Best	33,978,136		34,264,810		34,860,680		34,047,531	

Superstition Vistas
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	Scenario A		Scenario B		Scenario C		Scenario D	
	Total	Percent	Total	Percent	Total	Percent	Total	Percent
Landscaping Water Demand								
Impervious Surface (Acres)	75,351	75%	74,552	78%	52,199	80%	36,339	80%
Pervious Surface (Acres)	25,597	25%	20,462	22%	13,094	20%	9,167	20%
Water demand (gallons/sf/day) - No Rainwater Capture								
Baseline	47,377,258		37,873,214		24,235,990		23,828,920	
Good	35,986,661		28,767,611		18,409,093		18,099,892	
Better	30,291,362		24,214,809		15,495,645		15,235,378	
Best	18,900,765		15,109,205		9,668,748		9,506,350	
Water demand (gallons/sf/day) - With Rainwater Capture								
Baseline	47,377,258		37,873,214		24,235,990		23,828,920	
Good	35,986,661		28,767,611		18,409,093		18,099,892	
Better	26,340,195		21,056,260		13,474,412		13,248,095	
Best	13,369,131		10,687,237		6,839,022		6,724,154	
Landscape cost ($/sf)								
Baseline	$ 4,460,050,515		$ 3,565,348,776		$ 2,281,553,322		$ 2,243,232,104	
Good	$ 4,181,297,358		$ 3,342,514,477		$ 2,138,956,240		$ 2,103,030,097	
Better	$ 3,623,791,043		$ 2,896,845,880		$ 1,853,762,074		$ 1,822,626,084	
Best	$ 2,787,531,572		$ 2,228,342,985		$ 1,425,970,826		$ 1,402,020,065	
Total Water Demand (Building and Landscaping)								
Gallons/capita/day								
Baseline	119,060,250		110,225,840		97,902,585		95,876,497	
Good	88,420,619		81,641,643		72,200,625		70,633,158	
Better	70,546,243		65,522,128		58,616,276		57,163,712	
Best	47,347,267		44,952,047		41,699,703		40,771,685	

Superstition Vistas
Scenario Indicators

	Scenario A		Scenario B		Scenario C		Scenario D	
	Total	Percent	Total	Percent	Total	Percent	Total	Percent
Open Space Indicators								
Urban Park Area	7,310		3,894		2,880		2,180	
Acres per 1,000 HH	17.4		9.39		6.9		5	
Acres per 1,000 Pop (factor 2.93 Phoenix census)	5.9		3.2		2.4		2	
Urban Open Space	11,492		12,490		22,396		10,114	
Acres per 1,000 HH	27		30		54		25	
Acres per 1,000 Pop	9		10		18		9	
Scenic Open Space	56,109		61,045		80,860		112,929	
Acres per 1,000 Pop	46		50		66		97	
Preserved/Undeveloped Area within study area	67,601	40%	73,535	44%	103,256	61%	123,043	73%
Acres per 1,000 HH	161		177		248		310	
Acres per 1,000 Pop	55		61		85		106	
Total Open Space	74,911		77,429		106,136		125,223	
Acres per 1,000 Pop	61		64		87		108	
Extensiveness and connectivity of bicycle network	TBD		TBD		TBD		TBD	
Average walkability scores for neighborhoods served by transit	TBD		TBD		TBD		TBD	
Access to open space and parks	TBD		TBD		TBD		TBD	
Proportion of new buildings that are highly rated for energy and sustainability	TBD		TBD		TBD		TBD	
Extensiveness and connectivity of parks, greenways and trails	TBD		TBD		TBD		TBD	

Superstition Vistas
Scenario Indicators

	Scenario A		Scenario B		Scenario C		Scenario D	
	Total	Percent	Total	Percent	Total	Percent	Total	Percent
Community and Housing								
Housing Mix								
Single Family	318,658	76%	278,498	67%	226,572	54%	139,888	35%
Townhouse	48,602	12%	53,345	13%	39,720	10%	38,403	10%
Multi-Family	52,132	12%	82,939	20%	150,186	36%	218,644	55%
Density								
Units per Urbanized Acre	3.34		3.46		4.54		6.34	
PPL per Square Mile	6,270		6,485		8,516		11,892	
Land consumption								
Developed Acres	100,948	60%	95,014	56%	65,293	39%	45,506	27%
Urbanized Acres	125,426		119,945		91,707		62,590	
Square Mile	196		187		143		98	
Ideal Balanced Housing Demand vs. Supply of Housing Types (Negative is under ideal, positive is above ideal, 0 is at ideal)	Deviation from ideal amount		Deviation from ideal amount		Deviation from ideal amount		Deviation from ideal amount	
8-Story Mixed Use Retail/Residential	(14,828)	-100%	(6,873)	-46%	(4,075)	-27%	2,390	16%
3-Story Mixed Use Retail/Residential	(34,623)	-100%	(22,951)	-66%	(14,164)	-41%	(3,517)	-10%
8-Story Residential	(15,828)	-100%	(449)	-3%	2,158	14%	25,995	164%
3-Story Residential	(3,325)	-6%	(9,556)	-17%	41,313	74%	77,406	139%
2-Story Townhome	(4,866)	-9%	(1,242)	-2%	(14,704)	-28%	(14,145)	-27%
2-Story Single Family	(14,553)	-7%	1,148	1%	11,371	6%	(64,103)	-31%
Large Lot SFR	88,023	332%	39,924	151%	(21,901)	-83%	(24,025)	-91%
Balanced Housing Index (Closer to 100 represents better match between demand and supply)	57		80		73		48	
Number of housing units in mixed use areas/walkable areas	TBD		TBD		TBD		TBD	
Number of Mixed use dwelling units	TBD		TBD		TBD		TBD	

Superstition Vistas

Superstition Vistas
Scenario Indicators

	Scenario A		Scenario B		Scenario C		Scenario D	
	Total	Percent	Total	Percent	Total	Percent	Total	Percent
Transportation								
Vehicle Indicators: Superstition Vistas Site								
Vehicle Miles Traveled (VMT)	16,500,000		11,800,000		11,700,000		9,100,000	
per capita (miles)	8		12		12		9	
Vehicle Hours Traveled (VHT)	960,000		420,000		340,000		250,000	
per capita (Hours)	1		0.4		0.3		0.3	
Delay	640,632		164,000		114,000		79,000	
per capita (Hours)	0.3		0.2		0.1		0.1	
Value of Time Lost (per year)	$ 4,500,000,000		$ 1,200,000,000		$ 800,000,000		$ 600,000,000	
Gallons of Fuel Wasted Annually	140,000,000		36,000,000		25,000,000		17,000,000	
Trip Counts: Superstition Vistas Site								
Walk/Bike Trips	970,000	11%	1,620,000	17%	1,770,000	19%	1,830,000	19%
Vehicle Trips	8,170,000	89%	7,730,000	83%	7,620,000	81%	7,580,000	81%
Daily Transit Ridership: Superstition Vistas Site								
Local Transit Ridership	32,175		197,340		213,070		217,360	
Walked to Transit	24,131	75%	148,005	75%	159,803	75%	163,020	75%
Bike to Transit	1,609	5%	19,734	10%	21,307	10%	21,736	10%
Drive to Transit	6,435	20%	29,601	15%	31,961	15%	32,604	15%
Regional Transit Ridership	26,325		161,460		174,330		177,840	
Walked to Transit	11,846	45%	72,657	45%	78,449	45%	80,028	45%
Bike to Transit	1,316	5%	16,146	10%	17,433	10%	17,784	10%
Drive to Transit	13,163	50%	72,657	45%	78,449	45%	80,028	45%
Total Transit Ridership	58,500		358,800		387,400		395,200	
Proximity to Transit								
Stop 1/2 mile								
Households	38,170	9%	73,415	18%	84,303	20%	107,923	27%
Jobs	189,776	47%	193,485	39%	201,808	41%	175,531	33%
Commuter Rail Stop 1/2 mile								
Households	9,119	2%	15,594	4%	22,508	5%	27,554	7%
Jobs	15,931	4%	57,013	12%	65,427	13%	133,575	25%
All transit								
Households	47,289	11%	89,009	21%	106,811	26%	135,477	34%
Jobs	205,707	51%	250,498	51%	267,235	55%	309,106	58%

Superstition Vistas
Scenario Indicators

	Scenario A		Scenario B		Scenario C		Scenario D	
	Total	Percent	Total	Percent	Total	Percent	Total	Percent
Develop walkable neighborhoods and commercial centers	TBD		TBD		TBD		TBD	
Areawide and neighborhood splits between different modes of transportation	TBD		TBD		TBD		TBD	
Proportion of households/jobs in neighborhoods with high walkability scores (street and path connectivity and intersections)	TBD		TBD		TBD		TBD	
Proportion of households/jobs served by bicycle network	TBD		TBD		TBD		TBD	
Ratio of retail/entertainment/shopping to office/other employment within high-density employment areas - to measure mix of uses	TBD		TBD		TBD		TBD	
Cost of transportation improvements needed	TBD		TBD		TBD		TBD	
Annual household fuel expenditures	TBD		TBD		TBD		TBD	