Appendix A: Parcel Characteristics.

The runoff modeling and land cost estimates require data on impermeable and permeable area for each parcel. We assume that impermeable area is composed of roof and parking area (where parking area includes all lanes, medians and walkways necessary). Standard local roll parcel data does not contain information on the impermeable, roof, and parking area. We obtained real estate data for sold properties that contains the building footprint or roof area and the number of parking spaces on the property (the data consists of commercial real estate sales in Los Angeles County from 1996-2005 and was obtained from CoStar Inc.) We converted parking space numbers to parking area square feet using an estimate of 350 square feet per parking space which includes all lanes, medians, and sidewalks pertaining to the parking area (information from a personal communication with Willson 4/06/06).

We matched the real estate parcels sales data to the local roll data for area nearby to Sun Valley. This produced 550 matched parcels. For these parcels we have the roof and parking area data in the real estate sales data as well as all characteristics included in the local roll parcel data. The real estate data includes a variable on the building footprint as a proportion of property area. Therefore we use building coverage as one dependent variable. Since building coverage can by definition only be in [0,1] we use a logit formulation:

$$Log(\frac{PCV_i}{1-PCV}) = \beta_0 + \sum_{j=1}^{J} \beta_j X_{i,j} + \varepsilon_{1,i}, i = 1,2,...,392$$

PCV_i =Percentage of parcel covered by building footprint.

$X_{i,j}$ = Local roll parcel characteristics used for percent coverage regression.

i = 1,2,..,392 represents the number of matched observations with non-zero building coverage.

We use the general linear modeling framework in STATA to solve for the maximum likelihood parameters. For the PCV_i regression (see Appendix Table 2) the dependent variable is the proportion of property area covered by a building, therefore the independent variables should explain this proportion. For this reason we chose the ratio of building gross floor area (this is the sum of floor area for all stories) on the parcel to parcel area (*sqftac)* as an independent variable, along with the same ratio squared (*sqftac2*). We chose the polynomial in the ratio of building gross floor area to parcel area to capture the likelihood that 1) the greater this ratio the greater the coverage; and 2) the marginal effects of this ratio are likely to decrease because the greater the ratio the more likely the building has multiple floors. We also hypothesize that the dimensions of the lot might influence the structures built on the lot and therefore would affect building coverage so we include the perimeter length (*slength)* in the regression . Finally, the type of land use may affect the type of structure as well so we included dummies for land use. The other independent variables are *agepc*, the age of the main structure; *sqftage,* the building square footage times; *agepc*, the length of the perimeter of the parcel interacted with *sqftac (lgsqt); and simp_value*, the value of improvements on the property. Our results (see Table 2) indicate that the only significant variables are *sqftac* coefficient significant at the 5% level and *sqftac2* coefficient significant at the 1% level. As we expected, there is a quadratic relationship with a positive coefficient on the linear term and a negative coefficient on the squared term. This regression has a Psuedo R^2 of .59, indicating that the specification has fairly good explanatory power.

In order to estimate parking square feet on a property we tested both log and linear specifications of the dependent variable and found the log specification had greater explanatory power. We are not aware of prior literature attempting to estimate parking square feet on a property via statistical means. Our specification is as follows:

$$Log(PK_i) = \alpha_0 + \sum_{j=1}^{J} \alpha_j Z_{i,j} + \varepsilon_{2,i}, i = 1, 2, ..., 388$$

PK_i = Parking area (square feet).

$Z_{i,j}$ = Local roll parcel characteristics used for parking area regression.

i = 1,2,…,388 represents the matched observations where building coverage is greater than zero and where there are no missing variables.

We theorize that parking space demand may increase with building area, lot size and may vary by land use. The lot dimensions may influence the cost of placing parking and structures. The parking requirements may vary by the land use and the age of the structure (since parking requirements are usually based on building square footage and may change over time). Therefore, for the PK_i regression (see Appendix Table 3) the independent variables are: *bsq,* building square feet and *bsq* squared and cubed (*bsq2, bsq3)*; *lgsqt*, *slength* times *sqftac*; *agepc*, the age of the structure; *agesbuit*, *agepc* interacted with *bsq;* lot area (*ltarea)*; and lot area interacted with *bsq, bsq2* and *bsq3;* and dummy variables for each use code. The coefficients are generally significant at the 1% level except for the *agepc* and *agepc*bsq*. This regression has a Psuedo R^2 of .98.

We also use a separate parking area regression (see Appendix Table 4) for those parcels that do not have structures on them, this regression only has total parcel area (*ltarea)* and land use dummies and has a Pseudo R^2=.68. Lot area is positive as expected and significant at the 1% level. In addition, the dummy variable for multi-family land use is positive and significant. (If parcels do not have structures on them we assume building coverage is zero.)

We then use these regressions to estimate building coverage and parking area for the non single-family residential parcels in Sun Valley by using the variable values derived from the local roll data, inserting them into the appropriate equations, and using the estimated coefficients to project a building coverage and parking area. We calculate:

$$Log(\frac{PC\hat{V}_i}{1-PC\hat{V}_i}) = \hat{\beta}_0 + \sum_{j=1}^{J} \hat{\beta}_j X_{i,j}, s = 1,2,...,918$$

$$Log(P\hat{K}_i) = \hat{\alpha}_0 + \sum_{j=1}^{J} \hat{\alpha}_j Z_{i,j}, s = 1,2,...,918$$

$PC\hat{V}_i$ =Estimate of the percentage of parcel covered by building footprint.

$P\hat{K}_i$ = Estimate of parking area (square feet).

$X_{i,j}$ = Local roll parcel variables used in coverage regression for Sun Valley parcels.

$Z_{i,j}$ = Local roll parcel characteristics used in parking area regression for Sun Valley parcels.

s = 1,2,…,918 represents the Sun Valley parcels modeled in the paper.

Because the parking area estimate is not bounded by the size of the lot, for some of the parcels the sum of estimated roof and parking area is greater than the parcel area. For these parcels we multiply roof and parking by the ratio of parcel area to roof and parking area, rescaling them so that the sum of areas is equal to parcel area. We use these estimates of parking, roof, and impermeable area for runoff and land cost estimates.

Table A1: Summary Statistics for Key Variables used to Estimate Parcel Characteristics.

Variable	Definition	Mean	Sd
PCV	Proportion of lot area covered by a structure.	0.46	0.20
PK	Parking area (sq. ft.)	17,246.44	56,751.63
bsq	Building gross floor area (sq. ft.)	13,980.04	37,228.65
slength	Property perimeter length (ft.)	909.09	804.78
agepc	Age of main structure.	44.12	13.95
simp_value	Value of improvements ($).	1,097,532.00	2,819,214.00
ltarea	Lot area (acres).	1.14	2.15

Table A2: Building Coverage Estimation Equation.

Variable	Coefficient [#]
Dependent variable (logit of building cover percentage)	
Pseudo r2	0.590
Log Likelihood	-170.292
sqftac	0.121**
	(2.981)
sqftac2	-0.001***
	(-3.439)
agepc	0.015
	(0.219)
sqftage	0.570
	(0.958)
slength	0.639
	(1.470)
lgsqt	-0.030
	(-1.726)
simp_value	-0.003
	(-0.018)
_cons	-2.866
	(-0.563)
N	392.000

t-statistics in parentheses

* significant at the 10% level ** significant at the 5% level

*** significant at the 1% level

land use code dummies are not shown.

Variable scales are adjusted for this table in order to have coefficients of similar magnitude

Table A3: Parking Area Estimation Equation for Properties with Buildings.

Variable	Coefficient[#]
Dependent variable (log of parking area)	
Pseudo r2	.98
Log Likelihood	-3983.804
bsq	0.100***
	(9.322)
bsq2	-0.099***
	(-5.611)
bsq3	0.373***
	(3.820)
agepc	0.010
	(0.391)
agepc*bsq	-0.232*
	(-2.298)
lgsqt	-0.008**
	(-2.732)
ltarea	0.735***
	(8.224)
ltarea*bsq	-14.063***
	(-4.861)
ltarea*bsq2	0.127***
	(3.802)
ltarea*bsq3	-0.042***
	(-3.446)
_cons	7.166***
	(11.119)
N	388.000

t-statistics in parentheses

* significant at the 10% level ** significant at the 5% level

*** significant at the 1% level

land use code dummies are not shown.

Variable scales are adjusted for this table in order
to have coefficients of similar magnitude

Table A4: Parking Area Estimation Equation for Properties without Buildings.

Variable	Coefficient#
Dependent variable (log of parking area)	
Pseudo r2	.98
Log Likelihood	-3983.804
bsq	0.100***
	(9.322)
bsq2	-0.099***
	(-5.611)
bsq3	0.373***
	(3.820)
agepc	0.010
	(0.391)
agepc*bsq	-0.232*
	(-2.298)
lgsqt	-0.008**
	(-2.732)
ltarea	0.735***
	(8.224)
ltarea*bsq	-14.063***
	(-4.861)
ltarea*bsq2	0.127***
	(3.802)
ltarea*bsq3	-0.042***
	(-3.446)
_cons	7.166***
	(11.119)
N	388.000

t-statistics in parentheses

* significant at the 10% level ** significant at the 5% level

*** significant at the 1% level

land use code dummies are not shown.

Variable scales are adjusted for this table in order to have coefficients of similar magnitude