What Explains the Incidence of the Use of a Mandated Erosion and Sediment Control at Residential Lots with Houses under Construction?

Abstract

To analyze infrequent compliance with regulation of stormwater discharge, we estimate a random-cost model of the use of silt fence on a single-family lot under construction in an urbanizing county of the Southeast. The probability of silt-fence use increases if the original developer still owns the lot, a home owners association exists in the subdivision, or the neighborhood has a multi-family dwelling. The probability decreases as the mean cost of the lots and houses being built increase, heated floor space decreases, or the share of lots under construction decreases. These results can help county officials to target inspection where non-compliance is likely and modify regulations to improve compliance.

Key Words: compliance with regulation; erosion and sediment control; filter fabric; random-cost model; use of silt fence; soil conservation; storm water pollution prevention plan

JEL Categories: Water Pollution (Q53), Land (Q24), and Sustainable Development (Q01)

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Introduction

Background

Urbanization of land use is increasingly common in the U.S. The area of developed land—urban, built-up, and rural transportation land—increased 47.4%, from 72.8 million acres to 107.3 million acres, during 1982-2002 in the 48 contiguous states of the US (NRCS). Land development apparently accelerated during 1982-2002 in the lower 48 states; the area of developed land increased 18.8% during 1982-1992 but then 24.0% during 1992-2002 (NRCS). However, although land-use urbanization accompanies economic growth, the process of land-use conversion, particularly the removal of vegetation and disturbance of proportionally large areas of soil, can adversely affect aquatic environments.

In the United States sediments impaired 13.2% of assessed rivers and streams in 1998 (EPA, 2000) and 12.1% of assessed rivers and streams in 2000 (EPA, 2002). Construction sites within developed land areas, urban stream banks without adequate vegetation, and undeveloped areas that are being developed are important sources of these sediments (EPA, 2002).

The U. S. Environmental Protection Agency regulates discharge of storm water from construction sites. As required by 1987 amendments to the Clean Water Act (CWA), the EPA in November 1990 promulgated Phase I of a comprehensive national program to address storm water discharges. Phase I requires construction operators to obtain coverage under a National Pollutant Discharge Elimination System (NPDES) permit for discharge of storm water runoff into waters of the U.S. or into municipal separate stormwater sewer systems from sites where construction activities disturb at least 5 acres of land or disturb less than 5 acres but are parts of larger common plans or sales that disturb at least 5 acres (EPA, 2006 and 1997). These activities include grading, clearing, excavating, and other earth moving processes. As required by the same amendments to the CWA, the EPA in December 1999 promulgated Phase II of the NPDES Storm Water Program. Phase II expanded the requirement of permit coverage to operators of sites where construction activities disturb at least 1 acre of land. Regardless of Phase I or II, construction operators—the developer and all contractors—must develop and implement storm water pollution prevention plans (SWPPPs) to obtain permit coverage from NPDES permitting authorities (EPA, 2006, pp. 7-8; EPA, 1997; Sadler, pp. 17-21).

Storm water pollution prevention plans must include locations and descriptions of erosion and sediment controls (ESCs) that must be installed prior to construction and maintained in a timely manner during construction until final stabilization of the site (Sadler, pp. 11-17 and 23). ESCs restrain “solid material, both mineral and organic, during a land disturbing activity to prevent its transport out of the disturbed area by means of air, water, gravity, or ice” (DHEC, 2003, Appendix A, p. 9). In these plans, one of the most frequently promised ESCs at construction sites is silt fence, or filter fabric (figure 1 and Paterson, p. 351).

Previous Research

In spite of regulations, silt fence and other commonly required erosion and sediment controls (ESCs) are often not installed during construction of subdivisions. For example, silt fence was not installed in 33% of the instances that were specified in ESC plans for construction sites in North Carolina in 1989 (Paterson, p. 351). Sediment traps were not observed in 86% of the instances that were specified in ESC plans for construction sites in Greenville County, South Carolina in 2001 (Johns and Gillespie). Lack of required ESCs was particularly evident after the infrastructural phase of construction (Loew, Haselbach, and Meadows).

Social and biophysical scientists have extensively studied the reasons for the extent to which farmers conserve soil on agricultural land (e.g., Lynne, Shonkwiler, and Rola) and how to promote conservation (e.g., Setia and Osborn). However, reasons for non-use of promised ESCs in storm water pollution prevention plans for non-agricultural activities that disturb land have not been extensively studied. In a seminal paper, Burby and Paterson analyzed, among other things, the effects of site characteristics, capacity and commitment of developers, and the enforcement system on the degree to which sediment traps were actually installed as specified in approved ESC plans at construction sites during the summer of 1989 in North Carolina. However, the dependent variable in their model of compliant installation was a percentage. In such models, similar to linear probability models, predicted compliance can exceed 100% or fall below 0% and marginal effects of exogenous variables are constant, even near 100% and 0%.

In a recent paper (Loew, Haselbach, and Meadows), installation of silt fence on a lot during house construction was strongly and negatively related to a change before construction in the lot's ownership from the original developer to a builder or future homeowner. Of course, the strength and significance of any possible effect of ownership change on the use of filter fabric should be estimated with a statistical model and one that also incorporates other possible determinants. In general, characteristics of the lot, house under construction, and subdivision in which the lot is located might affect the benefits and costs, both psychological and financial, to a developer and contractor of complying with the storm water pollution prevention plan.

Our purpose in this paper is to analyze the magnitude and significance of the effects of a number of these characteristics on promised silt-fence use. To this end, we substantially augmented the data from Loew, Haselbach, and Meadows and used them to estimate a logit model of the probability that a contractor uses filter fabric on a particular lot. Information about the relative importance of determinants of required use of filter fabric can help government officials to focus inspection on certain types of lots, houses, or subdivisions during construction and, if necessary, revise regulation of stormwater runoff.

Methods and Models

Data Sources and Variables

Information about the presence of silt fence came from an ocular census of all, 184, single-family, residential lots with houses under construction in fourteen subdivisions of Richland County, a predominantly urban area in South Carolina, during September 2003 (Loew, Haselbach, and Meadows; also table 1). In their review of the county-approved storm water pollution prevention plans, Loew, Haselbach, and Meadows found that silt fences were required at all 184 lots but were observed at only 50. In our paper, SILTFENCE equals one if a visited lot with a house under construction had any required silt fence and zero if it did not (table 2).

From their review in late 2003 of the Tax Assessor's on-line records of 330 unimproved lots in the same 14 subdivisions, Loew, Haselbach, and Meadows found that ownership of 75.5% of the lots had changed (table 1). In our paper, OWNERCHG equals one for a lot with a house under construction if the developer, who was responsible for the storm water pollution prevention plan, sold the unimproved lot to a contractor, builder, or a future homeowner prior to construction of the house. Loew, Haselbach, and Meadows did not assign identification to individual lots that were visited or reviewed. Nonetheless, there is certainty that the value of OWNERCHG for 166 of the 184 visited lots is accurate because the original developer sold all reviewed lots in 11 subdivisions and none of the reviewed lots in the other two subdivisions in which the 166 lots were located (table 1). The developer of subdivision D sold two thirds of the 18 reviewed lots to someone else. Which two thirds of the 18 lots in subdivision D were sold is not known. However, deleting observations would eliminate potentially valuable information. Thus, in spite of preliminary evidence to the contrary in other subdivisions and to be agnostic, we assumed no correlation between ownership change and silt-fence use in this subdivision. Hence, OWNERCHG equals one for two of the three lots for which SILTFENCE equals one and also equals one for 10 of the 15 lots for which SILTFENCE equals zero in subdivision D.

The webpage of the Richland County Assessor's Office was also the source of information about real estate in a subdivision. PRICEHL is the mean price that homeowners paid for houses being built and lots in a particular subdivision around the time of the survey (table 2). HTDFLOOR is the mean floor space of heated portions of the houses under construction in the subdivision during same period (table 2). LOTSIZE is the mean size of lots on which houses were being constructed in the subdivision around the time of the survey (table 2).

To maximize the degree of correspondence between the lots that were surveyed in September 2003 and these three variables, we collected on-line information about all of the lots with houses that were completed within three to nine months after the date of the visit in September. After following this procedure, if the number of tax records was still less than 40% of the number of lots visited in a particular subdivision, we then collected on-line information about all of the lots with houses that were completed three months prior to September 2003. (See table 1 for the size of the sample of lots in a particular subdivision and the months during which construction of houses on unimproved lots in the subdivision's sample was finished.)

We also gathered information about general characteristics of the subdivisions where lots under construction were located. HOA equals one for all lots with single-family houses under construction in a subdivision with a home owners association (table 2). A subdivision has a home owners association if property tax records indicate that an association owns a pool, clubhouse, or common area. MULTI equals one for all single-family lots under construction at in subdivisions that have at least one apartment, condominium, or other type of multi-family housing (table 2). Each of the fourteen subdivisions was revisited in August 2005 to confirm the on-line Assessor's information about the presence of a home owners association, a multi-family dwelling, or both. CONSHARE equals the number of lots under construction in a subdivision when silt-fence use was investigated divided by the total number of lots in the subdivision.

Socio-Economic Model

Our socio-economic model of silt-fence use is based on the following assumptions and facts. Assume that developers and contractors want to earn profits and also care about their business reputations. Costs to builders of silt-fence use are primarily installation costs. Expenses for 3 ft. high polypropylene filter fabric, labor to install it, overhead, and profit were $0.76 and $1.30 per linear foot under ideal and adverse conditions in Columbia, South Carolina in Jan. 2004 (Murphy, p. 37; Waier, p. 53). The expected value of fines is one cost to builders of non-use of silt fence. Civil penalties for violation of the NPDES Stormwater Program and South Carolina's Sediment, Erosion, and Flood Control Program can amount to as much as $10,000 and $1,000 per day (DHEC, 2001). Costs of non-use of silt fence also include expected costs of additional bond payments or cleanup, all of which reduce profits. Publication of fines can also harm a builder's reputation with developers and others in the community. For similar reasons, eroded sediments on adjacent lots, roads in front of lots, and nearby sidewalks can also hurt the reputation of a builder or the developer. Assume that a builder installs filter fabric on a lot as promised in the SWPPP if the financial costs of silt-fence **u**se, $E(C^u)$, are less than or equal to the expected fines, loss of reputation, and other expected costs of **n**on-use, $E(C^n)$. In other words, the builder's decision rule is to use silt fence if $E(C^n) \geq E(C^u)$.

Econometric Model

Although the approximate unit costs of silt-fence installation in Columbia, South Carolina are known, there is no available or readily obtainable information about the complete financial and reputational costs to a builder of his or her use and non-use of silt fence on a particular lot in a particular subdivision of this study area in September 2003. To adapt random utility models (e.g., Train) to our problem, let $E(C_t^i) = \bar{C}_t^i + \upsilon_t^i$, $i = u$ for **u**se or n for **n**on-use of silt fence, and $t = 1, \ldots, T$, the number of individual lots investigated. $\bar{C}_t^i$ represents the deterministic and knowable portion of the expected costs of choice i and υ_t^i represents an independently and identically distributed random, but unobservable, portion of the expected costs of choice i at the t-th lot that, on average, has no effect on them. Given these random costs, the probability in the mind of the researcher that a builder uses silt fence on a particular lot t is

$$P_t^u = \Pr(\bar{C}_t^u + \upsilon_t^u \le \bar{C}_t^n + \upsilon_t^n) = \Pr(\upsilon_t^u - \upsilon_t^n \le \bar{C}_t^n - \bar{C}_t^u) \equiv \Pr(\upsilon_t \le \bar{C}_t)$$

Let $\bar{C}_t = \boldsymbol{X}_t'\boldsymbol{\beta}$, in which $\boldsymbol{X}_t'$ is a 1 x K vector of lot, house, and subdivision variables that affect the difference in costs to a builder between non-use and use of silt fence on the lot and $\boldsymbol{\beta}$ is a K x 1 vector of marginal effects exogenous variables on the difference in deterministic costs. If υ_t is a logistic random variable, then $P_t^u = \dfrac{\exp(\boldsymbol{X}_t'\boldsymbol{\beta})}{1+\exp(\boldsymbol{X}_t'\boldsymbol{\beta})}$.

Let $y_t = 1$ for use or 0 for non-use of silt fence on the t-th lot. Given the logistic probabilities and 184 observations of lots, the unconstrained likelihood function is

$$L = \prod_{t=1}^{184} \left(P_t^u\right)^{y_t} \left(1 - P_t^u\right)^{1-y_t} = \prod_{t=1}^{184} \left(\frac{\exp(\boldsymbol{X}_t'\boldsymbol{\beta})}{1+\exp(\boldsymbol{X}_t'\boldsymbol{\beta})} \right)^{y_t} \left(\frac{1}{1+\exp(\boldsymbol{X}_t'\boldsymbol{\beta})} \right)^{1-y_t}$$

The parameter vector $\boldsymbol{\beta}$ and the standard errors of the estimator of $\boldsymbol{\beta}$ were estimated with the Newton-Raphson algorithm in the LOGIT procedure of TSP Version 5.0 to maximize this likelihood function (Hall and Cummins). The parameter estimator is consistent, asymptotically efficient, and asymptotically normally distributed (Judge et al.).

The scaled R^2, or $SR^2 \equiv 1 - \left(\frac{\ln L_u}{\ln L_c} \right)^{-(2/N)\ln L_c}$, is a relatively new measure of the goodness of fit of dichotomous dependent variables (Estrella). In this formula 'L_c' refers to the maximized value of the **c**onstrained likelihood function in which K-1 parameters, all except the constant, are fixed at 0 and 'L_u' refers to the maximized value of L, the **u**nconstrained likelihood function. In contrast to older measures of fit, the scaled R^2 "may be interpreted intuitively in a similar way to R^2 in the linear regression context" (Estrella, p. 198). The likelihood ratio statistic, LR = $2(\ln L_u - \ln L_c)$, is used to test whether at least one exogenous variable, other than the intercept, in the logit model affects the probability of silt-fence use. Given the null hypothesis that no exogenous variable, except the constant, affects the likelihood of use, this statistic is asymptotically distributed as a chi-square random variable with K-1 degrees of freedom (Judge et al.).

Note that the marginal effect of the *k*-th continuous exogenous variable on expected cost differences, β_k, is also the marginal effect of this variable on the natural logarithm of the odds of silt-fence use on the *t*-th lot, $\ln\left(\frac{P_t^u}{P_t^n} \right)$. However, the marginal effect of the *k*-th continuous exogenous variable on the probability of silt-fence use on a particular lot is $\frac{\partial P_t^u}{\partial X_{t,k}} = \beta_k P_t^u P_t^n$.

Let $\boldsymbol{X}'_{-kt}$ and $\boldsymbol{\beta}_{-k}$ represent the 1 x K-1 and K-1 x 1 vectors of exogenous variables for the *t*-th lot and associated marginal effects on cost differences but not the *k*-th variable and effect. The discrete effect of the *k*-th exogenous dummy variable on the probability of silt-fence use at the *t*-th lot is $P_{kt}^u - P_{-kt}^u = \frac{\exp(\boldsymbol{X}'_{-kt}\boldsymbol{\beta}_{-k} + \beta_k)}{1+\exp(\boldsymbol{X}'_{-kt}\boldsymbol{\beta}_{-k} + \beta_k)} - \frac{\exp(\boldsymbol{X}'_{-kt}\boldsymbol{\beta}_{-k})}{1+\exp(\boldsymbol{X}'_{-kt}\boldsymbol{\beta}_{-k})}$.

Results

Parameter estimates, standard errors, *t*-statistics, *p*-values, and sample-mean marginal and discrete effects of the variables in the logit model are presented in table 3. The scaled R^2 is 50% (table 3). Furthermore, 87.5% of the estimated probabilities of silt-fence use on a particular lot are either greater than 0.5 for lots where the builder actually used silt fence or less than 0.5 for lots where the contractor did not. The *p*-value associated with the likelihood ratio statistic is extremely low (table 3). Thus, in addition to the constant, some of the exogenous variables statistically affect the probability of silt-fence use. Moreover, two-sided *p*-values of *t*-statistics indicate that each of the exogenous variables, except one, statistically matters.

The lot characteristic and two of the three means of lot-house variables in the subdivision are statistically significant. The probability that a builder uses silt fence on a lot with a house under construction is 21 percentage points lower, on average, if the original developer no longer owns the lot. The probability of use decreases 39 percentage points, on average, in response to a US $100,000 increase in the average cost of lots with houses being built. The probability increases 4.3 percentage points, on average, in response to a 100 ft^2 increase in the mean heated floor space of the houses under construction.

The three general characteristics of the residential development are also statistically significant. In particular, the probability that a builder uses filter fabric on a lot is 32 percentage points higher, on average, in a subdivision with a home owners association (HOA=1) than in a subdivision without one. This probability is 65 percentage points higher, on average, in subdivisions with mixed residential housing (MULTI=1) than in developments with only single-family dwellings. Finally, the probability that a builder uses silt fence on a lot increases 17 percentage points, on average, if the share of the number of lots on which houses are under construction in the total number of lots in a subdivision increases by 10 percentage points.

Discussion

The logit model predicts the probability of silt-fence use—conditional on characteristics of the lot with a house under construction, all such lots and the houses being built on them, and the subdivision in which the lots are located—better than the sample proportion does.

If the original developer still owns a particular lot, he shares responsibility with the builder for compliance with the storm water pollution prevention plan (SWPPP). As a result, the developer is more likely to monitor the builder's use of silt fence. If the builder is hired by the developer of a lot, the builder is more likely to feel responsible to the developer and comply with the SWPPP. However, if a builder owns a residential lot or is hired by the homeowner, the builder might not have filed a separate SWPPP or might be ignorant of the law and, in either case, will not be monitored by the original developer.

If the mean price of houses under construction and the lots in a subdivision increases, given the mean lot size and heated floor space, the market cost of a house that is built on a particular lot is also likely, on average, to increase. Increases in the number of indoor amenities and the quality of building materials are two reasons why the costs of constructing a house with a given heated floor space on a particularly sized lot increase. Whatever the reason, the more expensive is the house being built, the more the builder might be able afford a fine for lack of a silt fence.

As the mean heated floor space of houses under construction increases, for given lot sizes, the amount of disturbed soil from the lots tends to increase because surface areas of foundations grow for larger floors or the depths of foundations grow for finished basements. If the amount of disturbed soil per lot under construction increases, the costs of both use and non-use of silt fence increase. On the one hand, the costs of use increase because the builder would need to install more or better silt fence than he otherwise would. On the other hand, as the potential amount of eroded sediments on sidewalks and roads increases, so does the potential damage to a builder's reputation. As the expected costs of non-use increase, the builder is more likely to use silt fence. Our results indicate that the effect of an increase in heated floor space on the costs of non-use of filter fabric dominate the effect on the costs of use.

For similar reasons, lot size is also probably correlated with the costs of use and non-use of filter fabric. As the size of the lot increases, the amount of silt fence that should be installed tends to increase but so does the potential amount of soil that erodes off the lot. One possible reason why LOTSIZE has no significant effect on the probability of silt-fence use is because the variable is strongly, positively, and significantly correlated with HTDFLOOR and PRICEHL. The insignificance of LOTSIZE is broadly consistent with the finding of Burby and Paterson (pp. 762 and 764) that the area of the residential or commercial construction site did not affect the degree to which promised sediment traps were installed.

A builder is more likely to install silt fence when a homeowner's association exists because, we hypothesize, neighbors are relatively more organized and have a greater financial and emotional stake in the quality of the neighborhood. Hence, in such a neighborhood, a neighbor is more likely to complain if the builder does not install a silt fence on any lot under construction. The builder is more likely to use silt fence in a subdivision with at least one multi-family dwelling because the number of people who notice soil on sidewalks or in the road if the builder does not use silt fence is greater in subdivisions with multi-family dwellings.

An increase in CONSHARE, the number of lots with houses under construction relative to the total number of lots in a subdivision, implies increases in the frequency and magnitude per resident, *ceteris paribus*, of potential and actual adverse impacts of soil that erodes onto sidewalks, streets, or adjacent yards. If so, residents are more likely to complain or complain more strongly about the lack of erosion and sediment control.

Why do increases in the likelihood of an individual complaint, the potential magnitude of a complaint, and the number of potential complainers make a builder more likely to comply with the silt-fence portion of the SWPPP? First, the increases strengthen the intrinsic motivation for use, i.e., raise the expected damage to reputation of non use. Second, these increases probably induce the County Engineer to inspect more frequently and, thereby, strengthen the extrinsic motivation for use, i.e., raise the expected financial cost of non-use. Our second argument is consistent with the finding that the percentage of sediments traps actually installed as specified in the ESC plan increased as the frequency of monthly inspections of construction sites increased (Burby and Paterson, pp. 764).

Implications for Research and Policy

Our socio-economic, random-cost model undoubtedly simplifies the reality of, and the reasons for, the use of silt fence to control the movement of sediments off lots with houses under construction. The probabilistic model was estimated with data about characteristics of lots, houses, and subdivisions in only one fast-growing, urban county of one southeastern state. Whether a developer's sale of a lot to a builder or future homeowner reduces the probability of silt-fence use and whether the presence of a homeowner's association or multi-family dwelling in a subdivision increases this probability in other counties in South Carolina and other states are questions for future research. Information about individual lot sizes, costs of individual lots and houses under construction, and the heated floor spaces of houses is also needed to determine whether these lot- and house-specific variables affect the probability of silt-fence use in other places as subdivision-specific means do in this study area. In the past year Richland County's stormwater officials have become certified as SWPPP inspectors and code enforcement officers (Valavala). Whether the probability of silt-fence use has increased as a result of completion of official training and the on-site power to impose fines is another important question.

Our results enable us to suggest that government officials in this county and possibly other similar ones could improve the likelihood that builders comply with storm water pollution prevention plans if they target inspections of lots and residential developments with certain characteristics. In particular, inspectors should target lots with houses under construction in subdivisions where the developer has sold the lots and no home owner association or multi-family dwelling exists. In this and possibly other similar counties, any policy that discourages the transfer of lot ownership from developers who are originally responsible for SWPPPs will probably increase the probability of silt-fence use. Moreover, any policy that encourages the formation of home owners associations and permits at least one multi-family dwelling with single-family ones in a subdivision will also probably have positive effects on use of filter fabric. Finally, inspectors should also focus on subdivisions where relatively expensive houses are under construction and lots of houses being built are relatively small shares of all lots.

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Table 1: Subdivision information

Subdivision	Number of Lots under Construction with Silt Fence[1]	Number of Unimproved Lots with New Owners[1]	Number of Improved and Unimproved Lots[1]	Mean Lot Size (acres)	Mean Price of Newly Built House and Lot (US$)	Mean Heated Floor Space (sq. ft.)	*Sample Size* and Time-Period Code for Means[2]	Home Owners Association?	Multi- Family Units?
A	0 of 8	15 of 15	110	0.167	347,095	2,781	*4*, 4	Yes	No
B	0 of 8	15 of 15	123	0.225	185,423	1,935	*3*, 5	No	Yes
C	1 of 29	20 of 20	203	0.218	140,073	1,727	*11*, 2	No	No
D	3 of 18	12 of 18	77	0.310	279,051	2,986	*4*, 5	No	No
E	0 of 6	14 of 14	58	0.624	326,667	2,803	*3*, 5	Yes	No
F	20 of 20	0 of 50	208	0.082	78,875	1,186	*4*, 3	No	Yes
G	2 of 10	6 of 6	36	0.413	415,104	3,448	*4*, 5	Yes	No
H	6 of 8	35 of 35	64	0.496	264,887	2,991	*4*, 4	Yes	No
I	9 of 11	0 of 25	60	0.261	191,829	2,391	*11*, 4	Yes	No
J	4 of 9	7 of 7	30	0.225	211,019	2,202	*7*, 5	No	No
K	2 of 15	25 of 25	53	0.253	163,697	2,105	*5*, 1	No	No
L	1 of 8	50 of 50	66	0.240	179,430	2,254	*5*, 5	Yes	No
M	2 of 4	25 of 25	143	0.245	214,638	2,670	*3*, 5	Yes	No
N	0 of 30	25 of 25	396	0.153	94,113	1,363	*19*, 3	No	No

[1] Data come from Loew, Haselbach, and Meadows. [2] The codes refer to these time periods: 1) 9/8/2003-12/31/2003, 2) 9/10/2003-12/31/2003, 3) 9/22/2003-12/31/2003, 4) 9/11/2003-6/30/2004, and 5) 7/1/2003-6/30/2004.

Table 2: Descriptive statistics for lot, house, and subdivision variables

VARIABLE	Mean (n=184)	Standard Deviation	Minimum	Maximum
SILTFENCE	0.272	0.446	0	1
OWNERCHG	0.799	0.402	0	1
PRICEHL ($100,000)	1.88777	0.93986	0.78875	4.15104
HTDFLOOR (100 ft^2)	21.00	6.82	11.86	34.48
LOTSIZE (acres)	0.243	0.119	0.082	0.624
HOA	0.299	0.459	0	1
MULTI	0.152	0.360	0	1
CONSHARE (percent)	15.27	8.04	2.80	30

Table 3: Logit model of the probability of the use of silt fence on a residential lot

VARIABLE	**Parameter Estimate**	**Standard Error**	***t*-statistic**	***p*-value**	**Mean Marginal or Discrete Effects**
CONSTANT	-6.937	2.856	-2.429	[.015]	
OWNERCHG	-1.611	0.673	-2.393	[.017]	-0.214
PRICEHL	-3.889	1.274	-3.052	[.002]	-0.391
HTDFLOOR	0.425	0.192	2.211	[.027]	0.043
LOTSIZE	2.046	4.256	0.481	[.631]	0.206
HOA	2.955	0.795	3.718	[.000]	0.322
MULTI	5.124	1.417	3.616	[.000]	0.647
CONSHARE	0.171	0.054	3.160	[.002]	0.017
The log likelihood is -59.4101, the scaled R^2 is 0.5011, and the likelihood ratio statistic for test of non-zero slopes is 96.4528 (p-value < 0.001).					

Figure 1: Use of silt fence on a residential lot under construction in study area