

## *Reining in the Storm – One Building at a Time*

### **30 minute script**

(Larry Coffman) *On this slide is Congress' vision of the goal for our nation's water – It is to restore and maintain the chemical, physical, and biological integrity of the Nation's waters. Have we met that goal? I don't think so. Programs for the control of non-point source pollution be developed and implemented in an expeditious manner – 30 years! And we are still struggling with this issue.*

### **Title “Reining in the Storm – One Building at a Time”**

STASIO *Undisturbed by human activity, Virginia's forests and wetlands absorb and filter rainwater. Water seeps into the ground, where it works its way through the soil toward springs and small streams. Released by the soil as sparkling, clean water, it becomes a life-giving source, during both wet and dry years, to thousands of plant and animal species, including humans.*

STASIO *But in areas we have disturbed by cutting down forests; by filling in springs, streams and wetlands; and by covering soil with pavement, lawns and buildings, we have hindered nature's ability to provide us and other life forms with clean water. Pollution, soil sediment, and decaying organic matter were once controlled by forests, wetlands and small streams. They now flow, untreated, into Virginia's waterways. Streams and rivers quickly rise and flood more often than before development occurred. They also flow at lower levels during dry periods. As communities grow, the hard surfaces of rooftops, roads and parking lots, speed the flow of polluted, untreated stormwater into stormdrains or local streams and ultimately down to the Chesapeake Bay.*

STASIO *We now know that damage to our rivers and the Chesapeake Bay is caused by the way we build buildings and develop land. This damage has cost billions of dollars to taxpayers, and resulted in the creation of many government regulations.*

STASIO *For the past thirty years, while population and development has grown in Virginia, professionals have been studying and designing ways to recreate how forests and wetlands slow down and clean Virginia's stormwater. They know we have to recreate the natural rising and falling of streams and rivers during and after storms. They know we need a system of design strategies that will allow us to develop the land, allow us to lead productive lives, and have clean drinkable water all at the same time.*

(Larry Coffman) *I want to introduce to you the father of modern stormwater management – Earl Shaver.*

(Earl Shaver) *We've been implementing our traditional stormwater controls, but we are still seeing degraded environments in our urban streams. We have to start aiming higher in what we are doing.*

*Imagine you as a human being if 90% of your arteries were clogged & You couldn't have a healthy system. If we don't do a good job on protecting these small streams, in the U.S it is 70 % of all streams are 1<sup>st</sup> or 2<sup>nd</sup> order streams – **so that is something** we really need to be more aggressive on **is** protection of these small urban streams.*

*The developer came in with a traditional Stormwater treatment pond with 128 lots. We worked with the developer and said can we give you a better design? It lowered the peak runoff for a 2-year storm by 21%, just by how you develop the land. His yield went from 128 lots to 138 lots. And that the subdivision costs dropped by \$1.5 million. What's interesting in the project is that the profit margin for the developer went from 24-34%. So he made more money with less impact. I mean it's a win-win situation.*

STASIO *Designing a system that recreates nature's water-cleaning methods, that allows communities to grow and prosper, that protects our streams, rivers and the Chesapeake Bay, that holds the cost to developers rather than taxpayers is called **Low Impact Development***

(Larry) *"Low Impact Development involves a lot of various techniques. We are here at an elementary school where we used all of the techniques. There are really 5 steps to LID.*

(Larry ) *"The first step with LID is conservation. I'm standing in front of 5 acres of trees we were able to save on this site, just through sensitive site planning. Of course it is important to save the trees, because of the habitat value, because it plays an important role in recycling nutrients and to maintain the water balance on the site on the site."*

STASIO *And in Virginia, developers are learning that they too can make more money by conserving land and making more efficient use of land.*

(Rick Dengler, Brookfield homes) *We purchased the property at Camp Glenkirk which consists of 227 acres on the shores of Lake Manassas. We decided to spend the money up front and more detailed engineering to arrive at a more environmentally-sensitive land plan for this community. This site is quite unique. It has an eagle's nest on it. A matter of fact – two eagles nests and it has a majority of the site is wetlands. And so by spending the money up front, and the engineering, we were able to come up with a land plan that saves 55% of space in open space and becomes very environmentally-friendly, which we think is a very strong market place to sell homes. By using some of the Low Impact Design techniques that are on the market place today, many of those techniques are very, very advantageous to the developer, and we find them financially-rewarding to*

*us, too. And we find that they will be most advantageous to the homeowner and the consumer at the end.*

*(James Baish, Land Planning and Design Group) One of the initial concepts we had for the project was to do a cluster design which would cluster and condense the area for home ownership to a smaller portion of the site, rather than lot it out over the entire site. That gave us control over the preservation of the open space and trees that we have on the property.*

*(Larry) The second part of LID is the minimization of impacts and this is a good example of it, instead of paving. On this maintenance road we use a grass pave block system that still allows water to soak down into the ground so that we can also treat it and recharge the surface, rather than use a hard surface that would prevent water from getting into the ground.”*

*STASIO There are now alternatives to pavement for roads, driveways and parking lots that receive only occasional usage. These grass-covered structures are strong enough to hold a large vehicle, absorb most rainwater, and are much more attractive than paved or gravel surfaces.*

*STASIO A recent study found that the damage done to water quality by every square foot of pavement must be offset by 6 square feet of heavily planted landscape. The most efficient approach to protect our water is to reduce the amount of pavement and the footprint of buildings.*

*(Larry) “The 3<sup>rd</sup> part of LIDs is slowing the water down by taking the downspouts and disconnecting them from the pipe system and allowing it to drain out onto the landscape.*

*(Earl) Another practice that we use is house water tanks. If you think that over 60% of the water you consume in your house goes to toilet, laundry and outdoor use, why do we have to use potable water? I have 2 - 5000 gallon tanks. I have a carbon filter and a sediment filter and that’s all*

*STASIO The first step to collecting rainwater is to calculate how much water runs off of the roof. A 1,000 square foot roof may have 600 gallons of rain water run off for every inch of rain. A rainwater tank that is too small or poorly designed will overflow and create problems for the landowner. And as this seasoned expert says:*

*Kevin Mercer It’s large enough, it’s freeze-thaw tested, it’s UV proof, it’s child-proof, it’s animal-proof, it’s mosquito-proof!*

*(Jason Wisecarver) We have many sizes ranging from 30 gal. up to 15,000 gal. You can get them in all kinds of different sizes, dimensions, also color configurations that match the environment, match the aesthetics of the house and that’s where it becomes very important to look at that type of detail.*

*STASIO Herbert Dreiseitl is designing systems in Virginia that will integrate stormwater into our daily lives, rather than hiding it underground.*

(Herbert Dreiseitl) *I think it is important for people to understand what their water is in front of their doorstep. I think it is important to make it clear that the runoff of water is open to see, is clear for people. They have to get a feeling and understanding of their environment and they have to relate to it. It should also be funny. It should be interesting. It should be part of our culture. It's something for all.*

(Larry) *"The 4<sup>th</sup> step with LID is to use integrated management practices where we create storage. We create storage in the landscapes to recreate the storage that was lost in the development. This is an example of how to lose storage. This isn't an LID technique. See how the landscape is mounded up. So there is no opportunity to treat the water, store it. Essentially, water just runs off and it is disconnected from the parking lot. A good example here of integrated management practices is a rain garden with this landscape island. You can see how it's depressed and how it has vegetation growing in it. Curb cuts allow the water to get into it, where it can be treated and stored and provide stormwater management benefits."*

Asad This design is based on improving water quality on this .6 acre area. This is a good location for a Raingarden. We have a lot of runoff from a parking lot and these rooftops and part of the lot.

(Russell Katz) *All of the stormwater management for this new building is done using LID techniques. The courtyard is the center of the building and also where the stormwater management takes place. The stormwater management takes place in 2 different areas. Where we are standing right now is the green roof. We are on the roof above the sublevels of the building and just to my left we have 3 feet of soil with the plants above. Behind me where I just walked up from is the on-grade bioretention area. There we have 6-7 feet of soil with larger plants. In this system and on this site, every raindrop that falls comes to the courtyard. Either it falls on the roof of the building and comes down through the downspouts you see on the building on the perimeter. It comes down across these shallow runnels in the sidewalks and feeds the surface of the green roof and the bioretention area. The rain that falls in the back in the parking lot which is behind me through the gate is caught in a shallow catchment basin and feeds the surface of the on-grade bioretention.*

(John Tippet) *"What we have here is a one-acre parking lot that drains to the Rappahannock River. There's not much in the way of stormwater management here right now, so we came back and took a look at the site to see where we could apply some LID principles to try to put the water back into the ground and make it function a little more like it did when it was predeveloped forest. This is where the water goes right now and what we are going to be doing is taking this green island here and turning it into a functional filter – biofilter. And that's going to happen right here at the*

*curb cut. The first flush of rainfall is going right through here and come back through this excavated area. We've just begun digging it out. Once we get the rest of this soil removed, we are going to take out the existing soil, because this is not permeable enough to allow the good kind of filtration we want in a biofilter unity. So we are going to take this soil out and fill it up with the standard bioretention profile. Start with gravel to hold the water and then move it up with the bioretention soil mix with mulch on top. The whole thing will be depressed about 6" below grade where it is now. It will probably pond for an hour or so after a storm event. But we've taken this parking lot and made it a lot more functional from an LID perspective."*

**(Stacy Churchill)** *"We're here in my front yard in Stafford County, Virginia. We moved here about 2 years ago, and when we first moved in, we had all kinds of drainage problems. None of this landscaping was here and after heavy rains we had water that would flood and puddle up in the back; and we had a swamp over here to my right. We were able to solve all of those problems and improve our landscaping at the same time by putting in a rain garden here which has added a nice landscaping feature. Some flowers, some trees, looks great. In addition, we put a swale in the back yard. It runs along the width of our back yard. And that has solved the puddling problems in the back and has probably saved the foundation of our house as well. In addition, the final than we have done at the front of our house, we have taken our ditch here and taken out the ugly rip rap rock, put in a swale and covered it with ground cover that will fill on over the years and create an additional beautiful part our landscape." (149)*

**(Katrin)** *This is my private backyard urban, ultra urban backyard habitat. This property I bought about 10 months ago and what you see here did not exist 10 months ago. It was concrete and chain length fence. When it rains, all of the water from the downspout flows into the alley. And would create a stormwater management problem taking sediments and everything else from the alley. Since I bought the property, I just put in bluestone patio, sitting in crushed stone. So it is pervious. But more importantly, all of the stormwater that comes from the downspout for the entire roof runoff is being directed into this bioretention area right here. Excess water, after it pools here is directed via this drainage detail over to this site right here where it is allowed to maintain and to return and to slowly infiltrate into the ground adding to the plant growth. And I have not irrigated this since I planted it in April of this year.*

**(John Tippet)** *We are here in a large commercial parking lot in the City of Fredericksburg and this is where some of the first LID activities took place in the city. One of the things you notice when you first enter into the City. In this area you see the conventional parking islands –over my shoulder*

*and the vegetation there. And contrast that with the bioretention area here in the middle of the parking lot and the vigorous growth that's going on here. This is one of the many value added benefits that come along with bioretention systems, because we are using the stormwater runoff here to irrigate the trees in the parking lot. There is no need for an extensive irrigation infrastructure. That saves money. It also creates much more vigorous growth as the trees remove nutrients from the runoff, grow much more vigorously and create an aesthetic asset in the parking lot. Plenty of shade in what would otherwise really is a sea of asphalt. One of the neat aspects about this project here is that the success of this led the developers on their next project to decide to go ahead and do complete LID across their entire development."*

*(Fay Harwell) "I wanted to show you a little bit of the design that really incorporates the principles of how the water flows and how it has to be caught and brought to these basins. You can see that it comes down the face of the building and into a series of rills, And what we wanted to do was to be able to teach people how water flows through the landscape and not to put it in a closed pipe, but to put it in a system that has some openness and allows the sound of the water to be heard as it rushes down the top of the building into the rills and into these basins where water actually rushes quite fast and there's quite a lot of volume of water coming off the building. And so, the water comes into the rills and then the velocity is slowed down by a series of river cobbles which are natural Virginia river cobbles and it's brought into the basin where it begins to moisten the plantings and then infiltrate back into the ground. So the system works. It is the kind of system that's been around for thousands of years. And we're really kind of coming back to that after having paved and piped water for many, many years, since the 1940s."*

*(Mark Chambers) We're here today at the Baker-Butler School to see the biofilter installed in 2002 to treat runoff from the bus loop in the parking area. All of the stormwater from the bus loop and parking area enter the biofilter, then this curb cut. This stone dissipation channel takes some of the energy before it enters the biofilter. In this biofilter, the school wanted a lawn, so instead of shrubs and hardwood mulch, we planted grass and large trees.*

*(David Hirschman) The University of Virginia did a study on this biofilter on the removal of pollutants and came to measure the water coming off the parking lot. But when they came here to measure the water coming out – very often – there wasn't enough water coming out. So that shows how effective these biofilters can be at stormwater treatment.*

*(Emily Ayers) The soil mix that we've used in this Rain garden was a sterile purchased mix of that contained a very large amount of sand and very*

*little organic material. And no soil animals whatsoever! So what happened over time was that silt contained in the runoff coming off this parking lot flowed onto the surface of this soil and compacted the soil down and created an impermeable layer on the top. What would happen in a natural soil is that earthworms would burrow around in the upper layers of the soil and they would mix this silt into the soil matrix. Now the problem here is that there are no earthworms in this soil and very little organic matter and so when the silt washes in, nothing happens. My advice to anyone building a Raingarden is to add a lot of organic matter and import a lot of worms.*

*STASIO Vegetated or green roofs have also been used for thousands of years. These green roofs, just outside of Washington, D.C., were built in the early 1970s and represent the ancient theory of green roofs. A new style of green roof is light-weight and can be built onto already existing buildings. Some countries now require green roofs on all new buildings. These roofs are quickly becoming popular in Virginia for their stormwater value, the superior way they insulate the building, their longevity, and the way they look.*

*(Katrin Scholtz-Barth) Green roofs are one of the most effective technologies in urban areas available to you to manage your stormwater. Green roofs are very effective technology because it retains water, it filters water, it delays water, and it reduces temperature of urban runoff. It also takes up some of the nutrients that would otherwise be washed into our urban streams as a non point source pollution.*

*(Jeanette) – Hi – Come on Up! The roof is a year old. A week after it was installed, Isabel hit, it did just fine, it survived the winter. The building is about 36 years old. I expect to get 40+ years out of this green roof. We've taken 4,500 square feet of impervious surface and turned it into a pervious surface. This roof was constructed strictly for the longevity of the roof, to save the community money, to decrease the cost of heating the building for the stormwater management.*

*STASIO Where pavement is necessary, there are products that allow water to pass through them into a specially prepared underground system.*

*(James) We also have a unique design to the way we handle the runoff. We have an open section six-foot grass ditch that occurs along both sides of the street, which is a pervious surface, rather than curb and gutter. This converts to 4.2 miles of swale along both sides of the street, which is a pervious surface allowing infiltration to occur the entire length of it, as well as reducing the velocities from a curb and gutter situation. That 3 acres is an area we can flow water and reduces the velocity as well.*

*(Larry) "The 5<sup>th</sup> step is to provide public education and outreach*

**STASIO** Education includes teaching how to prevent pollution and soil sediment from entering our stormdrains and stream. Education also includes showing how Low Impact Development designs are cost-effective and attractive opportunities for land owners and developers. Prevention through education is the least expensive way to keep our waters clean.

(David Hirschman) *We're at Monticello High School in Albemarle County. We're looking at the very 1<sup>st</sup> biofilter that was installed in this whole area of Virginia, and the County did it as a demonstration project to basically show what this biofilter technology is all about and to promote it to the private sector. One of the great things about this particular biofilter is it is used as part of the educational process in the school.*

**STASIO** *Low Impact Development workshops are gaining popularity and have been very effective in helping government staff, architects, contractors and developers support these new designs.*

**STASIO** *Many LID Design competitions are being funded by government agencies, universities and Builder Associations in a successful attempt to encourage more professionals and students to gain skills in this field. F –*

(Meredith Upchurch , VA Tech) *I'm part of the team that took 2<sup>nd</sup> place in the national student LID Competition. This is showing our proposed design for the Virginia Tech Architecture School. The theme of our project is fabrics of the land and it's talking about interweaving water and how it runs through the land. So, we wanted to show before diagram and then we have a diagram showing the water flow with our proposed design. We found we were able to reduce the runoff from the building by about half.*

(Neil Weinstein) – *"Pilot projects are really a critical thing in watershed restoration. You really have to show – no matter where I go, Oh it's an East Coast thing, It's a west coast thing, It won't work here – You really have to get some in-ground examples.*

**STASIO** *Everything made by people needs maintenance to perform well over long periods of time. Low Impact Development projects are no different. Education doesn't stop when a project is built. Successive landowners must understand the purpose and requirements of their stormwater facilities.*

(Tom Wasoff) *We're walking by the site of the Commonwealth's first Raingarden created in 1994. As you can see, flows down along the curb and along the curb, an then there is this curb cut where it then flows into the basin. We've just got the problem with the invasive species, English Ivy, but that's going to be rectified with more education and maintenance.*

(Tom) *These rain gardens were constructed in 1996 and they are on private land and the actual homeowners are responsible for maintenances. As you can see, it is not functioning It's been barricaded on 3 of its sides. It will no longer allow the water to properly flow in from the driveway and*

*from the roof. It is not functioning properly. It does not have the correct vegetation. The plantings are not right, so the City has really learned a lot. It understands these homeowners need to be educated and the City has to have in place a good plan for enforcement.*

*STASIO Landowners, contractors and local government all play a role in enforcing contracts and agreements to insure that these Low Impact Designs are constructed correctly and perform well for many years.*

*(John Tippett) – One of the important aspects of LID that's particularly important is construction oversight during the construction phase. I think this site is really a good example. Construction just began this morning. And although construction specs say not to do this curb cut here until the very end of the project, it actually got done right at the beginning and because of that, we've got to be extra careful to make sure water doesn't get in here or else we are going to end up with a real mess. So it's a good example of how important it is to be out on site when these are being constructed, because a little error like this can end up causing a failure with your project.*

*(Earl) We found that the greatest impediment to LID is reliance on infrastructure, manuals, code, and practice. They are the ones that have the parking ratios, the street widths and all of them have to be updated if we are going to move in this direction.*

*(Pete Fields) Stafford County was the 1<sup>st</sup> county in the Commonwealth of Virginia to enact LID as part of our stormwater ordinance. After we made it part of our stormwater ordinance, we made it part of our planning and zoning ordinance, so that it would be as easy as possible to use LID. This year we have taken it one step further. We've made LID now required as the basic approach to Stormwater management, so stormwater management is Low Impact Development in Stafford County, Virginia. Many stormwater structures are expensive to maintain. Many of the conventional ones are failing and may never be working properly. LID allows a multitude of situations that better fits the land or the nature of the development.*

*STASIO Only through the partnership of landowners, contractors, and the government can this change begin. The quality of our water depends upon our ability to construct buildings and develop Virginia's land. It must be done in a way that does not pass the costs of building to downstream taxpayers. Low Impact Development allows nature, as it did for millions of years, to provide, once again, an abundance of clean, life-sustaining water.*

- **FINAL CREDITS INTERSPERSED WITH SCENES AND OUTTAKES**