Canvassing the Urban Landscape

Overcoming site challenges to control sediment

By Joel Jonker, CPESC

Projects in urban environments often require a different approach to sediment control than greenfield development. Space restrictions, extensive hardscaping, a rapidly moving project schedule and the existence of non-standard drain inlets created unique requirements for a high-profile project in Denver.

Recent experiences in the heart of Denver have reminded participants that some work requires not only all of the standard best management practices (BMPs) common to a linear project, but also BMPs tailored to specific project constraints. The tasks of the aforementioned high-profile project included utility replacements that ran under streets in commercial, retail and residential neighborhoods and that used a combination of trenching and boring.

The location and scope of the project created a set of constraints that led to the need for an unusual set of sediment control BMPs on site. The site used erosion control measures and procedural BMPs as needed, but this article will focus on the sediment control aspects.

Site Constraints

The project constraints largely were the result of the urban environment. For example, there was no space for sediment control basins because the project was surrounded by developed properties. Furthermore, the contractors performing the work had very narrow limits of construction, so placement of trench spoils posed a challenge.

Another factor typical of the urban environment was the extent of paved surface in the project area. Asphalt-paved streets, concrete curb and gutter, sidewalks and driveways dominated the work zones. This high level of impervious area meant that vegetative buffer generally was not available. In addition, sediment control BMPs that require trenching and staking only could be used in a small percentage of the landscaped work area.

The pace of the project became a factor in BMP selection and use. Workers used a combination of trenching in the streets and boring when necessary, with bore pit locations up on the landscaped areas behind the curb. Depending on the method and location, workers moved from around 100 ft per day to several hundred feet on the best production days. Stockpiles of trench spoils most often were replaced at the end of the day, but existed on site during the day and occasionally overnight.

The location and scope of this high-profile sediment control project in Denver created many unique challenges, such as space concerns.

Given the pace of crew movement, any BMP used for stockpile protection had to be able to be relocated quickly and easily. This requirement, and the fact that most stockpiles were located on pavement where typical trenched installation was not feasible, often eliminated silt fence and wattle as options.

The last set of constraints that impacted sediment control BMP selection involved the curb inlets and the requirements of the local flood control district. The existing curb inlets in the project work area often were found near intersections and pedestrian ramps, and they were of non-standard sizes because their installation time frame spanned many decades. Because the local flood control district does not allow the use of below-grade sediment control devices, an entire class of inlet protection devices was not available for use. Any sediment control devices used needed to be durable—as they frequently were driven over by vehicles—and able to adapt to a variety of inlet opening sizes.

Any sediment control BMP that required trenching was not feasible, and the "rock burrito" style inlet protection that is common in other Colorado locations was too labor-intensive to be economically viable in this situation, where the inlet protection device might be needed for only a few days or weeks.

Practices Employed

The project utilized a variety of sediment control practices. Some were in place from the beginning of construction, and others evolved from experience. The ability to adapt to the situation was an important value itself, and almost could be considered a BMP. Teamwork and communication were critical, too, because the project team included multiple contractors, regulators, inspection companies and BMP contractors. Everyone involved stepped up and participated, even when it pushed the comfort zone envelope.

As for the structural sediment control BMPs, seven practices were implemented:

1. ***Sediment removal.*** This proved to be an effective practice on site. In some trench locations where the fill material was to be imported flow fill, workers placed spoils from excavation

directly into waiting dump trucks. Because this material never touched the pavement, there was zero risk of sediment being carried to an inlet by a storm event.

2. ***Daily sweeping/cleaning.*** Per city and county requirements, paved areas with any sediment deposit were required to be swept "as needed." At a minimum, this included end-of-day cleanup.
3. ***Stockpile location.*** Where possible, spoils from trenching were placed up-slope from the open trench. In practice, this meant that trenching—typically occurring 6 to 8 ft from the curb—was placed closer to the street centerline, but not past the crown of the street. In this way, any sediment that might have come off of the spoils pile would be captured by the open trench and kept out of the flow line, in which higher-flow velocities might have been harder to control.
4. ***Stockpile management.*** This was a practice that evolved over the course of the project. Over several months and instances of feedback from the local municipality, the primary aspects of proper stockpile handling became a) contained on three sides by BMPs and on the fourth side by the trench; b) kept on one side of the crown of the road to minimize sediment and sweeping; c) having BMPs in place before dirt is stockpiled; and d) hauling off dirt unable to go back in the hole immediately as it came out.
5. ***Rock bag inlet protection.*** Also known as snake bags, these woven polypropylene bags were

Due to the extent of impervious project area, vegetative buffer generally was not available.

filled with gravel or stone. The stone gave the bags enough weight to prevent movement in high-flow situations, and the stone combined with the fabric allowed for some filtering, although the primary function was to pond water and allow sediment to settle out. The bags sustained repeated damage, but they were repairable.

6. ***Rock bag check dams.*** The detail for each inlet called for three or four check dams in the flow line up-slope from the inlet. Inlet protection was designed to follow state-recommended guidance, the inlet protection device being a second- or third-level protection. The checks in the flow line received the majority of the sediment, thereby minimizing maintenance of the inlet protection devices and ensuring redundancy in case of failure.
7. ***"Big Reds."*** For temporary stockpiles—typically on pavement in this project—and for situations where use of the trench as a BMP was not possible, the team used BMPs called Big Reds or an equivalent. These are tubular bags filled with shredded recycled rubber.
8. Key advantages to this BMP were the ability to conform to the pavement without the need for trenching or staking. They are quite portable, with each 10-ft bag featuring two lift straps. This allowed the pipeline workers to self-install quickly without the need to mobilize the BMP contractor. Over the course of the project, more of these bags were used in lieu of rock bags.

Lessons Learned

This project's urban environment created the need for a unique set of sediment control BMPs. The project team adapted to site conditions and modified the original plan as needed to minimize the risk of sediment in the storm water. In the end, procedural BMPs such as scheduling, stockpile removal and daily cleanup contributed to the overall sediment reduction, in concert with the structural sediment control BMPs used on site. SWS

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