exposed soils. In addition, stream channels and other sources of water that may discharge into a pit or quarry should be diverted around that area to prevent contamination.

Overburden, Waste Rock, and Raw Material Piles—Overburden, topsoil, and waste rock, as well as raw material and intermediate and final product stockpiles should be located away from surface waters and other sources of water, and from geologically unstable areas. If this is not practicable, surface water should be diverted around the piles. As many piles as possible should be revegetated (even if only on a temporary basis). At closure, remaining units should be reclaimed.

BMPs can be used to control total suspended solids levels in runoff from unvegetated areas. These can include sediment/settling ponds, check dams, silt fences, and straw bale barriers.

Reclamation Activities—When a mineral deposit is depleted and operations cease, a mine site must be reclaimed according to appropriate State or Federal standards. Closure activities typically include restabilization of any disturbed areas such as access or haul roads, pits or quarries, sedimentation ponds or work-out pits, and any remaining waste piles. Overburden and topsoil stockpiles may be used to fill in a pit or quarry (where practical). Recontouring and vegetation should be performed to stabilize soils, and prevent erosion.

Major reclamation activities such as recontouring roads and filling in a pit or quarry can only be performed after operations have ceased. However, reclamation activities such as stabilization of banks and reseeding and revegetation should be implemented in mined out portions, or inactive areas of a site as active mining moves to new areas.

EPA recognizes that quarries are frequently converted into reservoirs or recreational areas, after the mineral deposit is depleted. However, this does not preclude the reclamation of disturbed areas above the quarry rim.

(1) Discharge Diversions. Discharge diversions provide the first line of defense in preventing the contamination of discharges and the subsequent contamination of receiving waters of the United States. Discharge diversions are temporary or permanent structures installed to divert flow, store flow, or limit storm water runon and runoff.

These diversion practices have several objectives. First, diversion structures can be designed to prevent otherwise uncontaminated (or less contaminated) water from crossing disturbed areas or areas containing significant amounts of

contaminated materials, where contact may occur between runon and significant materials. These source reduction measures may be particularly effective for mineral mining and processing operations to prevent runon of uncontaminated discharges from contacting exposed materials and/or reduce the flow across disturbed areas, thereby lessening the potential for erosion. Second, diversion structures can be used to collect or divert waters for later treatment if necessary. The usefulness of these control measures are limited by such factors as the size of the area to be controlled and the type and nature of materials exposed and precipitation events.

Diversion dikes, curbs, and berms are temporary or permanent diversion structures that prevent runoff from passing beyond a certain point, and divert runoff away from its intended path. Dikes, curbs or berms may be used to surround and isolate areas of concern at mineral mining and processing sites, diverting flow around piles of overburden, waste rock, and storage areas, to minimize discharge contact with contaminated materials and to limit discharges of contaminated water from confined areas.

(2) Drainage/Storm Water Conveyance Systems. Drainage or storm water conveyance systems can provide either a temporary or a permanent management practice which functions to channel water away from eroded or unstabilized areas, convey runoff without causing erosion, and/or carry discharges to more stabilized areas. The use of drainage systems as a permanent measure may be most appropriate in areas with extreme slopes, areas subject to high velocity runoff, and other areas where the establishment of substantial vegetation is infeasible or impractical. For instance, several BMPs described below may be useful storm water and erosion control methods applicable to road construction and maintenance activities.

Channels or Gutters—Channels or gutters collect storm water runoff and direct its flow. Like diversion systems, channels or gutters may act to divert runoff away from a potential source of contamination, but may also be used to channel runoff to a collection and/or treatment area including settling ponds, basins or work-out pits.

Open Top Box Culverts, and Waterbars—These structures are temporary or permanent structures that divert water from a roadway surface. Open top box culverts may be used on steeply graded, unpaved roads in place of pipe culverts to divert surface runoff and flow from inside ditches onto the

downhill slope of a road. These structures are typically made of wood and should periodically be monitored and repaired if necessary.

Waterbars are berms built by a dozer or by hand to a one to two foot height. They serve to extend the entire width of the road, with a downslope angle between 30 and 40 percent. Waterbars are kept open at a discharge end to allow water to flow away from the road and require little maintenance. These berms may be used as temporary or permanent structures.

Rolling Dips and Road Sloping—Rolling dips and road sloping are permanent water diversion techniques installed using natural contours of the land during road construction. These BMPs prevent water accumulation on road surfaces and divert surface runoff toward road ditches which then convey the storm water to ponds or other management areas.

Roadway Surface Water Deflector—A roadway surface water deflector is another technique to prevent accumulation of water on road surfaces. The structure uses a conveyor belt sandwiched between two pieces of treated wood and placed within the road to deflect water. This is a useful technique for steeply graded, unpaved

roads. *Culverts*—Culverts are permanent surface water diversion mechanisms used to convey water off of, or underneath a road. Made of corrugated metal, they must extend across the entire width of the road and beyond the fill slope. Additional erosion control mechanisms may need to be installed at the discharge end of the culvert.

(3) Runoff Dispersion. Drainage systems are most effective when used in conjunction with runoff dispersion devices designed to slow the flow of water discharged from a site. These devices also aid storm water infiltration into the soil and flow attenuation. Some examples of velocity dissipation devices include check dams, rock outlet protection, level spreaders, and serrated and benched slopes.

Check Dams—Check dams are small temporary dams constructed across swales or drainage ditches to reduce the velocity of runoff flows thereby reducing erosion and failure of the swale or ditch. This slowing reduces erosion and gullying in the channel and allows sediments to settle.

Check dams may be installed in small temporary or permanent channels where vegetation of the channel lining is not feasible and where there is danger of erosion. These may be areas where installation of nonerosive liners are not cost effective.