United States Department of the Interior

FISH AND WILDLIFE SERVICE
Mountain-Prairie Region
134 Union Blvd, Suite 670
Lakewood, Colorado 80228-1807

IN REPLY REFER TO:
FWS/R6/ES/COFO

Project code: 2022-0065745

December 28, 2022

Stephanie Gibson
Federal Highway Administration – Colorado Division
12300 West Dakota Avenue, Suite 180
Lakewood, Colorado 80228

Dear Ms. Gibson:

The U.S. Fish and Wildlife Service (Service) received your request to initiate programmatic formal consultation on July 18, 2022. The purpose of the biological conference is to determine the degree of impact the Federal Highway Administration (FHWA)/Colorado Department of Transportation (CDOT)'s actions may have on the monarch butterfly (*Danaus plexippus*) (monarch), a federal candidate species. This letter transmits our conference opinion regarding the proposed action in accordance with section 7 of the Endangered Species Act (ESA) of 1973, as amended (16 U.S.C. 1531 *et seq*.) and the Interagency Cooperative Regulations (50 CFR 402).

In this conference opinion, we find that the proposed action is not expected to jeopardize the continued existence of the monarch. We base this conference opinion on the July 18, 2022, biological conference prepared by CDOT, as well as any additional clarifying correspondence.

Consultation History

Events relating to the consultation history for this formal consultation are as follows:

- On December 17, 2020, the Service issued a 12-month finding that the monarch was warranted but precluded from listing under the ESA (85 FR 81813, 2020-27523). This action gave the monarch candidate status. While not required by law, it is FHWA's policy to treat candidate species as though they were listed making it necessary to include the insect in most biological clearances and assessments with the goal to minimize or avoid adverse impacts to the species.

- Between April and November 2021, the CDOT/Service liaison, CDOT and FHWA staff discussed various options to address transportation project impacts on the monarch state-wide. It was determined that the best option would be to devise a programmatic biological conference.

- The Service received your biological conference on July 18, 2022.

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CONFERENCE OPINION

On July 5, 2022, the U.S. District Court of the Northern District of California vacated the 2019 regulations implementing section 7 of the Endangered Species Act (ESA). On September 21, 2022, the Ninth Circuit Court of Appeals granted a request to stay the U.S. District Court of Northern California's July 5, 2022, order that vacated the 2019 ESA regulations. As a result, the 2019 regulations are again in effect, and the Service has relied upon the 2019 regulations in rendering this conference opinion. However, because the outcome of the legal challenges to 2019 ESA Regulations is still unknown, we considered whether our substantive analyses and conclusions in this consultation would have been different if the pre-2019 regulations were applied. Our analysis included the prior definition of "effects of the action" among other prior terms and provisions. We considered all the "direct and indirect effects" and the "interrelated and interdependent activities" when determining the "effects of the action." As a result, we determined the substantive analysis and conclusions would have been the same, irrespective of which regulations applied.

1. DESCRIPTION OF THE PROPOSED ACTION

This programmatic conference opinion addresses the construction and improvement of highways, bridges, trails, enhancement projects, and other appurtenances that have a nexus to the FHWA (hereafter referred to as "Transportation Projects") that occur within CDOT rights-of-way (ROW). A complete list of the approximately 100 common CDOT actions that have a nexus to the FHWA are provided in Appendix A of this opinion and the biological conference report.

1.1. Conservation Measures

Conservation measures are actions outlined in the project description that the project proponent will implement to reduce the environmental impacts of the action or promote the recovery of threatened and endangered species. The Service considers the beneficial effects of these conservation measures during the jeopardy and adverse modification analyses. Conservation measures are part of the proposed action, and their implementation is required under the terms of this consultation.

CDOT maintenance staff typically maintain ROWs with mowing to prevent the spread of invasive species and to keep ROWs clear for any additional maintenance needs. Mowing at specific times of year and following specific mower blade heights can minimize impacts to the monarch and other pollinator species when these activities are undertaken. Seasonal mowing (mid-spring) may be beneficial for the monarch and other pollinators because reduction in the growth of weedy cool season grasses would benefit the native, warm-season grasses that are used as host plants by butterflies (Moffat and McPhillips 1993). Larvae may be feeding on plants within CDOT ROWs in which case adjusting a mower blade to a height of six inches can allow for low-growing flowers and grasses that provide a food source for larvae to persist. This also allows for quicker regrowth which can benefit larvae and monarch butterflies (Wisconsin DNR 2000).

CDOT will undertake the following conservation measures to minimize impacts to the monarch during routine construction and maintenance statewide:

1. All revegetation will consist of native plant seed including forbs.

2. Unless needed for human safety reasons, mowing will be restricted to one mower width in zone 1, the zone nearest to the roadway surface.

3. Mower height will not be set to less than six inches.

4. If mowing zones 2 and 3 are deemed necessary, they will be mowed after August 1 and before April 15 to minimize the number and type of blossoms on flowering plants and to allow milkweed to mature. In Colorado, milkweed typically blooms from May through September, with the majority of species completing their blooming cycle by the end of August.

2. ACTION AREA

The action area is not only the immediate area involved in the action, but also includes all areas to be affected directly or indirectly by the federal action (50 CFR § 402.02). The action area contains the most far-reaching potential effects of the federal and non-federal actions on the species being discussed. The action area is defined by measurable or detectable changes in land, air, and water or to other measurable factors that would result from the proposed action. In other words, the action area is not limited to the "footprint" of the action, but rather encompasses the biotic, chemical, and physical impacts to the environment resulting directly or indirectly from the action.

The action area for the proposed action includes the entire state of Colorado. According to the Service, every county in Colorado is considered to have the potential to have monarch occurrences. It is known that monarch butterflies can overwinter in areas of approximately 9,000 feet in elevation in parts of Mexico (Solensky 2004). The state of Colorado includes elevations upwards of 14,000 feet, but CDOT did not find any information that would suggest monarchs have an upper elevational limit. For the purposes of the biological conference, CDOT determined the entire state could provide suitable habitat for monarch migration, foraging, and reproductive purposes.

3. STATUS OF THE MONARCH BUTTERFLY

The status of the species is based on an analysis of appropriate information on the species' life history, habitat and distribution, and other data on factors related to its survival and recovery. This analysis considers the effects of past human and natural activities or events that have led to the current condition of the species. This information is usually presented in listing documents and refined in recovery plans (Service and NMFS 1998).

The Service published its decision that the listing of the monarch butterfly was warranted by precluded by higher priority listing actions on December 15, 2020. Now that the monarch is a candidate species its listing will be reconsidered in 2024, or earlier if warranted. The Service

recently completed a Species Status Assessment (SSA) for the monarch as part of its evaluation (Service 2020). Status information presented here is taken largely from the SSA.

3.1. SPECIES DESCRIPTION

The monarch is a species of butterfly in the order Lepidoptera (family Nymphalidae) that occurs in North, Central, and South America; Australia; New Zealand; islands of the Pacific and Caribbean; and elsewhere (Malcolm and Zalucki 1993). Adult monarchs are large and conspicuous, with bright orange wings surrounded by a black border and overlayed by black veins. The black border has a double row of white spots, present on the upper side and lower side of forewings and hindwings (Bouseman and Sternberg 2001). Adult monarchs are sexually dimorphic, with males having narrowing wing venation and scent patches (CEC 2008). The bright coloring of a monarch serves as a warning to predators that they can be toxic.

3.2. LIFE HISTORY AND RESOURCE NEEDS

Monarchs lay their eggs on their obligate milkweed host plant during the breeding season and larvae emerge after two to five days (Zalucki 1982, CEC 2008). Larvae develop through five larval instars (intervals between molts) over a period of nine to 18 days, feeding on milkweed and sequestering toxic steroids as a defense against predators (Parsons 1965). The larva then pupates into a chrysalis before emerging six to 14 days later as an adult butterfly. There are multiple generations of monarchs produced during the breeding season, with most adult butterflies living approximately two to five weeks. Overwintering adults suspend reproduction and live six to nine months (Cockrell et al. 1993, Herman and Tartar 2001).

The monarch life cycle varies by geographic location. Monarchs breed year-round in many regions where they are present and repeat the above-referenced life cycle throughout the year. Individual monarchs in temperate climates, such as eastern and western North America, undergo long-distance migration, where the migratory generation of adults suspends reproduction and lives for an extended time (Herman and Tartar 2001). In the fall, in both eastern and western North America, monarchs begin migrating to overwintering sites. This migration results in monarchs traveling distances of over 1,800 miles and lasts for over two months (Urquhart and Urquhart 1978, Brower 1996). Migratory individuals in eastern North America predominantly fly south or southwest to mountainous overwintering grounds in central Mexico, and migratory individuals in western North America generally fly shorter distances south and west to overwintering groves along the California coast into northern Baja California (Solensky 2004). Data from monarchs tagged in the southwestern states in the fall suggest that those in Nevada migrate to California, those in New Mexico migrate to Mexico, and those in Arizona migrate to either Mexico or California (Southwest Monarch Study Inc. 2018). Surviving monarchs mate at the overwintering sites before dispersing in mid-winter to early spring (January-March) (Leong et al. 1995, van Hook 1996). The same individuals that undertook the initial southward migration begin flying back through the breeding grounds and their offspring start the cycle of generational migration over again (Malcolm et al. 1993).

3.3. POPULATION, REPRODUCTION, AND DISTRIBUTION

Two North American populations, the migratory populations located east and west of the Rocky Mountains, have been monitored at their respective overwintering sites in Mexico and California since the mid-1990s. While these populations fluctuate year-to-year with environmental conditions, the census data indicate long-term declines in the population abundance at the overwintering sites in both populations.

3.3.1. EASTERN NORTH AMERICAN POPULATION

The eastern North American monarch population has been censused annually since 1994 (Vidal and Rendón-Salinas 2014). Although the population varies year-to-year, monarchs consistently numbered in the hundreds of millions throughout the 1990s and early 2000s (assuming a 21.1 million monarch/hectare density) (Thogmartin et al. 2017a). There are additional survey data suggesting that monarch populations were as high or higher in the two decades prior to standardized monarch monitoring at the Mexican overwintering sites (Calvert and Brower 1986, Vidal and Rendón-Salinas 2014). There has been a steady decline in overwintering area occupied since 1994 with the highest season average of 44.95 acres recorded in 1996-1997 and the lowest season average of 5.19 acres recorded in 2020-2021 (Monarch Watch 2021).

3.3.2. WESTERN NORTH AMERICAN POPULATION

The western North American population has been censused annually since 1997, providing an estimate of annual population size. Similar to the eastern population, data prior to standardized sampling suggest that the western population numbered at least 4 million monarchs in the 1980s (Schultz et al. 2017). The western population has been generally declining over the last 23 years, despite an increasing number of sites being counted (Service 2020). The 2020 data point is the lowest recorded at below 50,000 monarchs (Western Monarch Count 2021, Xerces Society).

3.3.3. HAWAII POPULATION

There is little data available on the population of monarch butterflies that exist in Hawaii. The 2020 SSA noted that the monarch is extant in Hawaii, but there are no known trends in population, milkweed, or nectar sources, impacts from insecticides, or predators/parasites and overall condition (Service 2020).

4. ENVIRONMENTAL BASELINE

Environmental baseline refers to the condition of the listed species or its designated critical habitat in the action area, without the consequences to the listed species or designated critical habitat caused by the proposed action. The environmental baseline includes the past and present impacts of all Federal, State, or private actions and other human activities in the action area, the anticipated impacts of all proposed Federal projects in the action area that have already undergone formal or early section 7 consultation, and the impact of State or private actions which are contemporaneous with the consultation in process. The consequences to listed species or designated critical habitat from ongoing agency activities or existing agency facilities that are not within the agency's discretion to modify are part of the environmental baseline.

This programmatic conference covers the entire State of Colorado which comprises an area of greater than 66 million acres ranging in elevation from a low of 3,315 feet mean sea level (msl) at the Arikaree River in Yuma County in the northeast portion of the state, to a high of 14,440 feet msl at Mount Elbert in Lake County in the central part of the state. The Colorado landscape extends across six ecoregions, defined by the US Environmental Protection Agency (EPA) (2006).

4.1. Status of the monarch butterfly within the Proposed Project and Action Areas

The State of Colorado includes both the Eastern and Western North American populations; located east and west of the Continental divide, respectively. As described above in Section 3.3, monitoring of both populations of monarchs have demonstrated long-term declines in the population abundance at the overwintering sites. These declining trends led to the petition to list the monarch butterfly for protection under the ESA.

The primary threat to monarchs includes the loss of habitat, due to urbanization and land conversion from prairie to agriculture and loss of overwintering habitat in Mexico and California. In Colorado, land conversion and urbanization reduce the amount, quality, and distribution of milkweed and other nectar plants, which monarchs depend on for reproduction and foraging (Ecowatch 2022).

The SSA listed 11 major influences that affect monarch populations (Service 2020, p. 35). Of these 11 factors, seven potentially occur within the action area. These are discussed in more detail below. In Colorado, the trends in influences affecting monarchs are expected to continue into the foreseeable future and may possibly be exacerbated by increasing population growth, increasing land conversion, and continued use of insecticides.

- Availability, spatial distribution, and quality of milkweed
- Availability, spatial distribution, and quality of nectar resources (breeding)
- Availability, spatial distribution, and quality of migration resources
- Insecticide exposure
- Climate change
- Disease and natural enemies
- Road mortality and pollutants

4.1.1. Availability, distribution, and quality of milkweed, nectar resources (breeding) and migration resources

The availability of milkweed is essential to monarch reproduction and survival and reduction in milkweed is a key driver in monarch declines (Brower et al. 2012, Pleasants and Oberhauser 2013, Inamine et al. 2016, Thogmartin et al. 2017b, Waterbury and Potter 2018, Saunders et al. 2019). Much of the milkweed loss has occurred in agricultural lands, where intensive herbicide usage for weed control has resulted in widespread milkweed eradication (Pleasants 2017).

Reduction in other breeding range nectar resources and in migration nectar resources are also a key driver in monarch declines and losses of other nectar resources are due to the same stressors identified for milkweed (Thogmartin et al. 2017b). Milkweed and other nectar sources are also lost on the landscape through development and conversion of grasslands (Lark et al. 2015). While land conversion from prairie to agriculture would predominantly occur on the eastern plains of Colorado overlapping with the Eastern North American population of monarchs, agriculture does occur across the state and could also affect monarchs in the western portion of Colorado.

4.1.2. Insecticide exposure

Insecticides are pesticides with chemical properties that are designed to kill insects. The monarch is widely distributed across Colorado and occurs in a variety of urban and rural habitat types that include milkweed plants and other flowering forbs. Any habitat where monarchs are found may be subject to insecticide use. Use of insecticides in vector control may be significant in areas of Colorado where mosquitoes pose a public health threat or reach nuisance levels.

4.1.3. Climate change

Climate change can affect monarchs directly and indirectly on breeding grounds in Colorado. Increasing temperatures may impact monarch fecundity, mating success, and survival during migration (Masters et al. 1988, Alonso-Mejía et al. 1997, Oberhauser 1997, Solensky and Oberhauser 2009). Laboratory studies indicate optimal temperatures for monarch range from 80.6-84.2°F (Zalucki 1982, York and Oberhauser 2002, Zalucki and Rochester 2004, Nail et al 2015). Temperatures consistently above 91.4-95.0°F are unsuitable for monarchs. High temperatures and drought conditions may be particularly impactful during the crucial spring migration (Chip Taylor pers. comm. 2020). A warming climate in Colorado may influence breeding habitat by altering suitable location for both monarchs and their milkweed host plant (Batalden et al. 2007, Lemoine 2015). Drought may also influence the amount and availability of nectar needed for migrating butterflies (Brower et al. 2015, Stevens and Frey 2010, Espeset et al. 2016).

4.1.4. Disease and natural enemies

Monarchs face pressure from a diverse suite of arthropod predators and predation pressure can be high. In prairie habitats (which in the action area, primarily occur east of the Continental Divide in Colorado), less than 20 percent of eggs and first instars survived a 72-hour period in one experimental period compared to greater than 70 percent survival in corn (Myers et al. 2019).

4.1.5. Road mortality

Negative impacts from roads have been observed for most vertebrate animals but studies on invertebrates are relatively new. One such study documented road mortality of pollinating insects along a 1.2-mile stretch of highway in Ontario, Canada and demonstrated the potential for loss of hundreds of thousands (on the studied highway) to hundreds of billions (across North America) of pollinators (Baxter-Gilbert et al. 2015). More specifically for monarchs, one study estimated autumn monarch roadkill rates within the Oklahoma to Mexico southern migration corridor.

Roadkill averaged between 3.4 monarchs per 328 feet and up to 66 per 328 feet. These numbers represent approximately 3 percent of the overwintering monarch population for the years in which the study was conducted (Kantola et al. 2019). While these studies looked at site-specific effects, the general conclusion is that road mortality is a factor in population declines of pollinators in general, and monarchs specifically, and these factors are also present in eastern and western Colorado.

4.2. Regulatory Actions under the ESA Completed by the Service for the monarch butterfly

Major conservation plans and regulatory actions include the Mid-America Monarch Conservation Strategy developed by the Midwest Association of Fish and Wildlife Agencies (MAFWA), the Western Monarch Butterfly Conservation Plan developed by the Western Association of Fish and Wildlife Agencies (WAFWA), and the Nationwide Candidate Conservation Agreement for Monarch Butterfly on Energy and Transportation Lands (CCAA/CCA) developed by entities from the energy and transportation sectors and the Energy Resources Center at the University of Illinois-Chicago. While the Mid-America Monarch Conservation Strategy and the Western Monarch Butterfly Conservation Plan do not include any direct conservation actions in the State of Colorado, conservation measures put into place by these plans would protect monarchs and enhance their habitat in portions of their eastern and western populations, respectively, which could result in benefits to monarch that migrate through or breed in Colorado.

The Mid-America Monarch Conservation Strategy established a goal of adding 1.3 billion stems of milkweed on the landscape by 2038 which is estimated to add enough habitat to support 14.8 acres of overwintering population for the eastern population (Pleasants 2017, Thogmartin et al 2017a, MAFWA 2018). The Western Monarch Butterfly Conservation Plan currently encompasses the states of Arizona, California, Idaho, Nevada, Oregon, Utah, and Washington, which comprise the core of the western population range. The plan includes short-term goals of 1) protecting and managing 50 percent of all currently known and active monarch overwintering sites, including 90 percent of the most important overwintering sites by 2029; and 2) providing a minimum of 50,000 additional acres of monarch-friendly habitat in California's Central Valley and adjacent foothills by 2029 (WAFWA 2019). There are many other conservation efforts implemented under agreements, such as the Farm Service Agency's Conservation Reserve Program, and the Natural Resources Conservation Service's Environmental Quality Incentives Program, Wetland Reserve Program, and Conservation Stewardship Program, which will be critical for meeting MAFWA and WAFWA's stated goals.

The monarch CCAA will coordinate and provide guidance to businesses and organizations in the energy and transportation sectors seeking to implement conservation efforts for monarchs in the coterminous United States. In exchange for implementing voluntary conservation efforts and meeting specific requirements and criteria, those businesses and organizations enrolled in the CCAA will receive assurance from the Service that they will not have to implement additional conservation measures should the species be listed. The goal of the CCAA is enrollment of up to 26 million acres of land in the agreement, providing over 300 million additional stems of milkweed (Cardno Inc. 2020).

5. EFFECTS OF THE ACTION

The effects of the action are all consequences to listed species or critical habitat that are caused by the proposed action, including the consequences of other activities that are caused by the proposed action. A consequence is caused by the proposed action if it would not occur but for the proposed action and it is reasonably certain to occur. Effects of the action may occur later in time and may include consequences occurring outside the immediate area involved in the action (see 50 CFR § 402.17).

The main impact to the monarch as a result of transportation projects is permanent loss of habitat due to the conversion of land from vegetation to impermeable surfaces. CDOT conservatively calculated a "worst case scenario" which estimated that Colorado contains approximately 65 million acres of suitable habitat, not including urban centers. Assuming an average ROW width of 60 feet as noted in Section 4, Environmental Baseline, it can be calculated that CDOT is responsible for approximately 131,200 acres of monarch habitat, or 0.20 percent of the total available monarch habitat in Colorado. Complete removal of 0.20 percent of the available habitat may have an effect on the monarch by removing milkweed and/or other nectar plants they depend on within these areas. Given the amount of available habitat outside of the ROW that contains suitable habitat, this amount of loss would be insignificant and would not impact the population of the monarch in any measurable manner. The proposed action would not restrict movement, increase predation, increase the use of pesticides or herbicides, or affect monarch overwintering areas.

5.1. Cumulative Effects

Cumulative effects include the effects of future state, tribal, local, or private actions that are reasonably certain to occur in the action area considered in this biological opinion. Future federal actions that are unrelated to the proposed action will be subject to the consultation requirements established in section 7 of the ESA and, therefore, are not considered cumulative to the proposed action. Projects that have undergone prior consultation with the Service are considered in the Environmental Baseline section.

Future actions reasonably certain to occur on state, local, or private lands in the action area in addition to increased impervious surface from development of suitable habitat include continued or expanding exposure to insecticides and climate change.

The exposure and effects of pesticides to the monarch could occur within Colorado from pesticide spot treatments used to control invasive plants and insects or from drift of pesticides used on land adjacent to suitable monarch habitat. The population-level response to insecticide exposure for the eastern population is a projected 5 percent decrease to a 30 percent increase over the next 25 years. The monarch population-level response to insecticide exposure for the western population is a projected 9 percent decrease to a 68 percent increase over the next 20 years (Service 2020, pp. 59-61). A worst-case scenario could include increasing pesticide use and land conversion to agriculture as a result of higher demand for food, the significant overlap of agricultural land in the areas most important to monarch production, and a lack of standardized and broad-scale efforts to reduce pesticide exposures.

Climate change may have far-reaching effects on habitats within the Southern Rocky Mountains and Southwest United States over time because of extended drought periods and increased temperatures. The impacts of climate change in the region may result in shifts in seasonal weather patterns, aridification, variations in stream flows, larger, more frequent wildfires, changes in species phenology, the reduction of forested habitat, upward shifts in the elevation of habitat types, and the possible elimination of some habitat types, all of which could impact monarch suitable habitat (USGCRP 2018).

6. CONCLUSION

The Service defines "jeopardize the continued existence of" as to engage in an action that reasonably would be expected, directly or indirectly, to reduce appreciably the likelihood of both the survival and recovery of a listed species in the wild by reducing the reproduction, numbers, or distribution of that species (50 CFR § 402.02).

After reviewing the current status of the monarch, the environmental baseline for the action area, the effects of the proposed action, and the cumulative effects, it is the Service's conference opinion that the action, as proposed, would not be expected, directly or indirectly, to reduce appreciably the likelihood of both the survival and recovery of the monarch in the wild by reducing the reproduction, numbers, or distribution of the species. We base our conclusion on the following:

- The action area constitutes a small portion of the species' entire range within the State of Colorado (a maximum of approximately 0.20 percent).
- The project area is likely only occasionally used by the species, and reproduction, numbers, and distribution of the species are unlikely to be affected by loss of habitat due to transportation projects.
- Temporarily disturbed habitat will be restored with native plant seed including forbs.
- The likelihood of the survival and recovery of the monarch butterfly will not be precluded through implementation of the proposed action.

7. CONSERVATION RECOMMENDATIONS

Section 7(a)(1) of the ESA directs federal agencies to utilize their authorities to further the purposes of the ESA by carrying out conservation programs for the benefit of endangered and threatened species. Conservation recommendations are discretionary agency activities to minimize or avoid adverse effects of a proposed action on listed species or critical habitat, to help implement recovery plans, or to develop information.

We have no conservation recommendations at this time.

8. REINITIATION NOTICE

Formal conference for the proposed action considered in this conference opinion is concluded. FHWA may request, in writing, that the Service and FHWA/CDOT work together to prepare a biological opinion if the monarch is listed under the ESA. During review of the proposed action, if the Service finds that there have been no significant changes in the expected benefits or

adverse effects analyzed herein, or the information used during the conference, the Service will modify the conference opinion to produce a biological opinion and authorize incidental take, and no further ESA section 7 consultation will be necessary.

If the Service can be of any additional assistance, please contact Kristin Salamack of the Colorado Field Office by telephone at (303) 236-4748 or by email to kristin_salamack@fws.gov.

Sincerely,

Liisa Niva
Eastern Colorado Supervisor
Colorado Ecological Services Office

cc: FHWA (Jeff Bellen)
CDOT, HQ (Jeff Peterson)

Reference: I:\Salamack\CDOT\Consultations_2022\HQ\Monarch Conference

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APPENDIX A – ACTIONS AND DEFINITIONS

Asphalt Patching- Patching of small areas of the roadway with hot or cold premix bituminous material using hand tools to correct abrupt depressions, potholes, edge failures, upheavals and other surface hazards. This activity is performed with pick-ups and dump trucks on the existing roadway and is different from resurfacing in that it does not involve rollers or other heavy equipment.

Bank Stabilization- Methods of securing the structural integrity of earthen stream channel banks with structural supports to prevent bank slumping and undercutting and overall erosion prevention. Bank stabilization helps maintain existing or newly constructed earthen banks by using techniques including but not limited to articulated block, riprap, gabions, or brush bundles to keep material in place. This is performed using some type of heavy equipment and may involve surface soil disturbance. Any upland bank/bluff or back slope stabilization work would be considered a major grading activity.

Betterments and emergency repairs
Betterments are small permanent improvements to the highway that are of urgent necessity. Emergency repairs are necessary when roadway use is impaired or substantially obstructed. Emergencies include landslides, fires, floods, and national emergencies. Maintenance actions include erecting barricades or providing flaggers, removing and repairing the obstruction, and providing a detour. There is no set procedure for these activities. They are highly variable and the rectifying actions are event-specific.

Bike trails and/or crossings
Bike trail construction includes scraping, grubbing, excavation, fill, compaction, and paving. Bike crossings are most commonly at-grade with pedestrian signalization and pavement marking, but are occasionally overpasses or underpasses.

Blasting- Storing, handling, transporting, preparing and using explosives. Blasting involves drilling at blasting area or in combination with the use of explosives and/or loading a hole with explosives.

Bridge Deck Repair- Repairing decks, expansion joints, patching spalled areas, overlaying and repairing with other material as appropriate to restore the deck from the roadway. Related activities may include but is not limited to timber plank replacement, milling and resurfacing the roadway, as well as silica fume overlays that do not penetrate the full depth of the deck. This may involve the use of heavy equipment on the bridge deck or roadway as well as methods to capture construction debris from falling into the channel.

Bridge Deck Replacement- Replacement of the entire deck. This may involve the use of heavy equipment as well as methods to capture construction debris from falling into the channel.

Bridge over Uplands/RR/Road- A grade separation where the highway passes over a highway or railroad. This activity will include the construction or repair of substructure and superstructure and involve heavy equipment and soil disturbance.

Bridge Painting- Sandblasting, cleaning, priming and painting of structure elements to prevent deterioration. Any lead based paints are stripped and collected for proper disposal.

Bridge Rail Repair/Replacement- The process of fixing or updating the railing on a bridge. This may include a transition from steel rails to concrete on the existing railing on the bridge.

Bridge Substructure New, Replacement, or Repair- Ephemeral- Replacement or construction of portions of a bridge below the superstructure including all or part of the following foundation elements: abutments, columns, wall piers, footings, pile caps, precast or auger-cast concrete piles, drilled shafts, etc over a channel that holds water only during and immediately after rain events.
Related Activities: Cofferdams, Piers, Pile Driving Vibratory, Pile Driving Impact, Temporary Work Platform, Bridge Superstructure New & Replacement, De-watering, Bank Stabilization, Clearing and Grubbing, De-watering, Drilled Shafts, Guardrail Repair, Lighting, Traffic and Pedestrian Signals, Dynamic Message Signs, Major Grading, Nighttime work with lights, Paving, Pile/Pier Encasement, Removal of Structures and Obstructions, Stream Channel Impact, Wetland Mitigation

Bridge Substructure New, Replacement, or Repair- Intermittent- Replacement or construction of portions of a bridge below the superstructure including all or part of the following foundation elements: abutments, columns, wall piers, footings, pile caps, precast or auger-cast concrete piles, drilled shafts, etc over a channel that holds water during wet portions of the year.

Bridge Substructure New, Replacement, or Repair- Perennial- Replacement or construction of portions of a bridge below the superstructure including all or part of the following foundation elements: abutments, columns, wall piers, footings, pile caps, precast or auger-cast concrete piles, drilled shafts, etc over a stream or river that holds water throughout the year. This activity will involve the use of heavy equipment and/or barges in river systems.

Bridge Superstructure New, Replacement, or Repair- Ephemeral- Replacement or construction of the structure above the substructure. The superstructure includes but is not limited to the deck and roadway for carrying traffic over a channel that holds water, only during and immediately after rain events. This may include silica fume overlays which penetrates the entire thickness of the bridge deck.

Bridge Superstructure New, Replacement, or Repair - Intermittent- Replacement or construction of the structure above the substructure. The superstructure includes but is not limited to the deck and roadway for carrying traffic over a channel that holds water during wet portions of the year.

Bridge Superstructure New, Replacement, or Repair - Perennial- Replacement or construction of the structure above the substructure. The superstructure includes but is not limited to the deck and roadway for carrying traffic over a stream or river that holds water throughout the year. This activity may include the use of heavy equipment or barges in river systems.

Channel Grade Stabilization Structures- Energy dissipation, head-cut control within the stream channel.

Channelization, Ephemeral- Modification of stream channel length and/or capacity in a channel that holds water only during and immediately after rain events.

Channelization, Intermittent- Modification of stream channel length and/or capacity in a channel that holds water during wet portions of the year.

Channelization, Perennial- Modification of stream channel length and/or capacity in a channel that holds water throughout the year.

Clearing- This refers to the removal and disposition of all unwanted material from the surface, such as trees, vegetation, boulders, and trash. This is performed using heavy equipment and can involve soil disturbance in the immediate area. This activity can occur in a wetland but will not occur in a stream or river channel.

Cofferdams— A temporary generally watertight enclosure that is pumped dry to expose the bottom of a body of water so that construction, as of piers, may be undertaken. This activity is performed using heavy equipment and will involve surface soil disturbance.

Concrete Pavement Repair- Patching concrete roadway surfaces by removing faulty surface sections (by jackhammering and sawing), including base or sub-grade material as required, and replacing with concrete and required base material to eliminate potential surface hazards. Sawing, jackhammering, cleaning and replacing expansion joints with special material to allow expansion and contraction of pavement. This is performed using some type of heavy equipment operated on the roadway and will not involve soil disturbance.

Crack Sealing / Joint Sealing- This is a preventative maintenance measure which consists of routing and sealing the joints and cracks in the pavement with a sealant or asphaltic sealing product to prevent the moisture from penetrating into the base and subgrade material**.** Joint sealing may consist of sealing joints between asphaltic concrete surfacing and portland cement concrete pavement. Cracks and joints are commonly routed and cleaned with compressed air before being sealed. No earthwork is performed with this operation. This is performed using compressors and equipment operated on the roadway and will not involve soil disturbance.

Culvert New, Replacement, Extension, Repair- Ephemeral- Installation or repair of any structure, not classified as a bridge, which provides an opening under the roadway in a channel that holds water only during and immediately after rain events. This activity may be performed by heavy equipment and may include soil disturbance.

> Culvert New-This activity is the installation of a culvert in a location where there was none previously. The activity requires excavation of material, placement of culvert pipe, backfilling around the new culvert, and finish grading. For box culverts, forms are set and concrete is poured to form the culvert.

Culvert Replacement- This activity is the installation of a new culvert of the same or different type and size in place of an existing culvert. The activity requires the excavation of material covering the existing culvert and backfilling around the new culvert.

Culvert Extension- This is an activity where a culvert is lengthened because of an increase in roadway width. For metal culverts, a piece of culvert is attached to the existing culvert and the area around the culvert is backfilled and finish graded. For box culverts, forms are set and new concrete is poured that extends the culvert to the plan specifications.

Culvert Repair- This includes but is not limited to sliplining, wingwalls, and box culvert floor repair.

Culvert New, Replacement, Extension, Repair- Intermittent- Repairs of any structure, not classified as a bridge, which provides an opening under the roadway in a channel that holds water during wet portions of the year. This activity may be performed by heavy equipment and may include soil disturbance.

Culvert New, Replacement, Extension, Repair- Perennial- Repairs of any structure, not classified as a bridge, which provides an opening under the roadway on a stream that holds water throughout the year. This activity may be performed by heavy equipment and may include soil disturbance.

Curb and Flume- A curb is a raised edge of asphalt built along the road to carry water along the side of the road to a flume which is an artificial water channel that carries water off the roadway and onto the shoulder. This activity is performed using heavy equipment and may include soil disturbance.

Curb and Gutter- Curb and gutter areas are constructed in urban areas where storm drains exist (urban areas). This activity is performed using heavy equipment and may include soil disturbance.

Detention Basin- A constructed pond or reservoir incorporated into the watershed for temporary storage, less than 72 hours, of stormwater. Its purpose is to reduce the peak flow into the downstream waterway.

De-watering-- Removing or draining water from an enclosure or a structure (such as a caisson or cofferdam) placed within a riverbed. Usually involves the use of "De-watering" pumps**.** Temporary diversions of streams or channels to bypass a bridge, culvert, or other work location are also considered de-watering.

Drilled Shafts- A Drilled Shaft is a deep foundation that is constructed by placing fluid concrete in a drilled hole (in channels or upland areas). Typically they are used for bridges and large structures, where large loads and lateral resistance are major factors. Drill cuttings generally must be discharged per conservation condition.

Earth Shoulder Construction- Procedure where material is hauled, compacted, bladed, and shaped to conform to the plan's typical cross sections and compaction requirements. This procedure may occur during the construction of new roadways or existing roadways where design standards require it either within or outside the hinge-point. This is performed using some type of heavy equipment and will involve soil disturbance.

Equipment Staging/Maintenance- The temporary storage of heavy equipment needed to perform construction activities. This also includes the areas needed to perform maintenance and preparation of equipment to be used currently or in the future on a project. Typically, these areas are adjacent to the roadway/bridge.

Erosion Control- Barriers- Installing stormwater barriers is a practice used to slow down runoff and allow sediment to settle out. Specific types of barriers include: topsoil, mulch, and silt fence. This activity can be performed using some type of heavy equipment and may include soil disturbance.

Erosion Control- Erosion Checks- Erosion checks are relatively small, temporary structures constructed across a ditch to slow water velocity and capture sediment. Specific types of erosion checks include: wattles, earth checks, rock checks, and synthetic checks. This activity can be performed using some type of heavy equipment and may include soil disturbance.

Erosion Control- Inlet/Outlet Protection- Storm drain inlets, curb inlets, and culvert outlets are designed to carry stormwater, but they can also carry sediment to streams, rivers, wetlands, lakes, and sensitive areas if they are not properly protected. These areas can be protected by the installation of wattles, synthetic barriers, and or rip rap in the case of culvert outlets. This activity can be performed using some type of heavy equipment and may include soil disturbance.

Erosion Control- Mulching- Mulching is an erosion control practice that uses prairie hay or straw to stabilize slopes and exposed soils although rushes and similar materials may also be considered. This temporary practice can also be used when seeding is not practical due to seasonal constraints and for erosion control prior to a rain event. Mulches assist with establishing vegetation in areas that have been temporarily seeded with a cover crop and for areas seeded with permanent vegetation. Hay is preferred to straw and may contain viable seed. This activity is performed using some type of heavy equipment and may include soil disturbance.

Erosion Control- Post-Construction Erosion Control- This refers to the erosion control activities that will take place by CDOT maintenance forces after all construction is completed on the project and may include soil disturbance.

Erosion Control- Rolled Erosion Control- Erosion control blankets and turf reinforcement mats are typically used on steep slopes (3:1 or steeper) where the erosion hazard is high and vegetation growth is likely to be too slow to provide adequate stabilization. This activity can be performed using some type of heavy equipment and may include soil disturbance.

Erosion Control- Slope Interruption- This is a technique that provides a barrier, diversion, or bypass for storm water to infiltrate or flow down a slope in a less erosive manner. Specific techniques include- soil roughening, slope tracking, berms and diversions, benching, temporary slope drains, and wattles/compost logs. This activity is performed using some type of heavy equipment and may include soil disturbance.

Erosion Control- Traps and Basins- Silt traps, sediment traps, and sediment basins are depressions or embankments created in the storm water flow path that causes sediment-laden water to slow and pool, and allows soil particles to drop out before the water exits the BMP. This activity can be performed using some type of heavy equipment and may include soil disturbance.

Erosion Control- Vegetation- Seeding and sodding are the primary methods of establishing vegetation and stabilizing soils disturbed by construction activity. Specific techniques include: cover crop seeding, temporary seeding, permanent seeding, and sodding. This activity is performed using some type of heavy equipment and may include soil disturbance.

Fencing- Building a barrier or boundary to prevent or direct movement from one area to another. Fencing operations may include clearing vegetation from the fenceline and material removal for installation of fence posts. It also includes the erection of wire and posts or other material and may include soil disturbance.

Grading, Major, Beyond Existing Hinge Point- Soil disturbance that takes place beyond the hinge point of the shoulder i.e. the foreslope and backslope. This is normally associated with projects that include roadway widening, slope shaping, slope stabilization, excavation, work on structures, drainage issues, and realignments. This is performed using some type of heavy equipment and will involve soil disturbance.

Grading, Minor, Edge of Pavement to Hinge Point- Grading associated with resurfacing projects that result in a grade rise of the roadway. Material is placed on the earthen shoulder and graded out to blend the new roadway height with the existing earthen shoulder. This activity will not occur beyond the hinge point of the shoulder. Hinge point is the point where the earthen shoulder breaks into the foreslope. This is performed using some type of heavy equipment and will involve surface soil disturbance.

Grubbing- This refers to the removal and disposition of all unwanted material from underground, such as sod, boulders, stumps, roots, buried logs, or other debris. This is performed using heavy equipment and can involve soil disturbance in the immediate area. This activity can occur in a wetland but will not occur in a stream or river channel.

Guardrail Installation (New) (W-Beam style)– Installation of new guardrail, steel beams, and end treatments including the supporting posts to create safe driving conditions. Associated work may include placement of new posts, placement of fill and grading to accommodate updated design standards. May occur beyond the hinge-point.

Guardrail Installation (New) (Cable Rail Only)— Installation of new cable-rail guardrail and end treatments including the supporting posts to create safe driving conditions. Associated work may include placement of new posts, placement of fill and grading to accommodate updated design standards. May occur beyond the hinge-point.

Guardrail Installation (New) (Concrete only; i.e., Jersey Barriers) – Includes the installation of new concrete barrier. Work may include drilling in dowels in pavement, placement of rebar, and placing concrete by slipform. Prefabricated concrete barriers may also be installed.

Guardrail repair w/ soil disturbance- Repairing or replacing all types of guardrail, steel beams, steel band or cable, end-treatments including the supporting posts to restore safe driving conditions. Associated work may include placement of new posts, placement of fill and grading to accommodate updated design standards. May occur beyond the hinge-point.

Guardrail repair w/out soil disturbance- Repairing or replacing all types of guardrail, steel beams, steel band or cable, or end-treatments to accommodate updated design standards. Does not include any activity that requires soil disturbance such as digging post holes or grading.

In-Stream Diversions – Includes the temporary installation of a culvert(s) [see Culvert New], creation of coffer dams [See Cofferdams], and/or the installation of lined jersey barriers. This activity is a temporary condition often associated with bridge pier construction and is usually covered under a Clean Water Act Section 404 Permit. This activity may be performed by heavy equipment and may include soil disturbance.

Interchange construction/reconstruction
Interchange construction or reconstruction generally consists of adding an overpass or underpass as a means of crossing existing roadways. Newly constructed or reconstructed overpasses or underpasses usually have four ramps as well as necessary lighting, signing and signalization in order to meet increased traffic volumes on the intersecting roadways. These activities are more likely to occur in urban areas.

Intersection improvements
Intersection improvements consist of adding or improving the signalization, signing, lighting, pavement marking, and/or sight distances. They may also entail separating traffic with medians, and/or constructing through traffic or turn lanes.

Landscaping- A term referring to any activity that modifies or enhances the visible features of the project site by shaping the terrain and planting a variety of grasses, trees, or shrubs. This activity may include the use of heavy equipment and will involve soil disturbance.

Lane addition (i.e., added capacity, acceleration/deceleration lanes, truck climbing lanes)
Lane addition involves earthwork, drainage work, base course addition, surfacing with either asphalt or concrete, pavement marking, signing and oftentimes guardrail placement.

Lighting- A term referring to the installation of illumination sources intended to allow safe conditions for the traveling public. The lighting could be associated with roadway illumination for vehicular travel, illumination for trail underpasses below road surfaces for bicycles and pedestrians, or sidewalks/trails associated with road improvements or as standalone facilities.

Material Stockpiling- The temporary storage of materials needed to construct roadways or bridges. Typically, these areas are adjacent to the roadway/bridge. This also includes the areas needed to perform preparation work, such as asphalt material milling, subgrade material, and storage of materials to be recycled.

Microsurfacing-- A mixture of polymer modified asphalt emulsion, mineral aggregate, mineral filler, water, and other additives, properly proportioned, mixed, and spread on a paved surface. Microsurfacing differs from slurry seal in that it can be used on high volume roadways to correct wheel path rutting and provide a skid resistant pavement surface. This is performed using heavy equipment operated on the roadway and will not involve soil disturbance. Related Activities: Crack Sealing/Joint Sealing

Milling and/or In-place Recycling- This is a process by which existing surface material is removed and salvaged from the roadway. Milling is generally done with a large machine capable of grinding the surface material. The millings are loaded directly into trucks and removed from the project, unless in-place recycling is utilized (where millings are reused for the new surfacing). The surface is generally milled (cut to a certain depth) to remove surface irregularities, including longitudinal wheel ruts; but may be milled to a depth sufficient to provide a base for placement of a new pavement structure. The spoil is collected in the milling operation and hauled off the roadway and recycled into other work whenever practical. Residue may be broomed to the shoulder of the road. This activity may require soil disturbance up to a foot from the edge of pavement to prevent contamination from milling material. This soil disturbance consists of minimal grading up to 6 inches in depth.

Night-time Work- This applies to any construction activity that takes place at night where temporary construction lighting is required. Activities needing night work includes but is not limited to bridge deck pours, joint cutting, girder placement, etc.

Noise Walls— Noise walls are solid obstructions built between a roadway and an area where traffic noise is unwanted or needs to be reduced. The construction of noise walls is performed using heavy equipment to perform sub-grade preparation (soil disturbance) and construction of the walls.

Overhead Utility Conduit (New) - This process includes the installation of electrical conductors above ground. This activity will involve the use of heavy equipment and soil disturbance.

Pavement Marking- The process by which paint or other material is placed on the roadway surface to communicate instructions to motorists. This activity includes a truck traveling down the roadway spraying paint onto roadway, but may also include personnel using wheeled sprayers to mark turn arrows etc.

Pavement Removal- The process of removing the roadway (asphalt and concrete, not soil) using equipment such as jackhammers, backhoes, and excavators. Usually done when removing the full depth of roadway material, or patching individual panels in a roadway.

Paving- Placing of a new full depth roadway of asphaltic concrete or concrete pavement on new or existing alignment. May include night work requiring lights.

Piers- An intermediate support for the adjacent ends of two bridge/overpass spans. This activity is performed using heavy equipment or barges in rivers and will involve soil disturbance.

Pile Driving, Impact Method- Delivering repeated blows to the top of a pile for driving it into the ground. This method often uses a diesel pile hammer attached to heavy equipment to impact the pile.

Pile Driving, Vibratory Method- A machine is lifted and positioned over the pile by means of an excavator or crane, and is fastened to the pile by a clamp and/or bolts. Vibratory hammers can either drive in or extract a pile; extraction is commonly used to recover steel "H" piles used in temporary foundation shoring.

Pile/Pier Encasement- This process includes excavating around an exposed pile (in channels or upland areas) and encasing it in concrete to improve the structural integrity of the pier. This activity may include the use of heavy equipment and will involve soil disturbance.

Pipe Jacking and Casing- This is a method of tunnel construction where hydraulic jacks are used to push specially made pipes through the ground behind a tunnel boring machine or shield. This technique is commonly used to create tunnels under existing structures, such as roads or railways. This activity is performed using heavy equipment and will involve soil disturbance.

Pre-watering- Contractor may apply water by sprinkler irrigation or ponding methods to achieve optimal moisture content. The soil may be tilled to facilitate the penetration of the water and to minimize run-off.

Removal of Structures and Obstructions- This activity refers to the removal of buildings, old piling/piers, abutments, fences, old roadbeds, and other man-made obstacles in both upland and aquatic environments. This activity is performed using heavy equipment and will involve soil disturbance.

Replacing a Bridge with a Culvert- The act of replacing an existing bridge with a culvert. This activity will involve the use of heavy equipment and soil disturbance.

Resurfacing-Fog/Slurry Seal, Armor Coat/Chip Seal- Additional layer of surfacing material placed on top of the existing hard surfaced road. Fog/Slurry Seal includes the preservation of old asphalt surface, sealing small cracks and surface voids by spraying emulsions diluted with clear water. In the case of Armor Coat/Chip Seal, a thin covering of gravel/crushed stone is placed after the roadway has been sprayed with asphalt. This is performed using heavy equipment operated on the roadway and will not involve surface soil disturbance.

Retaining Walls (In Water/Wetlands)-- A retaining wall is a structure that holds back soil or rock from a building, structure or area. Retaining walls prevent downslope movement or erosion and provide support for vertical or near-vertical grade changes. This is performed using some type of heavy equipment and will involve surface soil disturbance to shape and backfill the area.

Retaining Walls (Not in Water/Wetlands)-- A retaining wall is a structure that holds back soil or rock from a building, structure or area. Retaining walls prevent downslope movement or erosion and provide support for vertical or near-vertical grade changes. This is performed using some type of heavy equipment and will involve surface soil disturbance to shape and backfill the area.

Roadway geometrics improvements
These improvements include upgrading sub-standard roadways to meet current federal and state requirements. Examples would be improving the super-elevation of a curve, improving deficient sight distances, and changing the cross slope of the roadway for public driving safety. Construction could involve removing sub-standard road, earth work, should addition, resurfacing, adding guardrails, and jersey barriers, or blasting out rock faces.

Rock or Gravel Surfacing- The placement of rock or gravel material on unpaved roads, intersections or drives after final grading in construction situations or as a maintenance practice on existing unpaved roadways.

Rubbilization - A technique in which deteriorating Portland cement concrete pavement (PCCP) is broken into small pieces. Through rubbilization, existing concrete pavement panels are converted into coarse granular material. The coarse granular material is not hauled away; rather unused material is left to form a sub−base. Hot−mix asphalt is then used as an overlay.

Temporary Road - A shoo-fly is considered a structure for conveyance of traffic detoured around a bridge/culvert construction project (for full crossing of the stream channel from bank to bank). Culverts are covered by earthen fill and seeded or otherwise stabilized. Shoo-flies are part of the project engineering design, are shown on the plans, and are generally paved for traffic use. Shoo-flies are similar to temporary crossings with the addition of traffic safety features and are designed to convey a 2-year storm event, at a minimum. These are removed at the completion of construction.

Traffic and Pedestrian Signals, Dynamic Message Signs w/ soil disturbance- A term referring to work that provides roadway illumination, traffic signals, and/or dynamic message boards. The scope may include trenching or boring in electrical service and constructing concrete foundations for light poles. Related Activities: Major Grading, Minor Grading, Erosion Control, Underground Conduit

Traffic and Pedestrian Signals, Dynamic Message Signs w/out soil disturbance-
Maintenance of existing lighting structures (replacing poles or mast arms), traffic signals, and/or dynamic message boards that does not include disturbance of the area surrounding the lighting structure.

Shouldering-Paved – Placing of a new full depth roadway of asphaltic concrete or concrete pavement on shoulder of new or existing alignment. Includes shoulder repair of full or partial depth of asphaltic concrete or concrete pavement on shoulder on existing alignment. May include night work requiring lights.

Sidewalks and Bikeways- Surfacing of sidewalks, bikeways, or non-motorized trails. This activity pertains only to the placement of surfacing material and does not involve ground disturbance.

Signs with soil disturbance- The placement or maintenance of sign posts along with the new signage that requires the excavation of soil (digging post holes etc.) for their installation.

Signs without soil disturbance- The placement or maintenance of sign posts along with new signage without disturbing soil. This may include items such as replacing missing or damaged signs.

Stream Channel Impact, Ephemeral- Design and/or construction activities that will change the area below the high water mark by activities not included in Channelization or Culvert Extension, Replacement, Repair in a channel that holds water only during and immediately after rain events. Related Activities: Major Grading, Culvert Replacement, Enhancement, Repair, Bridge Substructure Repair, Replacement, Channel Grade Stabilization Structure, Replacing a Bridge with a Culvert

Stream Channel Impact, Intermittent- Design and/or construction activities that will change the area below the high water mark by activities not included in Channelization or Culvert Extension, Replacement, Repair in a channel that holds water during wet portions of the year.

Stream Channel Impact, Perennial- Design and/or construction activities that will change the area below the high water mark by activities not included in Channelization or Culvert Extension, Replacement, Repair in a channel that holds water throughout the year.

Survey and Staking- The action of determining the boundaries, area, or elevations of (land or structures on the earth's surface) by means of measuring angles and distances. Staking refers to slope stakes and/or lath for delineation of right of way and limits of construction. Typically this would include some vehicle and foot traffic in the survey area.

System quality enhancements
Bicycle trail construction/maintenance – maintain as originally constructed or subsequently reconstructed. Keep free of all brush and debris. Maintain same as bituminous roadway surface. If gravel, fill in ruts and holes. Construction consists of clearing the construction area, drainage, building sub-grade and surfacing with aggregate base, asphalt or concrete. Width usually varies from four feet to 12 feet.

Bicycle rack installation – Purchase and install prefabricated steel bicycle rack(s). These are usually attached to asphalt or concrete surfacing.
Pedestrian facility additions or improvements – Installation of miscellaneous amenities to improve or maintain pedestrian facilities, such as overpasses, ramps, etc.

Snow and ice control
Snow removal and ice control activities involve plowing, deicer or abrasive application, emergency assistance, rockslide removal, and snow fence maintenance and construction. Snow fences are erected at a set back from the highway of 35 times the height of the snow fence. They are repaired prior to the snow season and kept free of windblown sand and weeds. Where topography permits, snow fences may be constructed by plowing windrows of snow.

Temporary Crossing, Causeway, Work Platforms-
Temporary Crossing- A temporary crossing consists of a culvert(s) or temporary bridge for full crossing of the stream channel from bank to bank. Culverts are covered by earthen fill, clean granular fill or rock for the purpose of providing a temporary crossing for workers, equipment, and efficiency of phasing. The sides of the crossing may be armored with rock rip-rap, sheetpile, or other equivalent. The culverts used in the temporary crossing will allow for normal Ordinary High Water Mark (OHWM) stream flows with minimal backwater and shall not be placed to dewater the downstream channel area within the OHWM. These are removed at the completion of construction.
Causeway- A causeway is considered a construction activity using fill and culverts or temporary bridges for partial waterway crossing, not exceeding 50% of normal/ordinary high-water channel width. These are removed at the completion of construction.

Work Platform- A work platform is a structure used to conduct activities in or adjacent to a stream channel and may include a temporary bridge, causeway, bank platform, and/or work pads. These are removed at the completion of construction.

Traffic services
Traffic Services include activities related to installation, repair, and maintenance of traffic control devices (signs, signals, delineators, mile markers, guardrails, pavement markings, energy attenuators [crash cushions], portable variable message signs, barricades, lighting, rumble strips). Signs are visually inspected twice every year during daylight hours and once every year during darkness for general position, visibility, legibility, damage to sign or post, breakaway devises, and reflectivity. Delineators and mile markers are also regularly inspected and cleaned and repaired as needed. Guardrails, end sections, and guardrail posts are regularly inspected and are repaired, readjusted or replaced when their proper function is compromised. If more than 25 percent of a sub-standard guardrail is damaged, the entire length of the guardrail is replaced to current design standard.

Roadside vegetation management
Roadside vegetation management includes mowing, brush control, noxious weed control, bare ground treatment, tree pruning, planting, thinning, seeding, and other actions. The area covered by these actions extends from the roadway shoulder to the right-of-way limits and includes medians. Roadside vegetation management occurs on an as-needed basis and is coordinated through the RPEM in order to obtain any necessary permits. Roadsides are maintained to be as much like their natural habitat or the condition to which they were constructed or developed as possible. Four methods of vegetation management are used by CDOT: mechanical control, chemical control, cultural control and biological control. Burning is not used by CDOT to control vegetation.

Mechanical mowers, saws, axes or other cutting implements are the tools used in mechanical control. Mechanical mowers are used only in areas that are level enough for the machinery. Mowing in rural areas (i.e., non-landscaped areas) is kept to one mower width (not to exceed 22 feet), except in areas with safety or noxious weed concerns. Mowing width is also restricted to one mower width in habitats where sensitive species are known to occur. Grasses are generally mowed to a height of eight to 10 inches, but no less than six inches. In order to protect nesting bird habitat, mowing in areas beyond the slope area that allows surface drainage (Zones 2 and 3) is avoided between April 15 and August 1. Handsaws, axes or other cutting implements are used to remove select trees, shrubs, or other vegetation. Tree and shrub pruning is generally conducted when the plants are dormant.

Chemical control is accomplished by herbicide application through either hand spraying (pulling hose or back pack) or broadcast by truck, depending upon the situation and as directed by CDOT's Weed Coordinator. Herbicides are not applied within 15 feet of a riparian area, except by personnel licensed to apply herbicide within a wetland or riparian area. In habitats where sensitive species are known to occur, herbicide application is coordinated through CDOT's Office of Environmental Programs. Best Management Practices and a weed-spraying plan are being developed by CDOT's Weed Coordinator. Plant growth regulators are used on roadsides, around delineators, and along guardrails.

Cultural control methods enhance the competitive capabilities of desirable plants by meeting their nutrient, moisture, and light requirements. Methods include reseeding, fertilizing, and irrigating.

Biological control involves releasing organisms that prey upon a specific host plant. CDOT does not frequently employ this method of weed control.

Underground Utility Conduit Installation- Boring Conduit installation that includes excavating, backfilling and compacting soil or installation by horizontal boring equipment.

Underground Utility Conduit Installation- Trenched Conduit installation that includes excavating, backfilling and compacting soil or installation by horizontal boring equipment.

Wetland Mitigation- The creation, restoration, or enhancement of wetlands, to compensate for wetlands that were or will be lost due to regulated activities. This activity may include the use of heavy equipment and soil disturbance.

Wildlife crossings
Wildlife crossings are typically either a concrete box culvert or a large corrugated steel pipe with inlets to allow for lighting. Bridges spanning drainages may also serve as wildlife crossings. Crossings are maintained by removing debris and/or snow from existing culverts that could impede wildlife crossing.

Wildlife Ramp – The construction of an earthen ramp within the highway right-of-way to allow animals to escape the right-of-way in an area with wildlife fencing.