GREATER BALTIMORE SURVEY

2015 SURVEY SHOWS CONSTRUCTION SITE EROSION CONTROL IMPROVES 61% COMPARED TO 2014

PARTICIPATING GROUPS

1000 Friends of Maryland • Alliance for the Chesapeake Bay
Baltimore Harbor Waterkeeper • Bird River Restoration Campaign
Blue Water Baltimore • Community & Environmental Defense Services
Center for Progressive Reform • Chesapeake Bay Foundation
Chesapeake Legal Alliance • Friends of Harford
Gunpowder RiverKeeper • Howard County Citizens Association
Howard County Sierra Club • Magothy River Association
Maryland Bass Federation Nation • North County Preservation
Severn River Association

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SUMMARY
Sediment eroded from construction sites has polluted many miles of Greater Baltimore waters. But over the past year all six Greater Baltimore jurisdictions have made substantial progress in curbing this form of pollution. In fact, an overall 61% improvement was achieved by Baltimore City and Anne Arundel, Baltimore, Carroll, Harford and Howard counties. Though this is a tremendous step forward, the graph below shows that all six jurisdictions have a good way to go before reaching the goal of 100% compliance.

The chart above shows that Harford County continues to achieve the highest degree of complete stabilization on construction sites. By stabilization we mean the use of measures that reduce soil erosion. Covering exposed soils with straw mulch and seeding with grass is the most common stabilization measure. Road and parking lot beds are stabilized with a four-inch layer of stone. These stabilization measures reduce off-site pollution by 90% to 99%. Various scientific studies show that fish and other sensitive aquatic creatures will be damaged if construction site sediment pollution is not reduced by at least 90%. And stabilization is the only measure that achieves this goal. Perimeter measures like the black silt fence so commonly seen at construction sites only reduce sediment losses by a third to half. For each dollar spent keeping mud on the construction site with stabilization, we all save at least $100 in damages avoided. It is for these reasons that laws in all six Chesapeake watershed states and the District of Columbia require the use of mulch, grass, stone and other stabilization measures once earth-moving equipment have brought a site to the point where construction of buildings and roads can begin. Back to the 2015 survey results.
In 2015, all six jurisdictions achieved a higher level of stabilization compared to 2014.

Carroll County exhibited the most dramatic improvement by going from 12% in 2014 to 41% this year - an increase of 3.4 fold and was the second most successful jurisdiction. This improvement was accompanied by a 3.5-fold increase in the frequency of inspection and a tripling in the number of violation notices issued.

Anne Arundel County also improved dramatically (16% in 2014 to 40% in 2015) which may be due to the replacement of several ineffective enforcement staff.

Baltimore County went from a complete stabilization rate of 18% in 2014 to 32% this year. The County had previously cut back their enforcement staff from seven to four inspectors but opted to restore the three positions.

While it is tempting to attribute these three improvements to the factors cited above, enforcement is a complex process. The improvements may have as much or more to do with the level of support provided by elected officials, changes in contractor attitudes, how an inspector approaches their dual role of educator and enforcer, to name but a few of many variables.

The 2014 and 2015 surveys were carried out by the 73 volunteers from 40 organizations listed in Table 1 at the end of this summary. You will find the survey procedures at the end of this report.

For the most part, the volunteers had little experience with construction site erosion control. The volunteers were asked to read the survey procedures beforehand. The volunteers participated in a 15-minute training session at the start of each survey. The training was provided by Richard Klein, the author of this report. A survey would last three hours and consisted of three to five volunteers traveling together in one vehicle. Richard Klein participated in all the surveys and usually drove. He would stop the vehicle at one or more public areas adjoining each construction site. From this point the volunteers would discuss the answer to each of the questions posed on the survey form you will find in the procedures. The focus was solely on erosion control; not perimeter measures like silt fence. In 2014 and 2015, 105 and 131 sites were evaluated, respectively, in the Greater Baltimore Region. An average of 20 sites were evaluated in each jurisdiction, which is the same number visited by the Maryland Department of the Environment during their delegation reviews.
To learn why the extent of complete stabilization ranged so widely among the six jurisdictions, we attempted to meet with the six enforcement chiefs and Maryland Department of the Environment sediment control program review staff. In 2014, we succeeded in meeting with five of the local chiefs; Howard County and MDE declined to meet. In 2015, both Carroll and Howard county officials declined to meet. We also obtained data regarding staffing, workloads and use of enforcement tools for all six jurisdictions.

We believe differences in the attitude of enforcement staff directly relate to stabilization quality. In one of the most successful jurisdictions staff have a positive, can-do attitude. When we present issues each is greeted with respect and staff engages in a constructive discussion with us regarding possible solutions. At the other end of the extreme is one jurisdiction where the atmosphere is distinctly adversarial. Multiple reasons are put forth by staff to justify why stabilization could not be improved. Ironically, stabilization continues to improve in this jurisdiction. In another it is clear that budgets are so incredibly tight that few options for improvement are available.

According to the Chesapeake Bay Program, there may be 87,000 acres of bare construction site soils spread throughout the 64,000 square mile watershed at any given point in time. The model indicates that these sites are releasing 152,000 tons of sediment into the 100,000 miles of Bay tributaries each year. But the Bay model assumes that two-thirds of the time a typical construction site is fully stabilized. The Greater Baltimore Survey showed that stabilization is actually at 37%; not the 66% assumed in the Bay model. And random assessments by the author of construction sites in other Bay watershed states indicates that stabilization is substantially poorer when compared to Greater Baltimore. Achieving the goals set forth in the Chesapeake Bay Total Maximum Daily Load document may be very difficult if we cannot find a way to achieve higher stabilization rates on construction sites.

The organizations participating in this survey believe that the key to achieving a much higher degree of stabilization lies in the simple message: Exposed Soil=Pollution. The only way to fully protect sensitive waters and downstream residents is to eliminate exposed soil by covering it with straw mulch or grass along with stone placed on roads and parking lot beds. Other measures, like the black silt fence and ponds common to many construction sites, cannot retain enough mud pollution to protect our neighbors.

1 Personal communication with Mr. Jeff Sweeney, Environmental Protection Agency, Chesapeake Bay Program Office.

2 See Section 9: Sediment Simulation at: http://www.chesapeakebay.net/about/programs/modeling/53/
and the environment. So, when you see exposed soil on a construction site assume a nearby waterway will be polluted come the next big storm. As this message spreads we anticipate that exposed soil will become increasingly unacceptable to the general public. Increased voluntary use of stabilization measures may then follow.

**Recommendations**

It does appear that some jurisdictions lack the enforcement tools and/or staffing needed to achieve the much higher level of erosion control required to protect downstream property owners, the Bay and other waters throughout the region. Based on the information presented in this report, the following actions appear essential to achieving a higher degree of stabilization:

1. It is vitally important that enforcement agencies strongly urge contractors to carry out hydrotecning or other vegetation establishment measures in the spring and not in the summer when successful establishment is less likely. Agencies must also insist upon a second or third attempt if vegetation does not achieve the 95% groundcover required by MDE.

2. The ratio of active permits to inspectors should be no more than 100:1.

3. All jurisdictions should set fines at a level which provides a strong incentive to comply with Correction Notices. This level may be somewhere between the $100 to $500 current maximum and the $10,000 per day fine MDE is authorized to impose. There may be a need to educate judges about the importance of higher fines in achieving greater compliance.

4. The enforcement agencies must have the authority to issue fines rather than having to obtain approval from a Hearing Officer. Of course, the party fined must have the right to appeal.

5. There is a need for some process whereby erosion and sediment control violations likely to result in severe pollution are repaired immediately rather than being delayed until a judge rules on the validity of enforcement action. The authority granted by Natural Resources Article at 8-1815 (e), to the Maryland Critical Area Commission for the Chesapeake & Atlantic Coastal Bays may be an appropriate solution.

6. All jurisdictions should have the authority to stop the work authorized by a grading permit as well as that carried out on a site under all other local permits.

7. When an owner/developer has refused to comply and all lesser enforcement options have been exhausted, then all jurisdictions should have the authority to withhold permits/approvals for other projects being pursued by that same owner/developer within the same jurisdiction.
8. A better process is needed for obtaining and quickly utilizing funds from bonds and other securities to stabilize sites with long-standing noncompliance.

9. Other jurisdictions should consider making the following Anne Arundel regulation text a required part of the Sequence of Construction appearing on all erosion and sediment control plans:

(15) a statement in the construction sequence that the construction of the first floor walls of any building or structure may not proceed until the foundation has been backfilled, the disturbed areas have been stabilized and a certificate is provided to the inspector verifying the grades and drainage patterns shown on the approved erosion and sediment control plan have been obtained.

10. MDE should consider holding periodic sediment and stormwater training sessions which allow local sediment control staff to interact and to learn of new approaches.

11. Drew Brown, a survey volunteer, suggested: The list of plant species recommended for use on construction sites in Tables B.1 and B.3, of the 2011 Maryland Standards and Specifications for Soil Erosion and Sediment Control, should be reviewed for opportunities to substitute species native to Maryland for nonnatives.

12. Edwin Oaks, another survey volunteer, suggested: There would be value in exploring the possibility of adding a condition to each project approval requiring the permittee to contract with an independent company specializing in stabilization. That company would visit the site regularly and stabilize any areas of exposed soil. Of course, the company would need to coordinate with the site manager to ensure that grass seed is not applied to areas about to receive extensive foot or vehicle traffic. While the traffic would kill the grass, these areas could be stabilized with mulch or other resilient methods to reduce erosion. The advantage to this approach is that it establishes a funding source that is easily drawn upon by an independent company whose sole responsibility is to minimize soil erosion.
Table 1: Volunteers Who Participated in the 2014 & 2015 Surveys (Organization affiliation for identification purposes only)

Wendy Alberg  
Phillip Alexander  
Betsy Atkinson  
Teresa Bartley  
Chris Bellmeyer, Blue Water Baltimore, Inc.  
Kimberly Brandt, 1000 Friends of Maryland  
Drew Brown  
Morita Bruce, Friends of Harford  
Marc Brummitt  
William Davies, Chesapeake Legal Alliance intern  
Dan Doerfer, Essex-Middle River Civic Council  
Anne Eikenberg  
Betsy Eisbart  
Lou Etgen, Alliance for the Chesapeake Bay  
Benjamin Fertig  
David Flores, Baltimore Harbor WaterKeeper  
Denise Frey, Watershed Stewards Academy  
Bill Furman, Dundalk Renaissance Corporation  
William Garrett  
Bruce Gilmore, Anacostia Watershed Society  
Richard Goldring, Chesapeake Legal Alliance intern  
Anne Havemann, Center for Progressive Reform  
Joanne Heckman, Howard County Sierra Club  
Matthew Henjum, Chesapeake Legal Alliance  
Jennifer Herzog, Chesapeake Bay Foundation  
Ray Iturralde, Friends of Stony Run  
Alison Johnson  
Richard Klein, CEDS  
Brad Knopf, Magothy River Association  
Paul Krebs  
Theaux Le Gardeur, Gunpowder RiverKeeper  
Lee Meadows, Severn River Association  
Gloria Moon, Friends of Harford  
Doug Myers, Chesapeake Bay Foundation  
Ed Oaks, Chesapeake Bay Foundation member  
John Page Williams, Chesapeake Bay Foundation  
Christopher Perry  
Marc Petrequin, Unitarian Universalist Fellowship of Harford County  
Mike Pierce, North County Preservation  
Sarah Purpura, Chesapeake Legal Alliance intern  
Jeff Reagan  
Anna Renault, Maryland Colabs  
Lynne Rockenbauch, Severn River Association  
Joyce Rosencranz, Watershed Steward  
Kathleen Samiy, Friends of Sligo Creek  
Jacquie Sentell, Howard County Citizens Association  
Scott Sewell, Maryland Bass Federation Nation  
Tiffin Shewmaker  
Patricia Soffen  
Ariel Solaski, Chesapeake Bay Foundation  
Stuart Stainman, Patapsco/Back River Tributary Team  
Kathy Stecker  
Ken Steil  
Russ Stevenson, Chesapeake Legal Alliance  
Alan Sweatman, Friends of Harford  
Bill Temmink, HCCAC  
Janet & Pete Terry, Bird River Restoration Campaign  
David Titus, Chesapeake Bay Foundation member  
Al Todd, Alliance for the Chesapeake Bay  
Katrina Turner, Teacher BCPS  
Michail Turovskiy  
Alice Volpitta, Bluewater Baltimore  
Bob Vom Saal, Severn River Association  
Suzy Wald
INTRODUCTION
Maryland has long been a leader in reaping the benefits of construction activity while minimizing aquatic resource impacts. The principal construction related impact is eroded soil which becomes mud pollution upon entering a waterway. Prior to the adoption of erosion and sediment control laws, the mud pollution released from a typical construction site could damage several miles of downstream waters with recovery taking up to a century. Each dollar spent keeping mud on the site saves us tax-payers at least $100 in damages avoided.

In 1970, Maryland became the first to adopt a law requiring statewide use of erosion and sediment control measures on construction sites. The law is presently administered by the Sediment, Stormwater & Dam Safety Program of the Maryland Department of the Environment (MDE). MDE has delegated the authority to administer local erosion and sediment control programs to 13 counties and nine municipalities. This authority includes:

- the review and approval of erosion and sediment control plans for compliance with the 2011 Maryland Standards and Specifications for Soil Erosion and Sediment Control;
- the issuance of grading permits once the plan is approved;
- inspection of sites throughout the construction phase to ensure all plan provisions are fully implemented; and
- the authority to take a variety of enforcement actions should they become necessary to achieve plan compliance.

MDE is required to periodically review the delegated jurisdictions to ensure that a high level of compliance is being achieved. Presently it appears that reviews occur every two years. MDE also has the authority to take measures if compliance is unsatisfactory, including revoking delegation. Unfortunately, MDE is so understaffed that this is not a realistic option since the Department would then become responsible for local inspection and enforcement.

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3 See: http://www.mde.state.md.us/programs/Water/StormwaterManagementProgram/SedimentandStormwaterHome/Pages/Programs/WaterPrograms/sedimentandstormwater/home/index.aspx

4 For a list of delegated jurisdictions go to the bottom of: http://www.mde.state.md.us/programs/Water/StormwaterManagementProgram/SoilErosionandSedimentControl/Pages/Programs/WaterPrograms/SedimentandStormwater/erosionanderosion/home/index.aspx


6 See COMAR 26.17.01.02: http://www.dsd.state.md.us/comar/getfile.aspx?file=26.17.01.02.htm
Numerous local, statewide and national environmental advocacy organizations have been active supporters of the Maryland erosion and sediment control program since the early 1970s. These groups have supported MDE in winning improvements to the erosion and sediment control statute and regulations. In 1979, they supported the Water Resources Administration - an MDE predecessor agency - in adopting a specific time limit for applying erosion control measures to a construction site - the 7/14 day rule which is now the 3/7 day rule.\footnote{See COMAR 26.17.01.07.B.f.(1): http://www.dsd.state.md.us/comar/getfile.aspx?file=26.17.01.07.htm}

Occasionally the organizations would evaluate control quality at specific sites, those throughout a watershed or even an entire county. If control quality was found wanting then the groups would lobby local elected officials to gain the resources and political support the inspection agency needed to effectively enforce erosion and sediment control requirements. At times these efforts doubled inspection staff and brought about a four-fold increase in the quality of control. \textit{Suffice to say, citizen participation is just as critical to gaining the full benefits of the erosion and sediment control law as it is with all other Clean Water laws.}

However, from about the year 2000 citizen involvement in monitoring construction site mud pollution appears to have waned. Advocacy groups began noticing significant differences in the quality of control between counties and municipalities. We sought to determine if the differences were real by consulting the latest Maryland Department of the Environment (MDE) reviews. But the MDE reviews did not contain sufficient detail and repeated requests for clarification went unanswered by MDE.

In 2014, the groups put together the first citizen survey to determine if the perception was true. The 2014 survey focused on the six Greater Baltimore jurisdictions: Baltimore City and Anne Arundel, Baltimore, Carroll, Harford and Howard counties, as did the 2015 survey.

Past citizen construction site surveys were limited to evaluations of silt fence, sediment traps and other \textit{perimeter} sediment control measures (see Figure 2 on page 15). But the focus of the 2014-2015 Greater Baltimore Surveys was on measures to prevent soil erosion throughout the construction site. These erosion control measures consist mostly of applying sufficient straw mulch to fully blanket exposed soil, while applying grass seed too. During the early growing season (March - October) the grass should cover a minimum of 95% of the surface within four-to eight-weeks. Stone is placed on road and parking lot beds where mulch and grass would be ineffective. Building foundations are usually self-contained so there is no need for erosion control.

There are two reasons why we focus on erosion control. First, erosion control can reduce offsite mud pollution by 90% to 99% whereas perimeter measures retain about 40%. Second, evaluation of perimeter measures frequently requires trespassing onto a construction site, which is both dangerous and illegal. Erosion control quality can usually be assessed from roads and other public areas adjoining or within a site.
The groups who organized the survey also hoped it would set the stage for a sea-change in how the general public views construction sites. Perimeter controls capture the coarser eroded soils, but the finer particles (clays) will not settle out during the brief time runoff passes through trapping measures (ponds). Fine particles tend to be the most harmful to aquatic life for various reasons. The only way to prevent these particles from escaping is through erosion control.

Because of this, one can assume that pollution will occur come the next storm whenever exposed soil is present on a construction site. In other words, Exposed Soil = Pollution. If we can educate a significant part of the general public that they should think “pollution” when they see exposed construction site soil, then we believe a dramatic increase will occur in the voluntary use of straw mulch, grass and other erosion control measures. And this education should begin with the members of the many organizations advocating for Maryland’s environment.

A number of the groups who organized this survey are discussing how we can establish a process which allows citizens to not only alert enforcement authorities to erosion and sediment control deficiencies, but also create an online database available to the public. The author of this report has already created several free materials to train citizens in the How-To of site evaluation:

- **Five-page Factsheet**:
- **25-page Guidance Document**; and a
- **20-Minute Narrated PowerPoint Presentation Posted On YouTube**.

In addition to these materials, we need something like an App which would allow citizens to report problems by:

- taking a cell-phone photo of the site;
- add text describing what they saw which caused the citizen to believe a problem exists, while;
- automatically including the GPS coordinates of the site.

Each report would be screened then forwarded to the appropriate enforcement agency when warranted. The report would also be added to a central database where the citizen can update it with information such as agency response time and how fully each problem was resolved. This data could then be used to identify local jurisdictions which generate few reports and therefore have good control. The organizations could research what these successful jurisdictions are doing that results in so few reports. This information would then allow the organizations to support less successful localities in improving erosion and sediment control compliance.
HOW CONSTRUCTION SITE MUD POLLUTION DAMAGES THE ENVIRONMENT

Prior to the adoption of the 1970 Maryland Sediment Control Act, few of our present environmental protection laws existed. All the vegetation could be removed from a site, regardless of steepness of slope or susceptibility to soil erosion. In fact, streams, wetlands and other waters could be filled. This resulted in massive amounts of sediment washing into Maryland waters.

Early scientific studies showed that construction activity was having a devastating impact upon Maryland’s aquatic resources. A paper published in 1967 provided the wake-up call for many Marylanders. This study documented that construction soil losses could be 6,000 times greater than that of forest and 300 times greater than for agricultural watersheds. In 1974, Patuxent River researchers found that it takes a decade to a century for a waterway to fully recover from the sediment released from construction activity. These studies and others showed that a typical construction site, measuring 20 acres in area, could damage three miles of downstream waters with recovery taking up to a century.

In the early 1970s a bridge was built over Severn Run, a few miles west of Annapolis. At that time Severn Run was the leading Yellow Perch (Perca flavescens) spawning stream in Maryland. A major storm occurred during the peak of the spring spawning season while the bridge construction site was open. Enough mud washed into Severn Run to kill 100 million Yellow Perch eggs and larvae. Between continued construction and increasing impervious area in the watershed, the Severn Run Yellow Perch population has never fully recovered.

Soil is made up of three particle sizes: sand, silt and clay. And clay is the primary reason why erosion control is essential to aquatic life preservation. Clay is the smallest and the hardest to remove once it has been eroded from the soil surface and entrained in runoff. One might think that the small size renders clay particles harmless. In some respects the opposite is true. Much of the nutrients, pesticides, and other

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10 For further detail see: [http://dnr2.maryland.gov/fisheries/Pages/FHEP/severnriver.aspx](http://dnr2.maryland.gov/fisheries/Pages/FHEP/severnriver.aspx)
pollutants washing from construction sites travel attached to clay particles. Many fish eggs have a slightly sticky coating and clay can adhere so thickly to the egg surface that oxygen flow is blocked, suffocating the developing fish embryo. Clay is the most expensive soil particle to remove from drinking water sources. Clay and other fine suspended particles are responsible for a large portion of the turbidity which blocks sunlight and has greatly diminished the extent of submerged aquatic vegetation (SAV) throughout the Chesapeake Bay and other Maryland waters.

Sediment is one of three pollutants targeted for substantial reduction by the Chesapeake Bay Total Maximum Daily Load (TMDL) initiative. The other two are nitrogen and phosphorus. The three pollutants act in concert to impair not only submerged aquatic vegetation but many other aquatic organisms as well. No other land use in the Chesapeake Bay watershed can release as much sediment as construction sites. For example, in the Mattawoman Creek watershed of Southern Maryland, construction accounted for 23% of the sediment load but only 1.3% of the watershed land use. There may be 132 square miles of construction sites active in the Bay watershed at any given point in time. This could mean as many as 8,450 sites active throughout the 64,000 square mile Bay watershed. The Chesapeake Bay Program assumes an average of 66% of a typical construction site is stabilized for half the life of the site. As will be seen later in this report, the actual stabilization rate in the Greater Baltimore region must increase two-fold to achieve 66%.

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13 Costs of Water Treatment Due to Diminished Water Quality: a Case Study in Texas, available online at: [http://agecon2.tamu.edu/people/faculty/mccarl-bruce/papers/535.pdf](http://agecon2.tamu.edu/people/faculty/mccarl-bruce/papers/535.pdf)

14 Chesapeake Bay Total Maximum Daily Load (TMDL), available online at: [http://www.epa.gov/reg3wapd/tmddl/ChesapeakeBay/tmdlexec.html](http://www.epa.gov/reg3wapd/tmddl/ChesapeakeBay/tmdlexec.html)

15 Ibid.


18 Ibid.

19 Ibid.
Sand and coarse silt can be kept on a construction site with silt fence, sediment traps and other perimeter control measures. These perimeter measures mostly rely upon settling to remove sediment from runoff. The larger particles settle fairly quickly while days or weeks may be required for clay and finer silts to settle from suspension. So, the most effective way of keeping clay on a construction site is to prevent erosion, which means minimizing the exposure of soil to the erosive force of rainfall and runoff. This, in turn, means protecting soil as quickly as possible following disturbance with a layer of stone or straw mulch and grass.

**EROSION CONTROL VERY COST EFFECTIVE**

It’s no coincidence that all the Chesapeake Bay watershed jurisdictions require rapid use of stabilization measures. Erosion control is one of the most cost-effective pollution control programs we have. For example, in Maryland an unprotected construction site might erode at a rate of 40 tons/acre/year, which is six times the rate for cropland, and 80-times that of forest. It costs $800 to $1500 to apply mulch and grass seed to an acre of construction site. These practices reduce erosion by 90% to 99%. So, assuming a typical construction site is active for a year, mulch and seeding would keep 36- to 39-tons of sediment on each acre at a cost of $20 to $42 per ton.

In terms of the benefit of aquatic resource damages avoided, Maryland has 470 miles of trout streams, each mile of which adds about $35,000 per year to the state and local economy. A single 20-acre construction site could destroy three miles of trout stream for a decade to a century. That would work out to an economic loss of at least $1.1 million. It would cost

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25 See: [http://www.dnr.state.md.us/irc/docs/00006468.pdf](http://www.dnr.state.md.us/irc/docs/00006468.pdf)


$25,000 to apply erosion control measures which would keep 780 tons of sediment out of the trout stream. So the ratio of cost to benefit would be 1:42 ($25,000 cost:$1,050,000 benefit).

But the benefits don’t end at the mouth of the trout stream. Eventually each ton of sediment deposited in the trout stream would travel downstream causing additional damages. If the sediment came to rest in a navigable channel the removal cost would be $6 to $28 per ton.\(^{28}\) The cost to remove sediment from Columbia, MD lakes runs around $175 per ton.\(^{29}\) These costs further increase the benefits of preventing erosion. Additional benefits would come from reduced water treatment costs, other recreational and commercial fisheries preserved, enhanced waterfront property value, and on the list could go. So, as we said, erosion control is one of our most cost effective pollution control strategies. The true cost-to-benefit ratio could be well in excess of $100 saved for each dollar spent.

**EROSION CONTROL ENHANCES WORKER & PUBLIC SAFETY**

In some jurisdictions, but not others, we found that most of the soils next to single family homes were well stabilized while the home was under construction. At first one might assume that applying mulch or grass seed next to a house under construction would be a waste. Between foot-traffic and material hauling equipment, grass would be killed and mulch destroyed. In reality straw mulch would be pressed down into the surface yet continue to reduce runoff and erosion. We saw sites with grass surrounding most of the house with a few paths for foot traffic. In return, the mulch and grass would reduce the area around the home that turns into a sea of mud or ice which enhances worker safety. Also, stabilization would reduce the quantity of mud washing onto public streets where it would create a dangerous situation for motorists, bicyclists and pedestrians.

**EROSION & SEDIMENT CONTROL 101**

All but the smallest construction sites must have an erosion and sediment control plan prepared under the direction of a Professional Engineer. The plan must conform to the general requirements set forth in the Code of Maryland Regulations (COMAR)\(^{30}\) and in local ordinances. The plan must also conform to the specific requirements contained in the *2011 Maryland Standards and Specifications for Soil Erosion and Sediment Control*.\(^{31}\) In general, an erosion and

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sediment control plan will call for a construction site to be developed in the sequences depicted in Figures 1 to 3, which follow this page, and as described below:

1. Throughout the life of a construction site there should be no point where runoff from exposed soil could leave the site without flowing to a perimeter trapping device such as a sediment trap (small pond), sediment basin (large pond), super silt fence, etc;

2. To achieve the first criteria, initial site clearance is limited to a narrow swath along the downslope edge of the site;

3. Within this narrow swath earth dikes (ridges), swales (ditches), pipe slope drains or silt fence is installed to intercept runoff from upslope areas and direct it to a sediment trap or a basin, which are also installed within the perimeter swath;

4. Within three days of when the perimeter controls are completed, all soil surfaces must be stabilized with a blanket of straw mulch thick enough to obscure underlying soils (about two tons/acre). Grass seed is also applied and should achieve 95% groundcover within four- to eight-weeks during the growing season (March-October). Mulch must be reapplied whenever underlying soil becomes visible again. If grass cover does not attain a 95% groundcover then additional treatments must be made;

5. Once perimeter controls are stabilized the interior can be cleared of vegetation in no more than 20-acre increments;

6. Earth-moving equipment (bulldozers, graders, etc.) are used to fill and cut the interior of the site to bring it to rough grade, which is the point at which road, parking lot and building construction can begin;

7. Once rough grade is reached then all areas, except building foundations, must be stabilized within seven days as follows:
   a. Road and parking lot beds must be stabilized with four inches of stone (the base course);
   b. Building foundations are usually self-contained so no stabilization is needed;
   c. All other areas of exposed soil must be stabilized, which is usually done with straw mulch and grass. The blanket of straw mulch must be thick enough to obscure underlying soils from view (about two tons/acre). Grass seed is also applied and should achieve 95% groundcover within four- to eight-weeks during the growing season (March-October). Soil stockpiles must also be stabilized with mulch and grass unless they are to be frequently worked, in which case tarpaulin
HOW CONSTRUCTION SITE STABILIZATION IS REQUIRED TO EVOLVE

Site Prior To Clearance; Red Arrows Show Direction of Runoff Flow (Downhill)

Initially Clear Swath for Earth Berm, Silt Fence, Trap & Other Perimeter Controls

Once Controls Are In Place Mulch & Seed Perimeter Then Clear Site Interior

Interior Has Been Cleared: Nonerodible Areas (Building + Lower-Left Parking) = 30% of site; Of The Pervious Areas 90% is Exposed Soil

50% of Site Erodible; North, East & South Areas Must be Stabilized With Mulch & Grass

WHY IS IT IMPORTANT TO DETERMINE THE PERCENT OF A SITE THAT’S ERODIBLE & NONEROIDIBLE?
Areas of the site occupied by buildings, streets, parking lots and other impervious surfaces (those which do not allow rain to soak into underlying soils) are no longer a source of eroded soil. The remaining pervious areas would be the only source of soil erosion and mud pollution. Therefore it is these areas where we’d like you to focus your attention and estimate percent that’s exposed soil, partially stabilized and fully stabilized.
When the perimeter controls were installed & stabilized the contractor was then allowed to clear the interior (upper portion) of the site. Here you see perimeter stabilization with dense mulch plus grass approaching 95% coverage.

**GOOD STABILIZATION**
Straw mulch completely blankets underlying soil from view.

**POOR STABILIZATION**
Soil still visible through the sparse grass and mulch.
Site is definitely at rough grade when building foundations appear or road bed construction begins. At that point all exposed soils must be stabilized with mulch. Mulch must completely blanket soil. More mulch must be applied when underlying soil becomes visible. During the growing season (March-October) a 95% grass cover should appear within 4- to 6-weeks from when seeding occurs. If after 8 weeks grass cover is less than 95% then reseeding is required.
covers may be better stabilization. Mulch must be reapplied whenever underlying soil becomes visible again. If grass cover does not attain a 95% groundcover then additional treatments must be made; and

8. Sometimes activity will come to a halt on a site before rough grade is reached. When earth-moving will cease for an extended period the site must be fully stabilized.

GREATER BALTIMORE SURVEY SITE EVALUATION CRITERIA
The criteria used to evaluate construction sites in the Greater Baltimore region will be found in the form at the end of this report. The purpose of this section is to document that the survey criteria conform to State law and the 2011 Maryland Standards and Specifications for Soil Erosion and Sediment Control. The evaluation criteria are based upon the following from the Code of Maryland Regulations (COMAR) which requires stabilization of the site perimeter within three days of work completion and seven days once earth-moving ceases in the site interior:

COMAR 26.17.01.07

.07 Application for Approval of Erosion and Sediment Control Plans.

A. When an approved erosion and sediment control plan is required, an applicant shall make a submittal to the approval authority in accordance with procedures established by the jurisdiction and this chapter, and shall be subject to any fees established under Environment Article, §4-103(c), Annotated Code of Maryland.

B. At a minimum, a submittal must include:

   (6) An erosion and sediment control plan including the following, unless otherwise noted in this chapter:

   (f) Details of temporary and permanent stabilization measures including:

   (i) The following statement on the plan: “Following initial soil disturbance or redisturbance, permanent or temporary stabilization is required within three calendar days as to the surface of all perimeter controls, dikes, swales, ditches, perimeter slopes, and all slopes steeper than 3 horizontal to 1 vertical (3:1); and seven calendar days as to all other disturbed areas on the project site except for those areas under active grading.”;

---

The Maryland Department of the Environment (MDE) publication *2011 Maryland Standards and Specifications for Soil Erosion and Sediment Control* provides the specific requirements for all construction site mud pollution control measures. Most of the same requirements appeared in the *1994 Maryland Specifications for Soil Erosion and Sediment Control*. Section B-4-4 and B-4-5 of the 2011 Standards and Specifications defines *permanent* or *temporary* stabilization as:

**TEMPORARY STABILIZATION**

**Definition:** To stabilize disturbed soils with vegetation for up to 6 months.

**Purpose:** To use fast growing vegetation that provides cover on disturbed soils.

**Conditions Where Practice Applies:** Exposed soils where ground cover is needed for a period of 6 months or less. For longer duration of time, permanent stabilization practices are required.

**PERMANENT STABILIZATION**

**Definition:** To stabilize disturbed soils with permanent vegetation.

**Purpose:** To use long-lived perennial grasses and legumes to establish permanent ground cover on disturbed soils.

**Conditions Where Practice Applies:** Exposed soils where ground cover is needed for 6 months or more.

Additionally, Section 5-4-3, provides the following standards and specifications for seeding and mulching, which in turn serve as basic requirements for *Temporary* or *Permanent Stabilization*:

**SEEDING & MULCHING**

**Definition:** The application of seed and mulch to establish vegetative cover.

**Purpose:** To protect disturbed soils from erosion during and at the end of construction.

**Conditions Where Practice Applies:** To the surface of all perimeter controls, slopes, and any disturbed area *not under active grading* [emphasis added].

On the vast majority of construction sites, temporary stabilization consists of applying straw mulch and grass seed at the same time. Section 5-4-3-B-2-b defines *adequate* straw mulch as:

When straw mulch is used, spread it over all seeded areas at the rate of 2 tons per acre to a uniform loose depth of 1 to 2 inches. *Apply mulch to achieve a uniform distribution*

and depth so that the soil surface is not exposed [emphasis added]. When using a mulch anchoring tool, increase the application rate to 2.5 tons per acre.

Section B-4, requires that each construction site comply with the following with regard to Adequate Vegetative Establishment:

Inspect seeded areas for vegetative establishment and make necessary repairs, replacements, and reseedings within the planting season.

1. Adequate vegetative stabilization requires 95 percent groundcover. [emphasis added]
2. If an area has less than 40 percent groundcover, reestablish following the original recommendations for lime, fertilizer, seedbed preparation, and seeding.
3. If an area has between 40 and 94 percent groundcover, over-seed and fertilize using half of the rates originally specified.
4. Maintenance fertilizer rates for permanent seeding are shown in Table B.6.

Incredibly, some have misinterpreted this requirement to read that if 95% of a site has some vegetative cover and no more than 5% is bare, then the site is OK. As you will see later in this report, survey participants encountered many sites where mulch and vegetation only covered 30% to 50% of the underlying soil; not the 95% coverage required by Section 5-4-3-B-2-b. The MDE Compliance Chief for the Central Region of Maryland agreed that it is OK if 5% of a site has less than a dense groundcover (provided the 5% drains to fully functioning perimeter controls) but the remaining 95% must have sufficient groundcover to obscure the underlying soil from view once a site reaches rough grade.34 The groundcover can be mulch, grass, other vegetation, stone or completed asphalt roads and parking lots or buildings.

Section B-4-7 requires the following with regard to Heavy Use Area Protection. These areas include road beds, parking lots under construction, material storage areas, and so forth. Mulch and grass would not last long in such areas. The following measures are required by Standards and Specifications.

1. A minimum 4-inch base course of crushed stone or other suitable materials including wood chips over nonwoven geotextile should be provided as specified in Section H-1 Materials.
2. Select the stabilizing material based on the intended use, desired maintenance frequency, and runoff control.
3. The transport of sediments, nutrients, oils, chemicals, particulate matter associated with vehicular traffic and equipment, and material storage needs to be considered in the selection of material. Additional control measures may be necessary to control some of these potential pollutants.

34 Personal communication with Mr. Kevin Weis on August 20, 2014.
4. Surface erosion can be a problem on large heavy use areas. In these situations, measures to reduce the flow length of runoff or erosive velocities need to be considered.

In other words, once a site comes up to rough grade and road or parking lot construction begins, you should see sufficient stone on road and parking lot beds to obscure the underlying soils from view and, therefore, protect the soils from the erosive effects of rain and runoff.

GREATER BALTIMORE SURVEY PROCEDURES
The 2014 procedures consisted of a five-page factsheet setting forth how the survey would be conducted.35 For 2015, these procedures were expanded to provide additional detail and to address concerns raised by one of the local enforcement agencies.36 However, the evaluation criteria remained the same so the results obtained by using the 2014 and 2015 procedures would be comparable.

Both draft procedures were sent to the erosion and sediment control enforcement chiefs in the six Greater Baltimore jurisdictions. The procedures were also sent to the Sediment, Stormwater & Dam Safety Program of the Maryland Department of the Environment. In 2014, the procedures were sent to the Homebuilders Association of Maryland and the Associated Builders & Contractors of Maryland. Comments on the 2014 procedures were received from two of the six enforcement chiefs, but from no one else. The procedures were modified to address the comments.

The procedures were also forwarded to all of the environmental organizations having interest in the topic. In addition to requesting comments on the procedures the groups were asked to circulate an announcement among their members to recruit survey participants. This resulted in 55 people expressing interest in the survey in 2014 and 104 in 2015. Of these folks, 33 actually participated in 2014 and 70 in 2015. A list of these people who generously donated their time will be found in Table 1, at the beginning of this report.

In 2014, three surveys were scheduled for each of the six jurisdictions. The author of this report located active construction sites by driving the major roads in each jurisdiction. Through this process 105 sites were identified for an average of 17 per jurisdiction. MDE visited an average of 21 sites during their most recent review of these six jurisdictions.37 Three surveys were completed in two jurisdictions (Anne Arundel and Baltimore counties) and two each in the other four jurisdictions. All surveys were conducted between June 22nd and July 12th of 2014.

35 See: http://ceds.org/esp/ES=PSurveyFactsheet.pdf
37 See a compilation of the MDE reviews at: http://ceds.org/esp/AllGreaterBaltimoreReviews.pdf

23
According to precipitation measurements made at BWI airport,\textsuperscript{38} it rained on seven of these 21 days. The largest storm occurred on July 10\textsuperscript{th} and totaled 1.15 inches for the 24-hour period. This modest rainfall would not have had a significant effect on the survey results. It did not rain during any of the surveys.

In 2015, three to four surveys were scheduled for each of the six jurisdictions depending upon the number of sites. A list of active construction sites was compiled by asking volunteers to report any sites they encountered. Also October 2014 Google Earth aerial photos were searched for areas of exposed soil which might be construction sites. Each site was then visited by the author and frequently Jennifer Herzog of the Chesapeake Bay Foundation. All of the sites reported by volunteers were made part of the survey and about 75\% of the exposed areas shown on aerial photos were active construction sites. Through this process 146 sites were identified of which 131 were evaluated for an average of 22 per jurisdiction. As stated above, MDE visited an average of 21 sites during their most recent review of these six jurisdictions.\textsuperscript{39} Four surveys were completed in two jurisdictions (Baltimore and Howard counties) and three each in the other four jurisdictions. All surveys were conducted between June 7\textsuperscript{th} and June 26\textsuperscript{th} of 2015. According to precipitation measurements made at BWI airport,\textsuperscript{40} it rained on eleven of these 19 days. The largest storm totaled 2.37 inches for the 24-hour period, which was a new record. June 2015 was also the wettest June on record since precipitation data was first gathered at BWI airport in 1873.\textsuperscript{41} In the past excessive rainfall has been cited as a reason why erosion and sediment control measures failed. It is interesting to note that the use of erosion control measures increased regionwide by 61\% when 2014 data are compared with 2015 despite record-setting rainfall.

The reason for multiple surveys in each jurisdiction was the hope of documenting improved erosion control and to gain a more accurate evaluation of erosion control rates. In both years the six enforcement chiefs were already alerted to the coming survey through our request for comments on the procedures. Additionally, a list of the sites we were surveying was forwarded to each enforcement chief following the first survey date in 2014. In 2015, each chief and all local elected officials were alerted two days in advance that the survey was about to begin.

Two-thirds of the 2015 surveys ran from 10:00 am to 1:00 pm with the other third going from 1:00 to 4:00 pm. Each consisted of three to five people traveling from site to site in a single vehicle. Participants were asked to review the procedures beforehand. Each survey began with a review of the procedures, which was presented by the author of this report. The review was

\textsuperscript{38} For BWI climate data see: http://www.nws.noaa.gov/climate/index.php?wfo=lwx

\textsuperscript{39} See a compilation of the MDE reviews at: http://ceds.org/esp/AllGreaterBaltimoreReviews.pdf

\textsuperscript{40} For BWI climate data see: http://www.nws.noaa.gov/climate/index.php?wfo=lwx

based on the figures shown in the 2015 Procedures Greater Baltimore Survey Packet found at the end of this report. The author participated in all surveys.

The first site visited during each survey was simple and served as the training ground for the participants. Again, the author was present during each survey and could have easily biased the findings by offering his own answers to the survey questions. Instead, the participants were urged to discuss their answers to each question in hopes of reaching a consensus. Occasionally the author would throw out an answer which was intentionally incorrect to verify that the participants were forming their own, unbiased opinions on the conditions found at each site. The author was always called and corrected on the bogus answer.

At each site the author would help participants reach consensus on the boundaries which we called the Originally Disturbed Area. The evaluation would be based solely on the portion of the site visible from adjoining public areas. With very large and complex sites one or more representative portions would be selected and the evaluation was based on just that portion. On subsequent surveys of the same site a different area would be assessed to improve the degree to which the data represented conditions throughout the entire site.

The first question posed on the survey form was: Based on what you can see from adjoining public areas, of the originally disturbed area what percentage has been rendered nonerodible because it is covered with buildings, building foundations, completed streets, completed parking lots, etc: _____% Figure 4, on page 24, depicts areas considered erodible and nonerodible. Erodible areas include exposed soils as well as stabilized soils which could begin to erode again if mulch, grass or stone are not maintained. Nonerodible areas included paved roads and parking lots along with buildings and self-contained building foundations.

The next question was 3. Of the erodible area - that which is still susceptible to soil erosion - what portion is at rough grade as indicated by the presence of buildings, building foundations, roads-road beds or parking lots-parking lot beds: _____%. Figure 3, on page 16, was used to show survey participants what is meant by Rough Grade.

If a site goes idle for a period of weeks or more but hasn’t reached rough grade, then stabilization may still be required. The following question addressed this scenario: 4. Are there other portions of the erodible area which you believe have been idle long enough that they should be stabilized too, as indicated by any of the factors checked below:
   a. Earth-moving equipment (bulldozers, graders, etc.) no longer present;

A site is definitely at rough grade if building foundations are present

Earth-Moving Equipment
**Examples of Erodible & Nonerodible Portions of a Construction Site**

**Erodible Areas** Bare soil or areas stabilized but could begin eroding if stabilization isn’t maintained.

- Fully exposed soil between stone pile and grass
- Some grass and mulch but underlying soil still visible
- 95% or better grass cover
- Mulch completely obscures soil
- Road bed stabilized with stone
- Parking lot stabilized with stone

**Nonerodible Areas**

- Building footer
- Paved street
- Paved parking lot
- Remnant concrete & other nonerodible surfaces
- Partially-Complete buildings
- Completed building
b. Earth-moving equipment present, but you saw the site a month or more ago and the equipment has not moved and site grading appears the same;
c. Earth-moving equipment is present but there is at least sparse vegetation growing throughout the area indicating its been a long time since earth-moving occurred; or
d. Other:
e. Based upon the factors checked above, what additional percentage of the erodible area is inactive and thus at the stabilization point: ____%
f. What is the total percentage of the erodible area at rough grade or inactive requiring stabilization (3 + 4 =): ____%

The remaining question focused on the erodible areas on each site.

5. Of the portion of the site which is at rough grade or inactive, what percentage is:
   a. Fully exposed soil (zero mulch, grass, stone, etc.): ........................ ____%
   b. Partially stabilized (has some mulch, grass, stone, etc.) but underlying soils still visible: .................................................... ____%
   c. Completely stabilized with mulch, grass, stone, etc.: ....................... ____%

\[5a + 5b + 5c \text{ Must Total: } 100\%\]
Fully exposed soil was defined as 0% to 10% coverage of underlying soil and the easiest to discern. Partially stabilized meant 11% to 90% coverage of underlying soil. Complete stabilization equaled 91% to 100% coverage. With 5b we were frequently seeing soil with only a 30% to 50% cover, which was easy to identify. Occasionally, binoculars would be needed to distinguish between 5b and 5c.

After each survey the data noted on the forms was entered into a spreadsheet. The survey forms were scanned and e-mailed to each participant along with the spreadsheet containing their data. Participants were asked to compare the spreadsheet with their forms and report any errors, which were then corrected.

GREATER BALTIMORE SURVEY RESULTS
In 2014, 33 participants completed 688 site evaluations for 105 sites or an average of 6.6 evaluations per site. In 2015, 39 volunteers made 839 site evaluations for 131 sites or an average of 6.3 per site. During an average three-hour survey, 12.5 sites were evaluated. Table 2, on the next page, summarizes the results of both surveys.

Since the goal of the survey is to increase public support for making maximum use of stabilization measures on construction sites, the primary criteria used to compare the six jurisdictions was Complete Stabilization under the Table 2 heading of Condition of Erodible Portions of Site. Table 2, shows that overall the non-erodible portion of sites went from 20% in 2014 to 21% in 2015. Of the erodible areas, complete stabilization increased by an impressive 61%. The average for the six jurisdictions was 23% in 2014 which rose to 37% in 2015. There was a 9% increase in the portion of sites at rough grade which may account for some of the rise in complete stabilization.

All six jurisdictions improved when 2014 and 2015 data are compared. Carroll County exhibited the most dramatic improvement - 12% to 44%. Anne Arundel County went from 16% complete stabilization to 40%. The third most impressive improvement took place in Baltimore County - 18% complete stabilization in 2014 to 32% this year.

Data regarding three other variables were gathered at each site: earth-moving equipment presence, presence of volunteer vegetation, and stabilization in the vicinity of foundations. The first two variables were used as part of the determination of whether the site was at rough-grade or if it had remained idle long enough to trigger stabilization requirements. If earth-moving equipment was absent then the site was probably at rough grade or had been idle for a while. If vegetation was sprouting (volunteer growth) throughout a cleared area then it had likely been idle for weeks which would also trigger the need to stabilize.
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<th>SITES</th>
<th>NONERODIBLE PORTION OF SITE</th>
<th>Fully Exposed Soil</th>
<th>Partial Stabilization</th>
<th>Complete Stabilization</th>
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In 2014, considerable differences were also found within one jurisdiction. Construction sites on the eastern side of the jurisdiction were only 5% completely stabilized while western sites were 30% completely stabilized. During the latter half of 2014 a very successful volunteer mobilization campaign was organized. This effort became the Bird River Restoration Campaign\(^{42}\). The Campaign focused a considerable amount of public attention on erosion control in the east County. No doubt this effort played a role in the improvements. The difference no longer existed in 2015.

The Chesapeake Bay Program (CBP) guidance document for construction site erosion and sediment control assumes 66% of a site is stabilized for half the life of a typical site.\(^{43}\) This survey showed a stabilization rate nearly one-half of the CBP assumption - 37%. And even the best jurisdiction was only achieving a 44% stabilization rate, which is slightly more than half the CBP assumption.

This survey found that an average of 97% of the erodible portion of the 131 sites were at rough grade or idle, which is the point where stabilization should be applied to all disturbed soils (with the exception of the inside of foundations). There seems to be no legitimate reason why 97% of the soils were not completely stabilized. Achieving this standard would bring about a dramatic reduction in the release of sediment and other pollutants. This action would also greatly diminish damage to downstream ecosystems and the many public costs resulting from poorly controlled erosion and sediment pollution.

**DISCUSSIONS WITH ENFORCEMENT AGENCIES**

In both 2014 and 2015, we attempted to meet with the enforcement chiefs for all six jurisdictions and the Sediment, Stormwater & Dam Safety Program of the Maryland Department of the Environment (MDE). In 2014, we met with all six enforcement chiefs except Howard County’s. This year both Carroll and Howard County declined to meet with us. This is curious since we clearly stated that the purpose of the meeting was to answer any questions they might have and to learn what approaches they’ve found to be most effective in encouraging compliance with erosion and sediment control requirements. In addition, we wanted to learn about changes program staff would like to see that

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\(^{42}\) See: [http://restorebirdriver.org](http://restorebirdriver.org)

would make it easier to enforce erosion and sediment control requirements.

Following is a summary of what we’ve learned from the meetings which did take place.

**Enforcement Tools**
In general, the tools available to sediment control enforcement agencies are:

- Field Reports;
- Correction or Violation Notices;
- Stop Work Orders;
- Fines and Imprisonment;
- Withholding Permits for Other Projects; and
- Bond Forfeiture.

**Field Reports:** During each inspection a field report is completed, noting factors relevant to compliance. The inspector will leave a copy of the form with whoever is responsible for sediment control and present on the site. Otherwise the form is sent to the owner/developer. If violations are noted then the report will specify the action that must be taken to correct each and the deadline for completion of corrective action.

**Correction/Violation Notices:** If the inspector finds that the violations noted on the field report have not been corrected by the required date then a Correction or Violation Notice may be issued. Failure to comply with this notice can then lead to the following penalties.

**Stop Work Order:** As the name implies, this order can stop all work on a construction site authorized by the grading permit. While grading stop work orders are highly effective when earth-moving is ongoing and a site is being brought up to rough grade, it loses much of its power once grading ceases. In some jurisdictions sediment control program staff can coordinate with other local permitting programs to halt ALL work on a site (building construction, electrical, plumbing, etc.), not just grading-related. In other words, should an owner/developer fail to correct serious sediment control violations the local jurisdiction may stop not only grading but building construction, road paving, and all other activity on the site. We are told this is a very effective enforcement tool.

**Fines & Imprisonment:** Several of the jurisdictions have the authority to fine and even imprison those who violate sediment control laws. Unfortunately the maximum fine is either too low or the process for issuing a fine is too cumbersome. The jurisdictions which can issue a fine are limited to a maximum of $100 to $500. We also learned that judges may be reluctant to approve larger fines. In one jurisdiction a fine must be approved by a Hearing Officer, which involves a three- to four-week delay until a hearing can be set. Anne Arundel County has a more expedient process where the enforcement agency issues the fine. The fine can be appealed but it is very rare that a judge reverses the fine in Anne Arundel County. With regard to the bottom line of fines, they appear to be set far too low to serve as an effective tool for achieving
compliance. The reason is that it's cheaper to pay the fine than to make the corrections. So the fines become a cost of doing business which is cheaper than complying with erosion and sediment control requirements. Put another way, some unscrupulous contractors prefer to pay a relatively small fine rather than expending a larger sum on installing and maintaining control measures. This practice externalizes costs which the rest of us pay through higher water treatment bills, waters less suited to recreation, lower waterfront property values, increased flooding and so forth. And as far as imprisonment goes, it rarely happens.

One jurisdiction has found a way to fine the most recalcitrant offenders that does motivate compliance. The Maryland General Permit for Stormwater Associated with Construction Activity lists seven conditions indicating the discharge of significant amounts of sediment. If a permittee is found violating any of these conditions then this would trigger enforcement action by the Maryland Department of the Environment (MDE). MDE can fine the permittee up to $10,000 a day and for multiple days. This is at least 20 times greater than the local fine. One County has found that by threatening to refer a project to MDE most offenders will move very quickly to achieve compliance. But, again, this only works if one of the following trigger conditions exist:

1) Earth slides or mud flows; 2) Concentrated flows of stormwater such as rills, rivulets or channels that cause erosion when such flows are not filtered, settled or otherwise treated to remove sediment; 3) Turbid flows of stormwater that are not filtered, settled or otherwise treated to reduce turbidity; 4) Deposits of sediment at the construction site in areas that drain to unprotected stormwater inlets or catch basins that discharge directly to surface waters; 5) Deposits of sediment from the construction site on public or private streets outside of the permitted construction activity; 6) Deposits of sediment from the construction site on any adjacent property outside of the permitted construction activity; or 7) Discharges from the construction site to municipal conveyances, curbs and gutters, or streams running through or along the site where visual observations show that the discharges differ from ambient conditions in terms of turbidity so as to indicate significant amounts of sediment present in them.

Obviously, there is an urgent need to allow all jurisdictions to set fines at a level which makes it cheaper to comply with sediment control laws versus the current situation where it pays to ignore the law. There may also be a need to educate judges about the need to support fines that will motivate a higher level of compliance.

There is also another urgent need. If a permittee elects to appeal a fine, then weeks may pass by while a site remains in noncompliance and excessive sediment releases continue. A process is needed where the permittee must stabilize a site immediately but allow for

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44 See: [http://www.mde.state.md.us/programs/Permits/WaterManagementPermits/WaterDischargePermitApplications/Documents/www.mde.state.md.us/assets/document/General_Permit_SW_Construction09GP_Signed.pdf](http://www.mde.state.md.us/programs/Permits/WaterManagementPermits/WaterDischargePermitApplications/Documents/www.mde.state.md.us/assets/document/General_Permit_SW_Construction09GP_Signed.pdf)
compensation if the fine is later found to be unwarranted. The following statute, from Natural Resources Article at 8-1815 (e), may provide a precedent for such a process. The statute allows the Maryland Critical Area Commission for the Chesapeake & Atlantic Coastal Bays to require rapid restoration of damage caused by an alleged violation when imminent harm may result from delay.

\( (e) \) Notwithstanding any other provision of this section, whenever a development in the Critical Area is proceeding in violation of approved project plans and threatens to immediately and irreparably degrade the quality of tidal waters or fish, wildlife, or plant habitat, the Attorney General, upon request of the chairman, may bring an action to restrain the violation and, as appropriate, to compel restoration of any land or water areas affected by the development.

**Withholding Permits for Other Projects:** At least one jurisdiction has the authority to withhold permits for other projects an owner/developer may be pursuing within that county or city. In other words, if Developer Smith has serious, long-standing violations on Project A and is seeking approval to start Project B, then the jurisdiction can withhold permits-approvals for Project B until all the Project A violations are corrected.

**Bond & Other Security Forfeiture:** For many projects, the owner/developer must post a bond with an amount sufficient to cover the cost of stabilizing a site and maintaining perimeter controls in the event the project goes bankrupt or the permittee refuses to correct significant violations. It appears that a number of the Greater Baltimore jurisdictions go through the bond forfeiture process a couple of times each year. The ease of collecting the funds varies depending upon the form of the bond, such as Letter of Credit or whether an insurance company is involved. One jurisdiction reported that once the funds are obtained they must go through their local government procurement process to use the funds to stabilize a site. This can be a time-consuming and frustrating process which acts as something of a disincentive to pursue bond forfeiture.

**Statistics**

Tables 3a and 3b, on the next pages, contain statistics for the six sediment control programs with regard to staffing, workloads, enforcement tools and complaints received from the general public. The six jurisdictions do not come up for review in the same years. So we selected the most recent fiscal year where data was available for most of the jurisdictions.\(^{45}\)

Table 3a and 3b, contain the following statistics from the FY2011 to FY2014 delegation applications:

- Number of inspectors;

\(^{45}\) The applications can be viewed at: [http://ceds.org/esp/ALLDelegationApplications.pdf](http://ceds.org/esp/ALLDelegationApplications.pdf)
<table>
<thead>
<tr>
<th>JURISDICTION</th>
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<th>Inspection Workload Data from Delegation Application Year</th>
<th>Number of Inspectors</th>
<th>Percent of Time Spent On Sediment Compliance</th>
<th>Full-Time Equivalent Inspectors</th>
<th>Acres Disturbed Active Permits</th>
<th>Number of Active Permits</th>
<th>Average Active Permit Acres</th>
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Table 3b: Greater Baltimore ES=P Survey - Enforcement Actions 2014 & 2015

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<tr>
<th>JURISDICTION</th>
<th>Complete Stabilization Rate</th>
<th>Data to Right from Delegation Application Year</th>
<th>Number of Active Permits</th>
<th>Violation Notices Issued</th>
<th>Notices Per Active Permit</th>
<th>Stop Work Orders Issued</th>
<th>Orders Per Active Permit</th>
<th>Fines Securities Collected</th>
<th>Fines Securities Per Active Permit</th>
<th>Hearing Required for Civil Penalties</th>
<th>Number</th>
<th>Cases Per Active Permit</th>
<th>Sediment Control Complaints Received</th>
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• Number of inspections;
• Number of active permits and disturbed acreage covered by these active permits (grading and other);\textsuperscript{46}
• Number of violation notices issued;
• Number of stop work orders issued;
• Number and amount of fines or securities (bonds) collected;
• Number of court cases; and
• Number of sediment control complaints received (which we believe is mostly from the general public but couldn’t get MDE to confirm this).

**Inspection Staff:** The jurisdictions had an average of 5.8 inspectors in 2014 which has decreased to 5.4 today. Anne Arundel had the highest number of inspectors - 13 - but just lost two positions. In three jurisdictions, inspectors spend 100\% of their time on sediment control compliance. In the other localities sediment control occupies 40\% to 75\% of each inspector’s time, with the rest spent on other issues on a construction site: stormwater, electrical, building, plumbing, etc. In FY2012, Baltimore County had seven inspectors, which dropped to four in FY2013, and has since been restored to seven.\textsuperscript{47} Another county is hoping to add an additional inspector. One of the jurisdictions that exhibited a dramatic improvement in complete stabilization attributed this to firing a couple of inspection supervisors who were performing poorly.

**Work Load:** Each inspector had an average workload of 85 active permits in 2014 which decreased to 68 today. Carroll County still has the highest workload but this has decreased 38\% (225 permits per inspector in 2014 vs. 139 today). At 25 permits per inspector, Baltimore County now has the lowest. Each permit covers an average of 3.2 acres with Anne Arundel having the smallest (1.1 acres/permit) and Baltimore County the largest (8.8 acres/permit). Each permitted site was inspected an average of 21 times in 2014 which decreased to 15 in 2015. Though Carroll County still has lowest inspection frequency, it rose by 3.5 times from 2014 to today. This was no doubt a significant fact in the dramatic 266\% improvement in complete stabilization achieved in Carroll County during the past year.

**Violation Notices:** In 2014, an average of 2.2 violation notices were issued for each permit which decreased to 1.1 today. Carroll County issued the fewest (0.01/permit) in 2014 but tripled the number of notices issued since then. Harford County continues to issue the most violation notices (7.88/permit).

**Stop Work Orders:** Overall the jurisdictions issued an average of 0.2 Stop Work Orders

\textsuperscript{46} An application footnote describes these other approvals as: “Many jurisdictions issue Soil Conservation District (SCD) approved standard erosion and sediment control plans or single-lot residential agreements for small projects in lieu of requiring engineered plans.”

\textsuperscript{47} See Baltimore County delegation application in: \url{http://ceds.org/esp/ALLDelegationApplications.pdf}
per permit in 2014 which decreased by 41% by 2015. Baltimore County continues to have the highest Stop Work Order frequency (0.65/permit in 2014) though it decreased 48% over the past year. Carroll County continues to have the lowest frequency of stop work order issuance.

**Fines & Securities:** The average amount collected through fines and securities (bond forfeitures?) was $25.07 per permit in 2014 which decreased to $4.35 by 2015. Three jurisdictions - Baltimore, Carroll, and Harford counties - did not report collecting any fines or securities.

**Court Cases:** Anne Arundel and Howard were the only jurisdictions that reported any court cases. The 91 cases (0.05/permit) were presumably for a couple of bond forfeitures and the rest were permittees appealing fines. We learned that Anne Arundel rarely loses an appeal.

**Complaints:** We assume these are complaints from the general public regarding perceived erosion and sediment control violations. In 2014, an average of 0.51 complaints were received per permit which decreased to 0.40 by today. Baltimore County had the highest rate of complaints received (1.46 and 0.94/permit). The number of complaints received by Carroll County increased 416% over the past year.

**Relationship Between Statistics & Rankings:** In 2015, the relationship between inspection workload and rankings does not seem quite as clear as last year. The dramatic 266% improvement in Carroll County must be due in part at least to the 3.5-fold increase in the frequency of inspections and a tripling in the frequency of Violation Notice issuances. The 143% improvement in Anne Arundel County could be due to replacing ineffective supervisors. There still seems to be a strong correlation between frequency of violation notice issuance and ranking. For both 2014 and 2015, Harford County was the highest ranked and issued the most notices per active permit. There continues to be a weak or nonexistent correlation with Stop Work Orders, Fines & Securities, Court Cases or Complaints from the public.

The following factors appear to have the strongest correlation with a higher ranking:

- moderate workload of less than 100 permits per inspector,
- inspection frequency of at least 7 - 13 per permit per year, and
- a high rate of violation notice issuance.

Fortunately, no factor has emerged which would prevent any of the other five jurisdictions from achieving Harford County's 44% stabilization rate. And we see no logical reason why the jurisdictions could not achieve a stabilization rate equal to that of the 97% of sites at rough grade or idle.

**Attitude May Be Everything**

We do see differences in the attitude of enforcement staff and stabilization quality. In one of the most successful jurisdictions staff have a positive, can-do attitude. When we present issues they
are greeted with respect and staff engages in a constructive discussion with us regarding possible solutions. At the other end of the extreme is one jurisdiction where the atmosphere is distinctly adversarial. Multiple reasons were put forth by staff to justify why stabilization could not be improved. Ironically, stabilization continues to improve in this jurisdiction. In another it is clear that budgets are so incredibly tight that few options are available.

Other Steps for Improving Erosion & Sediment Control
Following are suggestions from the local jurisdictions for other ways to improve erosion and sediment control.

Insist Upon Good Vegetation Establishment Practices: In the jurisdictions with the highest stabilization rates inspection staff cite the need to establish vegetation during the first half of the growing season (March - May). It is far more difficult to get grass established in the hot, dry summer months. The staff also say it’s equally important to require a second or third effort if the first attempt does not achieve the 95% vegetative groundcover required by MDE.

Anne Arundel Stabilization Trigger: Anne Arundel County officials feel one of the most effective measures for maximizing stabilization is the following language which must be part of every erosion and sediment control plan:

(15) a statement in the construction sequence that the construction of the first floor walls of any building or structure may not proceed until the foundation has been backfilled, the disturbed areas have been stabilized and a certificate is provided to the inspector verifying the grades and drainage patterns shown on the approved erosion and sediment control plan have been obtained.

This regulation is from §16-3-204. Erosion and sediment control plan, of the Anne Arundel County Erosion & Sediment Control Ordinance. The Anne Arundel staff feel this regulation ensures that the interior of a site is fully stabilized at least once. If lucky this one stabilization achieves 95% groundcover. If not then the staff feel it is very difficult to get a second stabilization given the available enforcement tools. While this tool definitely helps it is by no means a stabilization panacea.

Increase Perimeter Control Effectiveness: In 2007, Maryland adopted a new approach to stormwater management known as Environmental Site Design (ESD). One of the enforcement chiefs noted that an unintended consequence of ESD was to greatly reduce the number of stormwater ponds. While the reduction in ponds saves developers money, it also

48 See: http://www.amlegal.com/nxtgateway.dll/Maryland/annearundelco_md/article16floodplainmanagementerosionandsedimentcontrol?f=templates$fn=default.htm$3.0$vid=amlegal:annearundelco_md$anc=0-0-0-5760

49 See: http://www.ceds.org/esd.html
reduced the effectiveness of perimeter sediment control measures. Generally, stormwater ponds are much larger than the ponds used for sediment control. And the larger the pond, the more sediment retained. Additionally, the stormwater ponds would be designed to prevent an increase in downstream flooding. Compared to grass, newly graded construction site soils can produce four times as much runoff. The enforcement chief is now receiving more complaints about increased muddy water and downstream flooding from those living near ESD construction sites. At least one local Soil Conservation District is working on a solution to this problem. One option might be to increase the Maryland sediment basin and trap sizing criteria of 3,600 cubic feet per acre. Pennsylvania requires a minimum storage area of 6,000 cubic feet per acre for sediment basins. In Recommendations of the Expert Panel to Define Removal Rates for Erosion and Sediment Control Practices, the Chesapeake Bay Program identified several more effective control options which would reduce offsite sediment losses. But increased use of stabilization would resolve both the muddy water and flooding issue. Again, a well-stabilized site produces a fourth of the runoff compared to bare soil.

Training: Several of the enforcement chiefs commented on how seldom they have a chance to meet with their counterparts in other jurisdictions. One noted that MDE used to run a weekly sediment and stormwater training program over a two-month period. Not only was the training valuable but it also allowed staff to talk with sediment control officials from other parts of the state.

RECOMMENDATIONS
Based on the information presented in this report, the following actions appear essential to achieving a higher degree of stabilization.

1. It is vitally important that enforcement agencies strongly urge contractors to carry out hydroseeding or other vegetation establishment measures in the spring and not in the summer when successful establishment is less likely. Agencies must also insist upon a second or third attempt is vegetation does not achieve the 95% groundcover required by MDE.

2. The ratio of active permits to inspectors should be no more than 100:1.

3. All jurisdictions should set fines at a level which provides a strong incentive to comply with Correction Notices. This level may be somewhere between the $100 to $500 current

50 See Table 2-1 and 2-2 in Urban hydrology for small watershed, available online at: http://www.ceds.org/esd.html
52 Ibid.
maximum and the $10,000 per day fine MDE is authorized to impose. There may be a need to educate judges about the importance of higher fines in achieving greater compliance.

4. The enforcement agencies must have the authority to issue fines rather than having to obtain approval from a Hearing Officer. Of course the party fined must have the right to appeal.

5. There is a need for some process whereby erosion and sediment control violations likely to result in severe pollution are repaired immediately rather than being delayed until a judge rules on the validity of enforcement action. The authority granted by Natural Resources Article at 8-1815 (e), to the Maryland Critical Area Commission for the Chesapeake & Atlantic Coastal Bays may be an appropriate solution.

6. All jurisdictions should have the authority to stop the work authorized by a grading permit as well as that carried out on a site under all other local permits.

7. When an owner/developer has refused to comply and all lesser enforcement options have been exhausted, then all jurisdictions should have the authority to withhold permits-approvals for other projects being pursued by that same owner/developer within the same jurisdiction.

8. A better process is needed for obtaining and quickly utilizing funds from bonds and other securities to stabilize sites with long-standing noncompliance.

9. Other jurisdictions should consider making the following Anne Arundel regulation text a required part of the Sequence of Construction appearing on all erosion and sediment control plans:

   (15) a statement in the construction sequence that the construction of the first floor walls of any building or structure may not proceed until the foundation has been backfilled, the disturbed areas have been stabilized and a certificate is provided to the inspector verifying the grades and drainage patterns shown on the approved erosion and sediment control plan have been obtained.

10. MDE should consider holding periodic sediment and stormwater training sessions which allow local sediment control staff to interact and to learn of new approaches.

11. Drew Brown, a survey volunteer, suggested: The list of plant species recommended for use on construction sites in Tables B.1 and B.3, of the 2011 Maryland Standards and Specifications for Soil Erosion and Sediment Control, should be reviewed for opportunities to substitute species native to Maryland for nonnatives.
12. Edwin Oaks, another survey volunteer, suggested: There would be value in exploring the possibility of adding a condition to each project approval requiring the permittee to contract with an independent company specializing in stabilization. That company would visit the site regularly and stabilize any areas of exposed soil. Of course, the company would need to coordinate with the site manager to ensure that grass seed is not applied to areas about to receive extensive foot or vehicle traffic. While the traffic would kill the grass, these areas could be stabilized with mulch or other resilient methods to reduce erosion. The advantage to this approach is that it establishes a funding source that is easily drawn upon by an independent company whose sole responsibility is to minimize soil erosion.

NEXT STEPS
It is our hope that all of the watershed and other environmental organizations active in Maryland will educate their members about the Exposed Soil = Pollution message. Examples of educational tools appears on page 43.

There is an urgent need for something like a cell phone App which:

• Allows citizens to take photos of a construction site;
• Allow them to add text regarding any problems on the site or whether they think control quality is good;
• Automatically records the site coordinates;
• Describe the conditions which should prompt the citizen to immediately notify an enforcement agency;
• Allow them to either immediately forward problems to the appropriate enforcement agency; or
• To request a review by the App administrator to verify that a referral should be made;
• Send each report to a central database open to the public; and
• Allow those who reported a problem to provide an update such as:
  ▶ how long it took to get a response from the enforcement agency;
  ▶ when/if the problem was resolved;
  ▶ the degree to which it was resolved;
  ▶ how long after the initial report it took to resolve the problem; and
  ▶ allow for posting of additional photos so visitors can see Before and After shots.

Presently folks can report construction sites with both good and poor stabilization to: ceds.org/espreport, which is a poor substitute for the App described above.

We plan to offer local elected officials as well as Greater Baltimore State Senators and Delegates an opportunity to tour construction sites in their Districts. Organization leaders and individual voters active in each district will also be invited to participate in the tour with their elected representatives. During the tour we’ll explain why Exposed Soil = Pollution and why erosion control is so cost-effective and critical to preserving both the quality of life and the safety
of their constituents. We’ll then discuss recommendations for increasing the success of their jurisdiction with regard to construction site stabilization. This survey will then be repeated next June, 2016.
Exposed Soil = Pollution 4" x 6" Index Card

ES=P
Exposed Construction Site
Soil = Pollution!
Spread The Word

How Can You Save 100 Feet of Waterway With Just An Hour of Your Time?

To Find Out Visit ceds.org/esp and Download the Free ES=P Guide

Why Does Exposed Soil = Pollution?
Because you can’t keep enough mud pollution on a construction site with just the black silt fence and small ponds you see along the edge of most sites. To fully protect nearby waterways and the Chesapeake Bay, soil exposed to the erosive effects of rainfall and runoff must be protected with a blanket of straw mulch and grass. The mulch and grass must be thick enough to hide underlying soil from view. For further detail visit: ceds.org/esp
Many Thanks To Brad Knopf, Magothy River Association
bdknopf@gmail.com  443-324-1130
For This Great Education Piece
The purpose of the Greater Baltimore Exposed Soil = Pollution (ES=P) Survey is to support Baltimore City and the five surrounding counties - Anne Arundel, Baltimore, Carroll, Harford and Howard - in winning increased use of erosion control measures on construction sites. Generally construction sites in these six jurisdictions make fair to good use of perimeter controls like black silt fence and ponds, but these measures only keep a third to half of the soil eroded on the site from becoming offsite mud pollution. This is why State law requires the application of straw mulch, grass and other erosion control measures once the site reaches rough grade and mass earth-moving ends. By greatly reducing soil erosion these stabilization measures slash offsite mud pollution by 90% to 99%. And it is only through stabilization of soil erosion that sediment losses can be reduced to the point where offsite pollution is prevented. Hence the phrase Exposed Soil = Pollution. Whenever you see exposed soil on a site then pollution is likely to result come the next major storm. Further background, including the damages caused by sediment and State legal requirements for stabilization, see the Greater Baltimore Survey 2014 report posted at: ceds.org/esp/ES=PReport.pdf

With regard to stabilization and minimizing mud pollution, there are four phases to the development of most sites. First, site development begins with clearing just the site perimeter where silt fence, ponds and other control measures are installed. Once installation is complete the contractor has three days to get exposed soils on the perimeter stabilized with mulch or other measures. These soils must also be seeded with grass and a dense (95% coverage) growth should appear within four- to eight-weeks during the growing season (March - October). Mulch must be replaced whenever underlying soil becomes visible. Second, the interior of the site is cleared of vegetation, existing buildings, etc. Third, earth-moving equipment (bulldozers, graders, etc.) cut and fill until relatively level areas are created. Of course these level areas are where building will occur. This point is known as rough grade. When building foundations appear or roads-parking lots are under construction, then that part of the site is at rough grade and all exposed soil must be stabilized within seven days. The fourth phase is final stabilization when remaining erodible soils are smoothed then permanently landscaped. Several illustrations follow these procedures. The illustrations give examples of all four phases plus the other information requested on the survey form.

SURVEY PROCEDURES:
1. If you live or work in the Greater Baltimore area, then please keep an eye out for active construction sites. Sites can be anywhere but are usually concentrated along major roads. Sites also tend to congregate in a given area so check out Google Earth and other aerial photos to see where sites were a year or two ago. You may well find new sites in those areas. Note the name and location of each site then add it our database at: ceds.org/sites

2. In late May we’ll schedule three survey dates for each of the six jurisdictions. We’ll base the dates upon the preference you and others from your jurisdiction selected when you registered for the survey. We’ll send you an email asking you to sign up for one or more surveys. We’ll
keep taking names until we have five people signed up for a survey. *Preference will be given to those who have not previously participated in a survey.*

3. On the day of the survey we’ll meet at a central location such as a park and ride lot. Of course you’ll receive an email letting you know where and when to meet your survey team. You will receive a clipboard with Survey Forms, a blue pen (always use blue), a list of sites giving the ID for each, and a copy of these procedures.

4. The first construction we visit will be a simple one. There we will walk you through the following procedures for completing the ES=P Survey Form. As with all sites we visit we’ll park on a public area where we can get the best view of the site. We need not see the entire site, just a representative portion.

5. At each site you’ll be asked to complete a survey form using the blue pen provided. You’ll find a sample form at the end of these procedures. The team leader will provide the Site ID which you’ll print on your form along with your first and last name and the date (e.g. 6-7-15). The team leader will also ask each participant for their answer to each question on the form. If the numbers ranged widely then each team member will explain how they arrived at their answer. We’ll then seek to reach agreement on a number. But you will be free to enter another number if you disagree with the team.

6. First you’ll be asked to define the Site or the *originally disturbed area*. Of course this is the area where vegetation or existing buildings were cleared. This is usually easy to define by looking for the edge of recently cleared forest, the outermost perimeter silt fence, etc. The originally disturbed area will then be designated the *Site*. *See the first illustration following these instructions.*

7. Next we’ll ask each team member to estimate what percentage of the *Site* is *nonerodible* because it is covered by buildings, paved road or parking lots, a paved sidewalk, permanently stabilized, etc. *See the second illustration following these instructions.*

8. The remaining percentage of the Site is then the *erodible* area and consists of:
   a. areas blanketed by vegetation or exposed soil;
   b. exposed soil covered partially or completely with straw mulch or gras; or
   c. it could be a road bed or parking lot bed covered with stone to prevent erosion.
   All these areas are considered *erodible* because they are or could become susceptible to erosion if vegetation is cleared, mulch blows away, grass dies, or stone washes away.

9. Now, of the erodible area estimate the percentage which is at rough grade as indicated by the presence of buildings, building foundations, roads-road beds or parking lots-parking lot beds. Again, construction of these features can only begin when a portion or all of a site reaches rough grade. So, if they are present then that portion of the site is at rough grade. *See the third illustration following these instructions.*
10. On large sites the entirety may be cleared then left inactive while construction begins on a very small portion. The inactive area must be stabilized with at least straw mulch if it will be weeks before earth-moving will again take place in that area. The survey form lists the following indicators that portions of a site have been inactive long enough to trigger the need for stabilization:
   a. Earth-moving equipment (bulldozers, graders, etc.) no longer present;
   b. Earth-moving equipment present, but you saw the site a month or more ago and the equipment has not moved and site grading appears the same; and/or
   c. Earth-moving equipment is present but there is at least sparse vegetation growing throughout the area indicating its been a long time since earth-moving occurred.

11. Based on the factors given in step 10, estimate what percentage of the erodible area is inactive and thus at the stabilization point.

12. Next, compute the total percentage of the erodible area at rough grade or inactive which requires stabilization.

13. Finally, of the portion of the site which requires stabilization (areas at rough grade plus inactive) what percentage:
   a. Is fully exposed soil (zero mulch, grass, stone, etc);
   b. Has some mulch, grass, stone, etc.; but underlying soils still visible; and
   c. Underlying soil is completely covered by mulch, grass, stone, etc.
   The answers to a, b and c must total 100%.

14. On many residential projects you’ll find numerous lots where construction is complete and the adjoining area permanently stabilized. Interspersed with these lots are those where construction is ongoing with erodible areas remaining. Coming up with an average answer to Question #13 for each of the three percentages can be challenging. But the table on the back of this form will ease this task.

As you drive through a representative portion of the site, focus on the lots where construction is ongoing and permanent stabilization has not occurred. For each of these incomplete lots note the appropriate percentage on the table. Once all developing lots have been surveyed, total the percentages and divide by the number of lots to get an average.

On other sites you’ll find few lots but large variations as you drive construction roads. As you travel down a road take in a view and estimate the Question #13 percentages. Take in the next view and make another notation. Continue until you’ve looked at either the entire site or a representative portion. Finish by computing the average for the three percentages.

15. Add any comments you wish at the bottom of the form.
16. The Team Leader will collect your forms at the end of the survey. Later your forms will be scanned and emailed back to you.

17. When all the surveys are completed we’ll compile a draft report and request your comments on the draft. We’d like to list you as one of the volunteers who participated in the survey, but it’s OK to be anonymous too. Just make certain we know this is your wish. The 2014 report can be downloaded at: ceds.org/esp/ES=PReport.pdf

If you have any questions contact Richard Klein at 410-654-3021 or Rklein@ceds.org. For further detail on ES=P visit: ceds.org/esp
1. Site ID: __________ Your Name: __________________________ Date: ______________

2. Based on what you can see from adjoining public areas, of the *originally disturbed area* what percentage has been rendered *nonerodible* because it is covered with buildings, building foundations, completed streets, completed parking lots, etc: __________%

3. Of the *erodible* area - that which is still susceptible to soil erosion - what portion is at *rough grade* as indicated by the presence of buildings, building foundations, roads-road beds or parking lots-parking lot beds: _____________________________ ________%

4. Are there other portions of the *erodible* area which you believe have been idle long enough that they should be stabilized too, as indicated by any of the factors checked below:
   - ☐ Earth-moving equipment (bulldozers, graders, etc.) *no longer present*;
   - ☐ Earth-moving equipment *present* but you saw the site a month or more ago and the *equipment has not moved* and *site grading appears the same*;
   - ☐ Earth-moving equipment is *present* but there is at least *sparse vegetation* growing throughout the area indicating it's been a long time since earth-moving occurred; or
   - ☐ Other: ____________________________________________________________

   Based upon the factors checked above, what additional percentage of the erodible area is *inactive* and thus at the *stabilization point*: _____________________________ ________%

   What is the *total* percentage of the *erodible* area at *rough grade* or inactive requiring stabilization (3 + 4 =): _____________________________ ____________________%

5. Of the portion of the site which is at rough grade or inactive, what percentage:
   a. Is fully exposed soil (zero mulch, grass, stone, etc.): ____________________________ ________%
   b. Has *some* mulch, grass, stone, etc.; *but underlying soils still visible*: ____________________________ ________%
   c. Underlying soil is *completely* covered by mulch, grass, stone, etc.: ____________________________ ________%

   \[ 5a + 5b + 5c \text{ Must Total: } 100\% \]

**COMMENTS:** ________________________________________________________________

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No Disturbance

Originally Disturbed Area = Site
- 90% Erodible Stone Roads
- Exposed Soil Ponds
- 10% Nonerodible Model House Paved Roads

Before Site Clearance

NEW Originally Disturbed Area
- 50% Erodible Stone Roads
- Exposed Soil Ponds

50% Nonerodible Completed Houses
- Paved Roads & Permanent Stabilization (lawns)

Phase II Site Clearance

Originally Disturbed Area Unchanged
- 20% Erodible Exposed Soil Ponds

80% Nonerodible Completed Houses
- Paved Roads & Permanent Stabilization (lawns)

Phase I Completed
EXAMPLES OF ERODIBLE & NONEROODIBLE PORTIONS OF A CONSTRUCTION SITE

ERODIBLE AREAS  Bare soil or areas stabilized but could begin eroding if stabilization isn’t maintained.

- Fully exposed soil between stone pile and grass
- Some grass and mulch but underlying soil still visible
- Mulch completely obscures soil
- Road bed stabilized with stone
- Parking lot stabilized with stone
- 95% or better grass cover

NONEROODIBLE AREAS

- Building footer
- Paved street
- Paved parking lot
- Remnant concrete & other nonerodible surfaces
- Partially-Complete buildings
- Completed building
Site is definitely at rough grade when building foundations appear or road bed construction begins. At that point all exposed soils must be stabilized with mulch. Mulch must completely blanket soil. More mulch must be applied when underlying soil becomes visible. During the growing season (March-October) a 95% grass cover should appear within 4- to 6-weeks from when seeding occurs. If after 8 weeks grass cover is less than 95% then reseeding is required.
**How Construction Site Stabilization Is Required To Evolve**

**Site Prior To Clearance; Red Arrows Show Direction of Runoff Flow (Downhill)**

**Initially Clear Swath for Earth Berm, Silt Fence, Trap & Other Perimeter Controls**

**Once Controls Are In Place Mulch & Seed Perimeter Then Clear Site Interior**

**Interior Has Been Cleared: Nonerodible Areas (Building + Lower-Left Parking) = 30% of site; Of The Pervious Areas 90% is Exposed Soil**

**50% of Site Erodible; North, East & South Areas Must be Stabilized With Mulch & Grass**

**Why Is It Important To Determine The Percent Of A Site That’s Erodible & Nonerodible?**

Areas of the site occupied by buildings, streets, parking lots and other impervious surfaces (those which do not allow rain to soak into underlying soils) are no longer a source of eroded soil. The remaining pervious areas would be the only source of soil erosion and mud pollution. Therefore it is these areas where we’d like you to focus your attention and estimate percent that’s exposed soil, partially stabilized and fully stabilized.
PERIMETER CONTROLS & PERIMETER STABILIZATION

Perimeter Silt Fence Rows

Silt Fence & Earth Berm

Perimeter Sediment Trap

When the perimeter controls were installed & stabilized the contractor was then allowed to clear the interior (upper portion) of the site. Here you see perimeter stabilization with dense mulch plus grass approaching 95% coverage.

Good Stabilization
Straw mulch completely blankets underlying soil from view.

Poor Stabilization
Soil still visible through the sparse grass and mulch.

About 30% Vegetative Cover

About 75% Vegetative Cover

About 95% Vegetative Cover