The Monthly Dirt
A monthly newsletter on the California Construction General Permit

TREAT MENT TRAIN

An effective & affordable treatment option

Don't you just wish there was a way you could treat storm water effectively without breaking the bank? And while this might not be a cure-all or the best option for your site's unique challenges, it's definitely a BMP treatment option worth considering since not only is it affordable, quick and easy to install, but is also effective at reducing pollutant loads in storm water discharges. In this month's edition of **The Monthly Dirt,** we are going to look at a treatment option that is made up of a train of simple and effective BMPs. It's something you can try at your site for under $1000 and a couple hours of labor.

The Problem: What usually happens when you mix rain with disturbed soil? A nasty sediment problem. And attempting to clean the sediment-laden storm water before it leaves your site can feel like trying to stop a freight train. So, now that we've got a sediment problem on our hands, let's start off by talking about turbidity and how an effective filtration strategy works. What is turbidity? Turbidity describes the cloudiness or haziness of a fluid, which is typically caused by a large number of suspended particles. For storm water, turbidity is usually tested by a field instrument which shines a beam of light through a glass vial containing a water sample. The results are reported in NTUs (Nephelometric Turbidity Units). Note that turbidity is different than Total Suspended Solids – while they generally measure the same thing, they are fundamentally different analytical tests and are used for different purposes. (Total Suspended Solids is determined by passing a measured amount of water through a preweighed filter (typically glass-fiber) with a specified pore size. The filter is then dried and weighed. The difference between the two weights is the TSS result – reported in milligrams per liter, or mg/L.) Unless the turbidity is caused by a colloidal suspension (e.g., colloidal clay), the sediment particles that cause the water to be turbid will eventually settle out if the water is not disturbed. So, a good way to treat high turbidity is to create an area where storm water runoff can slow down, and sediment can settle out. Enter the treatment train which accomplishes this by using compost socks to create multiple "pools," and by using layers of filtering material within the pools to disperse and slow down the water flow and encourage sediment to settle out. To prevent additional turbidity problems from arising within the treatment train, the ground beneath the treatment train is fully lined so as to create a temporary swale.

The Backstory: In 2017, we were performing storm water inspections for the construction site of a subterranean parking garage. Not long after concrete was poured, over three inches of rain was dumped on the site, which resulted in the parking garage filling with water. Because of the recent concrete work, the pH of the impounded storm water was in the upper 10s, well above the Construction General Permit's numeric action level (NAL) of 8.5. The contractor needed to get rid of the water but did not know what to do. Our company had been experimenting with something we called a treatment train. We knew it would work, but we were not sure for how long or how much water could be effectively treated. But since the contractor had no other viable options to quickly resolve the situation, when he heard about our trial system, he asked if we would try it out at his site. So, we installed it in a matter of a few hours and soon had water passing through it. This early prototype of a treatment train consisted of a water chute constructed on plastic sheeting with fiber rolls rolled up in the plastic, forming the chute's walls. We constructed three 4-foot by 6-foot cells separated with compost socks. The cells were filled with clean, undyed redwood mulch.

There was a final sand filter bay placed at the discharge end of the treatment train. It worked! Well, actually it worked too well. The pH was not only lowered below the upper NAL but also descended below the lower NAL of 6.5. So, we backed off on the use of the redwood mulch and found a sweet spot. The turbidity was also very acceptable—the water being fairly clear except for some coloration from the natural tannins of the mulch. We ended up treating 60,000 gallons of water with the original media. That's not bad for a few hours of labor and under $500 of material costs!

The Blueprints: The treatment train can be designed and built to the size of your project, and the amount of sediment you need to remove. The general idea is to isolate the storm water outfall so that all of the storm water has to pass through the treatment train before discharging. Using fiber rolls, compost socks, or hay bales, create a "chute" to direct water into the outfall. Line the chute with black visqueen, making sure to wrap it over the sides of the chute. Section off a number of pools within the chute using compost sock check dams that are two socks wide and two socks high, installed in a backwards U configuration. The compost sock check dams in between the "pools" play an important role in treating storm water runoff. Compost is a very versatile and effective filtration media and is capable of reducing or removing a large number of pollutants—including nutrients, metals, hydrocarbons, and even bacteria. The heavy socks also help slow the water down in between the pools. In later versions of the treatment train, we have found that we get better performance when we stack an additional layer of compost socks over each check dam. The extra weight helps ensure that water is flowing through the socks instead of undermining them. We also started using passive treatment chemicals in the forebay where we get mixing of the influent water. The secured polyacrylamide (PAM) blocks dissolve in this bay and coat the suspended particles. The PAM then makes the particles more likely to be trapped by the downstream media. It also helps to clog any small gaps in the media or along the walls that might let a slipstream of untreated water through. Don't forget that when passive treatment chemicals are utilized, it should be done in accordance with Attachment G of the permit. See this past Monthly Dirt article for more on this topic.

Once the treatment train is set up and the pools are partitioned off by the compost socks, it's time to add a layer of treatment media to each pool. Our typical treatment media sequence is to start with wood mulch in the first pool (and include the polyacrylamide blocks here if using those), then sand, and end with river rock right before the outfall. Be sure to always install sand downstream of the wood mulch to prevent the mulch from causing any sediment problems of its own. Wood mulch—especially redwood or cedar mulch—is very effective at lowering pH numbers. Wood mulch not only helps lower pH but can also physically trap sediment particles and help with turbidity issues. However, wood mulch has a limited lifespan for reducing pH, and will need to be occasionally replaced, usually when you start noticing that your pH results are starting to climb back up.

How much space do you have available for installing a treatment train? A minimum area of 30 feet long by 8 feet wide is typically needed.

What is the anticipated flow rate that you are needing to treat? The limiting factor of the flow through (treatment) rate are the compost socks. An 8-inch diameter compost sock has a flow through rate of 7.5 gpm/linear foot, and a 12-inch diameter sock has a pass through rate of 11.3 gpm/linear foot. If you stack the socks two-high, you have doubled the flow-through capacity.

What kind of sand should I use? Select a clean, coarse sand. We prefer buying bagged sandbox or playground sand from a home improvement store.

A treatment train is not a magic bullet. Depending on your project site, sediment particle size, and sediment loads, it might work great – or it might not work at all. Again, treatment trains are not active treatment systems, and there will be situations where an active treatment system is the only treatment solution that will work. But before you spend the money to rent an active treatment system, it's worth checking out a treatment train. For under $1000 in materials and just a few man hours for installation, you could bring your numbers back under control.

Please contact us if you have any questions ...

The Monthly Dirt

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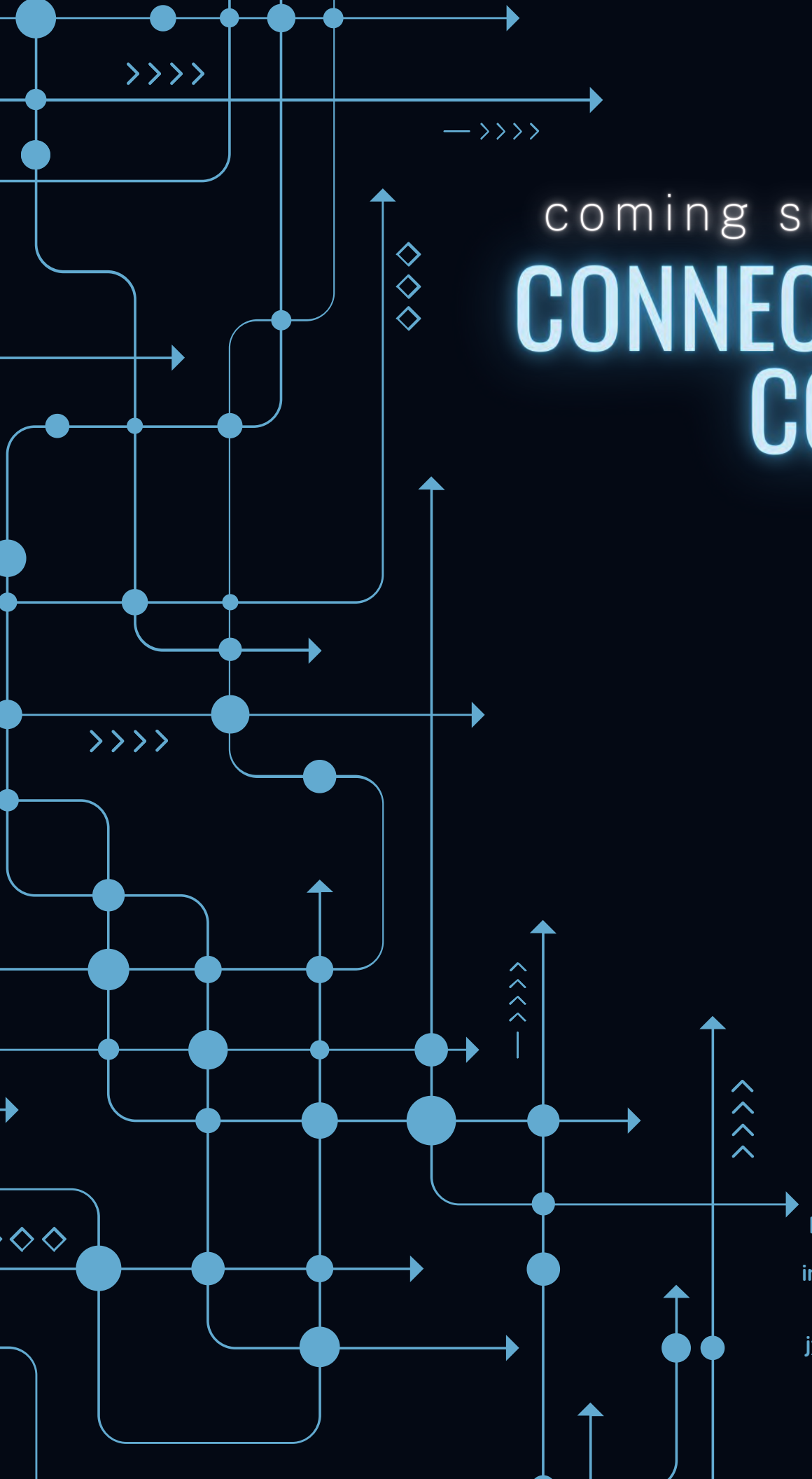

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