

**CITY OF COLUMBIA LANDFILL & YARD WASTE COMPOST FACILITY
NPDES Permit #MO-0112640**

Erosion Control Action Plan

May 21, 2015

Erosion control Best Management Practices

The following is a summary of Best Management Practices (BMP) to be completed at the facility to improve the quality of stormwater discharges.

Because our evaluation of Total Suspended Solids (TSS) and iron elevations indicate that elevations of iron are linked to Total Suspended Solids (TSS), the actions being undertaken at the site are focused on the reduction of sediment transport and erosion.

The below BMPs will be installed in general accordance with the facility's Stormwater Pollution Prevention Plan (SWPPP) dated August 2010. Deployed BMPs will be field evaluated for performance and may be adjusted or modified following deployment as needed. A general site map has been included as Figure 1 – Site Map and is attached to this Erosion Control Action Plan.

1. Seeding

Approximately 29 acres of poorly vegetated slopes and plateaus throughout the facility will be seeded and mulched for the establishment of vegetation. As of the date of this report approximately 12 of the planned 29 acres have been seeded. Prior to seeding activities, soil samples were collected from various areas of planned action for fertility evaluation. Soil samples were sent to the University of Missouri Extension, Soil Testing Laboratory to determine the appropriate fertilizer selection. Additionally, seedbed preparation occurred prior to seeding activities through equipment track walking and tillage methods. Seeding mixtures utilized at the facility are a specialty mix designed for landfills that utilize higher percents of warm season grasses that have been proven to be more resistant to the harsh conditions experienced at similar facilities. Seed application rates were increased from standard seeding rate recommendation to approximately 200 pounds per acre.

Approximately 15 acres of landfill slopes will be hydro seeded. Hydro seeding activities conducted at the facility in the fall of 2014 have proven to be more effective than previous broadcast seeding methods. Fair vegetation establishment has occurred in areas of previous hydro seeding activities, however over-seeding of these areas is planned as part of this project to insure a healthy dense stand of vegetation. Hydro seed is applied using a Finn T90 hydro seeder per the manufacture's recommendations. As of the date of this report, 80 percent of the planned hydro seeding activities have been completed at the facility.

Approximately 16 acres of landfill plateaus and inactive areas within the borrow area will be broadcast seeded. Areas where broadcast seeding will occur have slopes less than 5 percent. Once seed has been applied these areas will be mulched by a third party contractor using large straw or hay bales. The mulch will be crimped in place to reduce potential for movement.

Seeding will be conducted during the recommended growing season of March-May and September-October. Past seeding activities conducted at the facility have been greatly hampered due to recent weather conditions. Large and intense rainfall events coupled with extended dry periods have reduced effectiveness of past efforts resulting in areas of poor vegetative cover (i.e. 5 inch rain event in October 2014, among others). Seeding methods being implemented at the site will provide the best chance for vegetation establishment, although optimal weather during the growing season will also be necessary. Areas of planned action will be reseeded throughout the establishment process until a vegetative stand of approximate 70 percent is achieved.

Areas of planned seeding activities are indicated on Figure 2 – Erosion Control Plan and attached to this Erosion Control Action Plan.

2. Silt Fence

Silt fence will be utilized at the facility in areas of sheet flow to reduce effective slope length, reduce discharge of sediment, and assist in vegetation establishment. Silt fence will be spaced at an interval of approximately 50 feet and will be installed in accordance with the facility's SWPPP. Silt fence will be 100 gram monofilament will be utilized at the facility. Silt fence will be trenched in by silt fence plow to an approximate depth of 6 inches below grade and backfill. Steel post with a spacing of approximately 6 feet will be utilized to support. Three zip ties per post will be used to connect the silt fence to the steel post. Silt fence will be inspected weekly and following rainfall events for effectiveness, as required in the SWPPP. Upon identifying areas of damaged/down silt fence repairs will be made as soon as possible based on site conditions. If silt fence is determined non-effective as deployed additional BMP methods will be implemented.

Approximately 7,500 linear feet of silt fence will be deployed at the facility. Silt fence will be installed on contours as verified by field surveying methods. Once areas reach a vegetation density of approximately 70 percent silt fence will be removed and resulting disturbed areas will be seeded.

Areas of planned silt fence deployment are indicated on Figure 2 – Erosion Control Plan and attached to this Action Plan.

3. Rock Checks

Rock checks will be installed within on-site ditches to reduce stormwater velocities, associated scouring, and sediment loading of on-site basins. Ditch rock checks will be

constructed with a core of 6X12 rip rap rock and faced with 3-inch clean rock for filtration. Ditch rock checks will have an approximate height of 2 feet with 3:1 slopes, with varying spacing dependent on site conditions from approximately 65 feet to 100 feet.

Approximately 9 rock checks are planned for deployment within the on-site ditches requiring approximately 80 cubic yards of rock for construction. Stakes will be installed upstream of the rock checks to monitor silt deposits for planned maintenance activities. Rock checks will be inspected weekly and following rainfall events for effectiveness, as required in the SWPPP. Silt deposits at the face of the rock check structures will be removed once half of the height of the structure is reached. Additionally the 3-inch clean rock filtration medium will be monitored and replaced to insure permeability.

Rock check structures may be added or removed based on site observation regarding effectiveness. Areas of planned rock check construction are indicated on Figure 2 – Erosion Control Plan and attached to this Erosion Control Action Plan.

4. Sedimentation Basin Volume Increase

The volume of the sedimentation basin associated with Outfall 004 will be increased to lengthen the detention time and facilitate future development within its watershed. Approximately 3,388 cubic yards of material will be removed from the southeastern bank of the sedimentation basin associated with Outfall 004. Material removed from the basin will be hauled and placed within a designated stockpile area or used as daily cover within the landfill footprint. The Missouri Department of Natural Resources (MoDNR) has provided approval for the conceptual plan associated with the increase in size to the above referenced sedimentation basin. The increase in storage volume and longer detention time will result in improved water quality associated with the discharges from the sedimentation basin.

Areas of planned excavation within the sedimentation basin associated with Outfall 004 are indicated on Figure 2 – Erosion Control Plan and attached to this Erosion Control Action Plan.

5. Forebays

Forebays will be constructed in the inlet of three on-site sedimentation basins. Large shot rock and 6X12 rip rap rock will comprise the core of the forebay structures. The core of the structures will be faced with 3-inch clean rock for sedimentation filtration. Each forebay structure will have an approximate height of 3 feet with 3:1 slopes.

The areas up-gradient of the forebay structures are designed to be accessible by on-site equipment to facilitate maintenance and cleanout activities. Stakes will be installed upstream of the forebays to monitor silt deposits for scheduling planned maintenance activities. Silt deposit at the face of the forebay structures will be removed once half of the height of the structure is reached or sooner. Additionally the 3-inch clean rock

filtration medium will be monitored and replaced as needed to insure permeability. The forebay structures will be inspected weekly and following rainfall events for effectiveness.

Forebays will be constructed in the inlet of the following sedimentation basins:

- a. Sedimentation basin associated with Outfall 004 – Forebay structure will require approximately 52 cubic yards of rock.
- b. Sedimentation basin associated with Outfall 005 – Forebay structure will require approximately 67 cubic yards of rock.
- c. Sedimentation basin associated with Outfall 007 – Forebay structure will require approximately 67 cubic yards of rock

Approximately 125 cubic yards of rock will be utilized in the construction of the on-site forebay structures within the on-site sedimentation basins. Areas of planned forebay construction are indicated on Figure 2 – Erosion Control Plan and attached to this Erosion Control Action Plan.

6. Drainage Ditch Clean Out

The drainage ditch located north of the on-site operations center will be returned to its original design. Currently, sediment deposits have accumulated within the drainage ditch resulting in flooding and increased flows directed to the on-site sedimentation basin associated with Outfall 006. The cleanout of the ditch located north of the on-site operations center will prevent any overloading of the above-referenced basin resulting in improved water quality.

Approximately 561 linear feet of ditch will be returned to its original design elevation. Upon the completion of the ditch cleanout, erosion control mats or rip rap rock blanket will be installed within the ditch to prevent scouring. The erosion control mats or rock blanket will be installed within the channel's flow line in accordance with the site's SWPPP. The disturbed ditch side slopes will be seeded and returned to a vegetative state following the completion of the regarding activities.

Areas of planned drainage ditch cleanout are indicated on Figure 2 – Erosion Control Plan and attached to this Erosion Control Action Plan.

7. Sedimentation Basin Cleanout

Sediment deposits from within seven on-site sedimentation basins will be removed and the basins will be returned to their original design elevations. A third party contractor will perform the on-site sediment deposit removal for five of the on-site basins. Prior to the initiation of cleanout activities the on-site sedimentation basins will be dewatered utilizing a six inch pump.

All sediment material removed from the on-site sedimentation basins will be hauled to a designated stockpile area. The stockpile area will be located in an area protected by an

earthen berm to prevent sediment discharges. Upon the completion of the basin cleanout the associated stockpile area will be seeded for vegetation establishment. During the cleanout of the on-site sedimentation basins, each outlet structure will be evaluated and returned to its original designed configuration if necessary.

The third party contractor will perform cleanout activities on the following sedimentation basins:

- a. Sedimentation basin associated with Outfall 002 – Approximately 4,537 cubic yards
- b. Pretreatment sedimentation basin associated with Outfall 003 – Approximately 815 cubic yards
- c. Sedimentation basin associated with Outfall 004 – Approximately 10,889 cubic yards
- d. Sedimentation basin associated with Outfall 007 – Approximately 11,844 cubic yards
- e. Temporary sedimentation basin located south of Cell 5 – Approximately 3,101 cubic yards

City of Columbia Landfill staff will perform cleanout activities on the following sedimentation basins:

- a. Sedimentation basin associated with Outfall 005 – Approximately 1,000 cubic yards
- b. Sedimentation basin associated with Outfall 006 – Approximately 800 cubic yards

Upon the completion of the above referenced cleanout activities all resulting disturbed areas will be seeded for vegetation establishment. Areas of planned sedimentation basin cleanouts are indicated on Figure 3 – Sedimentation Basin Cleanout and attached to this Erosion Control Action Plan.

8. Background Iron Evaluation

Multiple soil samples will be collected from areas located within the watersheds of the on-site sedimentation basins. Photographs documenting the location of each sample location will be collected at each sampling point. Soil samples will be analyzed for total iron content and compared to associated levels when mixed in solution at specific concentrations.

The City of Columbia will contract laboratory analytical testing and bench experiments through a third party laboratory. A composite sample comprised of the soil samples collected from within a specific sedimentation basin watershed will be mixed to achieve solutions with specific Total Suspended Solids (TSS) levels that represent discharge limits. Mixed TSS solutions will represent the following TSS concentrations, based in part on the site's MoDNR NPDES permit: 80mg/L, 50 mg/L, 30mg/L and 10 mg/L. The mixed TSS solution will be analyzed for dissolved iron and total iron concentrations to evaluate possible connections associated between iron and TSS concentrations.

Summary

Numerous erosion control methods and activities, specifically addressing TSS and iron, will be implemented at the facility to improve stormwater discharge at the landfill. The City estimates

that it will take six months from the date of the Environmental Protection Agency's approval of this plan to implement these activities, with the exception vegetative densities. Vegetation activities may require multiple seeding events and minor erosion repair until the 70 percent vegetative density is achieved. We further propose that a mechanism to extend the timeframes associated with these activities as necessary.

Efforts will be implemented at sediment sources to prevent excessive loading within the on-site sedimentation basins. Areas of poor vegetation will be seeded for vegetation establishment and BMPs will be installed throughout the facility to assist in these efforts. Historically, seeding activities were conducted at the facility utilizing broadcast seeding methods. However, following the demonstrated success from hydro seeding methods during the fall 2014, hydro seeding methods are now being relied upon more greatly at the facility specifically in areas with slopes.

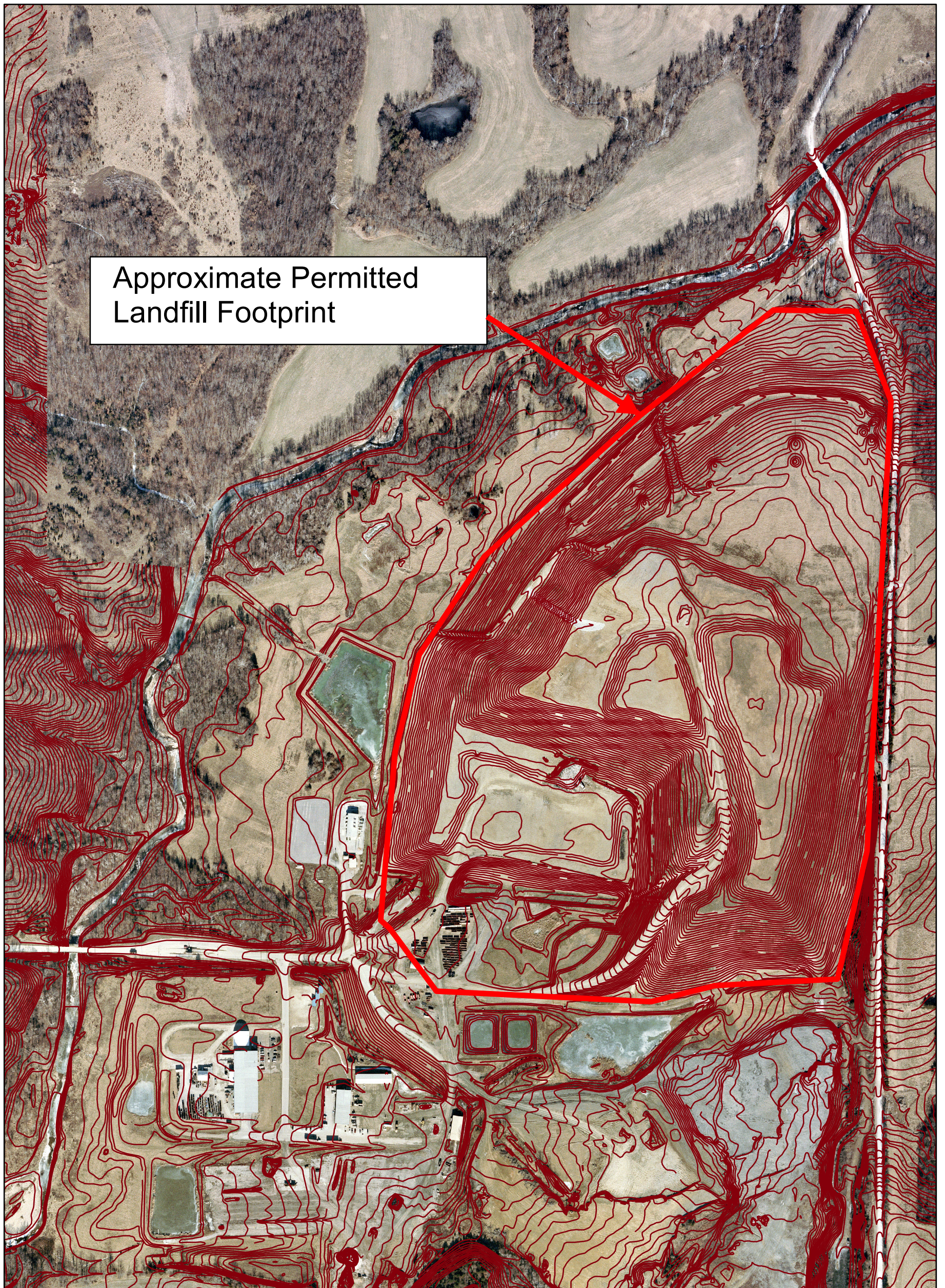
Additionally in conjunction with vegetation establishment efforts, on-site sedimentation basins will be returned to their original design to help further treat stormwater prior to discharge off-site. A third party is being contracted to complete sedimentation basin cleanout efforts.

The City believes the efforts of addressing the above-mentioned sources coupled with the improvements to the existing on-site treatment systems will result in compliant stormwater discharges from the facility. As stated above, compliant discharge levels will be based largely on the establishment of vegetation, which may be challenged by adverse weather conditions.

City of Columbia Landfill & Yard Waste Compost Facility

Site Map

Figure 1



0 187.5 375 750 1,125 1,500 Feet

City of Columbia Landfill & Yard Waste Compost Facility

Erosion Control Plan Figure 2



Legend

- Area of broadcast seeding
- Area of hydro seeding
- Forebay - rock dam
- Ditch rock check
- Silt fence
- Area of excavation
- Ditch cleanout

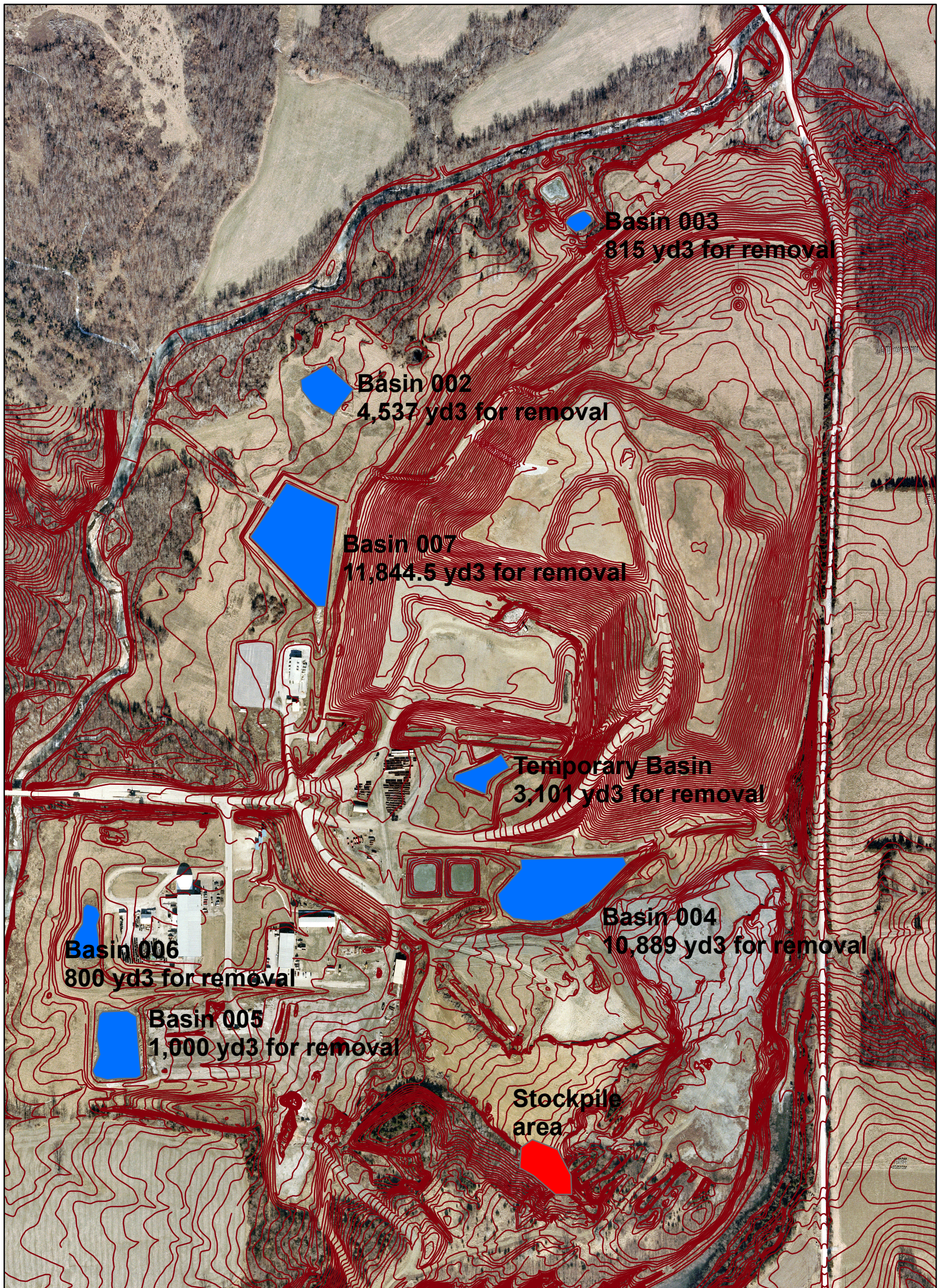
0 150 300 600 900 1,200 Feet





City of Columbia Landfill & Yard Waste Compost Facility

Sedimentation Basins Scheduled for Cleanout

Figure 3



Legend

-  Sedimentation Basin
-  Stockpile area

0 187.5 375 750 1,125 1,500 Feet