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PART 1 - GENERAL

1.1 DESCRIPTION

A. Applicability

This SECTION provides for the common situations where cover material is not available and for those situations where cover material is available.

B. Work Included

Work under this SECTION covers requirements for materials, tools, equipment and services necessary to complete the subgrade preparation for this project. The work shall include, but is not necessarily limited to, completion of the following work:

1. Field engineering.
2. Soil testing.
3. Wetland undercut and subgrade preparation.
4. Lime-mulch application.
5. Incorporation of the applied lime and mulch materials.

1.2 REFERENCE SPECIFICATIONS

A. The following specifications or standards are incorporated by reference into this SECTION:

1. Iowa Agricultural Liming Material Act.
2. SECTION 02250 EARTHWORK, SELECT BORROW
3. SECTION 02700, PERMANENT SEEDING
4. Trees to remain shall be protected as described by Iowa State University (ISU) Extension Service at https://naturalresources.extension.iastate.edu/forestry/care_maintenance/construction.html

B. Above-mentioned references, which do not appear printed with the Contract Documents, can be provided to Contractor upon request.

1.3 QUALITY ASSURANCE

A. Contractor shall use adequate numbers of skilled workers who are thoroughly trained and experienced in the necessary crafts and who are completely familiar with specified requirements and methods needed for proper performance of work of this SECTION.

B. Contractor shall use equipment adequate in size, capacity and numbers to accomplish work in a timely manner.

C. In addition to complying with requirements of governmental agencies having jurisdiction, Contractor shall comply with directives of Engineer and Division.

1.4 DELIVERY, HANDLING AND STORAGE

A. Storage of materials on job site must be approved in writing by Engineer.

B. Materials approved for storage on site which are being degraded due to storage must be removed and replaced at no additional cost to Division.

C. Deliver packaged materials to the site in the supplier's original unopened containers; each container to bear certification as specified.

D. Store packaged materials off ground and protected from moisture.

1.5 SUBMITTALS

A. Agricultural Lime

1. Contractor shall submit vendor's certified analysis for ECCE (Effective Calcium Carbonate Equivalent) in minimum pounds of ECCE per ton of material, fineness of agricultural lime, and supplier's name and location.

2. Contractor shall submit results of recent moisture tests for the agriculture lime.

B. Weight Tickets

Contractor shall submit weight tickets and/or shipping tickets of all materials delivered to the site for the work in this SECTION to Engineer for payment purposes.

C. Soil Tests

Soil tests to determine the applicable liming rate shall be taken by the Engineer with assistance from Construction Observer and Contractor. Test results will be submitted to the Contractor and Division when received by Engineer. Payment for these tests will be made by Engineer.

1.6 SITE DISTURBANCES

Contractor shall take precautions to ensure that equipment and vehicles do not unnecessarily disturb or damage existing grading or other site improvements. Any areas identified by Engineer or Division as becoming excessively disturbed shall be repaired at Contractor’s own expense.

PART 2 - PRODUCTS

2.1 AGRICULTURAL LIME

A. Agricultural lime shall be ground calcitic limestone conforming to the current requirements of the Iowa Agricultural Liming Material Act. The liming material shall contain calcium in the carbonate, oxide or hydroxide form, or a combination thereof. The lime shall have a minimum fineness of fifty-five (55) percent and shall contain at least one thousand (1,000) pounds ECCE per ton of lime to be applied.

B. If agricultural lime with at least one thousand (1,000) pounds ECCE per ton is not locally available, Contractor may submit a proposal for use of equivalent material based upon the minimum pounds required of ECCE per acre.

C. Lime sludge salvaged from water treatment plants or other industrial operations can be used for agricultural lime if it can be uniformly distributed over the site. Moisture content and ECCE tests results shall be provided to Engineer and Division to determine application rates. Moisture tests will be taken by Engineer during placement and application rates will be adjusted as appropriate.

2.2 MULCH – NON-WETLAND AREAS

A. Conventional mulch shall be air-dry and shall consist of straw, harvested from oats, rye or wheat, corn stover (stalks) hay or grass forage cut from native grasses or other plants approved in writing by the Division.

B. Conventional mulch shall have been properly cured, harvested and baled. Mulch harvested after a killing frost or during dormant periods will not be acceptable.

C. All mulch shall be free of noxious weeds as published by the local County Weed Commissioner and other weeds deemed undesirable by Engineer, such as foxtail, etc.

D. Each load of mulch shall be subject to inspection and acceptance by Engineer or Construction Observer prior to unloading.

E. Alternatives to conventional mulch material like wood chips or composted organic materials, may be considered but are subject to approval by Engineer and Division. Mulch substitutions shall be tested for moisture content. The bulk weight of alternative mulch must be adjusted to provide the same amount of dry mass as that provided by conventional mulch with an assumed moisture content of twenty (20) percent. Based upon moisture tests, Engineer shall determine the adjusted bulk application rate for the substitute mulch.

1. Wood Chips – This substituted material can either be processed on site or delivered to the site.

    a. All material must be able to pass through a one-half (1/2) inch screen and shall not have excessive amounts of leaves or soil.

    b. All material shall be able to decompose within a sixty (60) day to ninety (90) day period.

    c. Additional nitrogen must be applied prior to disking to provide better decomposition.

        i. The amount of active nitrogen required is approximately one (1) percent of the dry weight of the wood chips, subject to adjustment by Engineer.

        ii. This additional nitrogen will not be measured for payment and is considered incidental to allow for the use of wood chips as a substitute for mulch.

2. Composted Organic Materials

    a. Compost can be derived from processed wood chips, food waste or other non-hazardous organic waste, subject to approval by Engineer.

    b. Compost shall be able to pass through a one-half (1/2) inch screen.

c. Compost shall be aged at least twelve (12) months and from an approved supplier.

2.3 MULCH – WETLAND AREAS

A. Mulch material, condition and quality shall conform to the provisions of 2.2 A through C above.

B. Each load of mulch shall be subject to inspection and acceptance by Engineer or Construction Observer prior to unloading.

C. No alternatives to conventional mulch shall be considered for use in wetland areas.

2.4 WETLAND FERTILIZER

A. Fertilizer shall be a standard commercial product which, when applied at the proper rate, will supply the quantity of total active nitrogen (N) at a rate of thirty (30) pounds per acre for the lower portion of the subgrade treated in wetland areas.

B. Fertilizer shall be uniform in composition, liquid or dry, and shall be free flowing. Fertilizer may be delivered in bulk from the supplier or in its original unopened containers. Any fertilizer which becomes caked or otherwise damaged, making it unsuitable for use, will not be accepted.

2.5 COVER MATERIAL

A. Cover material soil shall be subject to approval of the Engineer and Division. It shall exhibit suitable soil pH, texture and structure appropriate for supporting grass vegetation. Evaluation of soil properties may include visual, tactile and/or laboratory tests.

B. Should soil exhibit sub-optimal pH but possess suitable soil texture and structure, it may be considered suitable for cover material, if a neutralization period is implemented.

Cover material may include, but is not necessarily limited to:

1. Dark brown to black topsoil of appropriate texture typically encountered in the A horizon of a soil profile.

2. Light to dark yellowish brown, lean, sandy or silty clay loam to silty or sandy clay with redoximorphic features typically encountered in the B horizon of a soil profile.

C. Gray to black soil materials typically encountered below the B horizon in a soil profile are generally not considered suitable for use as cover material without detailed testing.

D. Platy shale, shale-like coal slag or spoily materials shall NOT be considered suitable for cover material.

PART 3 - EXECUTION

3.1 TIMING – *WITHOUT* COVER MATERIAL -- NEUTRALIZATION PERIOD REQUIRED

A. When cover material is NOT available, both time and moisture are required for lime to neutralize acidic spoil material and for mulch to decompose. A delay period is required to enhance the benefit between the lime/mulch treatment and seeding operations. The length of the delay is dependent on many factors including lime and mulch properties, soil properties, and weather conditions.

B. Contractor shall coordinate his work to achieve maximum delay time, perhaps as much as several months or over-winter, at no additional expense to Division. Contractor shall request approval of Division for when the seeding operations can begin.

3.2 TIMING – *WITH* COVER MATERIAL

A. Prior to application of ag lime, Engineer and Division shall approve the final grades of areas to receive cover material.

B. No cover material shall be placed over untreated spoil material. All agriculture lime application and incorporation shall be completed in areas designated to receive cover material.

C. No cover material shall be placed in constructed wetland areas until the agricultural lime, fertilizer and mulch have been placed and properly incorporated. If cover material is placed inadvertently prior to placement of agriculture lime to neutralize the soils, Contractor shall remove and replace the cover material as needed at his own cost to allow for the lime to be placed and incorporated.

D. When cover material is available, it shall be applied as a uniform thickness on top of treated spoil material per the requirements of SECTION 02250 EARTHWORK, SELECT BORROW. The minimum thickness of cover material placed shall be nine (9) inches unless a greater thickness is determined by Engineer based upon the volume of cover material available.

E. When approved cover material is properly placed over treated spoil material, a neutralization period is not required unless additional time is required to improve sub-optimal soil pH as directed by the Engineer or Division.

F. If Engineer or Division determines that the addition of mulch will improve the soil tilth of cover material, mulch shall be applied and incorporated into the cover material the rate specified in 3.7 A. below. Contractor shall limit the depth of incorporation so that spoil material below the cover is not brought up to the finished surface. Mulch so incorporated shall be allowed at least thirty (30) days to decompose prior to seeding.

3.3 SOIL TESTING

A. WITHOUT Cover Material: As the Contractor is nearing final grade in portions of the site to prepare for seeding, the Contractor shall contact and schedule soil sampling with the Engineer.

B. WITH Cover Material: As the Contractor is nearing final subgrade in portions of the site to prepare for placement of select borrow (cover) material, the Contractor shall contact and schedule soil sampling with the Engineer. The Engineer is to collect the samples, assisted by the Construction Observer and Contractor, and submit them for testing.

C. The Engineer is to collect the samples, assisted by the Construction Observer and Contractor, and submit them for testing.

1. Engineer and Contractor shall collect composite samples of not less than ten (10) well-distributed individual soil cores from any contiguous area of ten (10) acres or less. Soil cores shall be three-quarter (3/4) inch to one (1) inch diameter to a depth of about twelve (12) inches. Areas having observable differences in material types or surface conditions (soil types) shall be handled as different samples, even if less than (10) ten acres.

2. Engineer shall combine soil cores to form composite samples for each (10) ten acres of contiguous area and/or observable different soil types by mixing well and placing in sample bag to be sent to laboratory. (e.g. If total area is 30 acres and has two (2) distinctly different soil types of fifteen (15) acres each, then there should be four (4) composite samples containing ten (10) soil cores each – two (2) composite samples from each soil type.)

D. Engineer shall take responsibility to have each composite soil sample delivered to an approved soil testing laboratory. Each sample should be tested for the properties listed below. It should be noted by Contractor that test results for Item #3 below can often take four (4) weeks or longer to receive. The Engineer cannot be held responsible for delays in schedule due to Contractor scheduling of sampling or the time it takes for the laboratory to complete the tests.

1. pH.

2. Buffer pH.

3. Acid/Base Accounting based on pyritic sulfur with total sulfur

E. Engineer shall obtain liming recommendations to achieve a pH of at least 6.5 for spoil from the laboratory and submit the results to Division. The cost of all services required from the testing laboratory for initial liming recommendations shall be the responsibility of Engineer.

F. Soil test results and laboratory recommendations shall be used by Engineer and Division in determining the amount of ag lime to be applied. The final rate determined by Division and Engineer shall be applied by Contractor and this rate may be more or less than that recommended by the laboratory.

3.4 WETLAND AREAS – ***WITHOUT*** COVER MATERIAL

A. Subgrade Preparation

1. Engineer and Division shall approve the final grades in the wetland areas prior to incorporation of mulch and fertilizer materials by Contractor.

2. After final grade acceptance, Contractor shall excavate at least nine (9) inches of material below final grade in the constructed wetland areas as shown on the plans. This material shall be set aside to be replaced after this exposed layer has been treated.

B. Application for Undercut Area

1. Agricultural Lime (tons ECCE per acre) shall be applied at the same rate as that determined from the soil tests taken for the rest of the site.

2. Fertilizer – Nitrogen (N) shall be applied at a rate of thirty (30) pounds per acre.

3. Mulch – Mulch shall be applied at a rate of five (5) tons per acre.

C. Incorporation for Undercut Area

1. Contractor shall apply and incorporate the lime, fertilizer and mulch into the exposed undercut area over the entire wetland areas as designated in the plans. The depth of incorporation shall extend at least nine (9) inches into the spoil material beneath the undercut level and shall be completed with an acceptable method as approved by the Engineer.

2. Application will not be permitted during adverse conditions, such as high winds, surface frost to a depth of greater than one (1) inch, excessive moisture in the surface to be treated, or if rain is predicted within the time Contractor estimates will be required for application and incorporation of the mulch and fertilizer within the approved wetland area(s).

D. Replacement of Undercut Material

After application and incorporation of lime, fertilizer, and mulch is complete in the undercut subgrade, Contractor shall replace the excavated material.

E. Application for Replaced Undercut Material

1. Agricultural Lime –Agricultural lime (tons ECCE per acre) shall be applied at the same rate as that determined from the soil tests taken for the rest of the site.

2. Fertilizer – Nitrogen (N) shall be applied at a rate of thirty (30) pounds per acre.

3. Mulch – Mulch shall be applied at a rate of five (5) tons per acre.

F. Incorporation for Replaced Undercut Material

Contractor shall apply and incorporate ag lime, fertilizer, and mulch into the replaced material from undercut area over the entire wetland areas as designated on the plans. The depth of incorporation shall extend at least nine (9) inches into the spoil material beneath the undercut level and shall be completed with an acceptable method as approved by the Engineer.

3.5 WETLAND AREAS – ***WITH*** COVER MATERIAL

A. Subgrade Preparation

Contractor shall establish the final grade, less the depth of cover, in the areas where constructed wetlands are shown on the plans. The Engineer and Division shall approve the final grades in the wetland areas prior to incorporation of lime materials by Contractor as described in *3.6 Lime-mulch Application* above.

B. Application Rates – Prior to Cover Placement

1. Agricultural Lime –Agricultural lime (tons ECCE per acre) shall be applied at the same rate as that determined from the soil tests taken for the rest of the site prior to placement of cover material.

2. Fertilizer – Nitrogen (N) shall be applied at a rate of thirty (30) pounds per acre prior to placement of cover material or as otherwise indicated in the Supplemental Specifications.

3. Mulch – Mulch shall be applied at a rate of five (5) tons per acre prior to placement of cover material or as otherwise indicated in the Supplemental Specifications.

C. Incorporation – Prior to Cover Placement

1. After final grade acceptance and before placement of cover material, Contractor shall apply and incorporate the lime, fertilizer and mulch over the entire wetland areas as designated on the plans. The depth of incorporation shall extend at least into the upper nine (9) inches of spoil material and shall be completed with an acceptable method as approved by the Engineer. Cover material can then be placed over the wetland treated subgrade as shown on the plans.

2. Application will not be permitted during adverse conditions, such as high winds, surface frost to a depth of greater than one (1) inch, excessive moisture in the surface to be treated, or if rain is predicted within the time Contractor estimates will be required for application and incorporation of the mulch and fertilizer within the approved wetland area(s).

D. Application Rates and Incorporation – After Cover Placement

1. After placement of cover material, areas within the wetland areas will receive additional lime and fertilizer, as established in SECTION 02700- SEEDING. Additional mulch shall also be applied at a rate of two (2) tons per acre on the cover material within the wetland areas shown on the plans. These materials shall be incorporated into the cover material as soon as conditions allow and prior to the impoundment of water. Care shall be taken not to mix the spoil material into the cover material during this disking.

3.6 LIME-MULCH APPLICATION – ***WITHOUT*** COVER MATERIAL

A. Application Rates

1. Agricultural Lime - Contractor shall plan to apply lime (tons ECCE per acre) at the rate as shown on the plans or listed in the Supplemental Specifications unless a different rate is specified based on the results of soil tests as described in 3.3.D. which are taken after rough grading is completed. The application rate provided in these documents is based on limited information available and is for bidding purposes. Actual application rate will vary depending upon soil test results.

2. Mulch, Subgrade - Contractor shall apply mulch at a rate of five (5) tons per acre or as otherwise indicated in the Supplemental Specifications.

3. Weight Tickets - Weight tickets shall be provided to the Engineer to determine that the appropriate amount of lime and mulch was applied prior to incorporation.

B. Incorporation

1. Contractor shall demonstrate to Engineer and Division on a small plot of one-tenth (1/10) acre or more in size, the method and equipment which will be used to thoroughly mix the lime-mulch materials into the upper twelve (12) inches of spoil. When an acceptable method is agreed to by Engineer and Division, that method shall be used throughout the Project. Engineer and Division reserve the right to reject the method of incorporation as it progresses if the previously approved procedure stops obtaining the desired results.

2. Prior to the application and incorporation of the lime and mulch materials, Engineer and Division shall approve the final grades and the lime application rates based on the spoil test results. Contractor shall request approval to initiate the lime-mulch application on areas of at least five (5) acres in size.

3. Contractor will obtain Engineer and Division's approval of site conditions prior to application of lime or mulch. Application will not be permitted during adverse conditions such as high winds, surface frost to a depth greater than one (1) inch, excessive moisture in the surface to be treated, or if rain is predicted within the time Contractor estimates will be required for application and incorporation of the lime-mulch within the approved area.

4. After receiving approval from Engineer and/or Division, Contractor shall evenly apply agricultural lime and mulch directly on the surface to be treated. Contractor shall incorporate the lime/mulch into the upper twelve (12) inches of material the same day the lime and mulch are applied, using the agreed upon method per 3.6.B.1 above. Incorporation shall be done along the contour, and compaction shall be kept to a minimum. This may require multiple passes to thoroughly mix both the lime and mulch through the upper twelve (12) inches.

C. Contractor shall use means necessary to prevent dust from becoming a nuisance to public, to neighbors and to other work being performed on or near site.

D. No lime or mulch shall be applied on site if that load of lime or mulch is not accompanied by an appropriate weight ticket. All lime and mulch weight tickets for material applied on site shall be submitted to the construction observer or engineer upon arrival of the material on site. If Contractor applies lime or mulch prior to construction observer or engineer receiving appropriate weight ticket for that material, or in the absence of the construction observer or engineer, Division may require additional lime and/or mulch be applied to the site at Contractor's expense to assure that Contract specified amounts are met.

3.7 LIME-MULCH APPLICATION – ***WITH*** COVER MATERIAL

A. Application Rates

1. Agricultural Lime – If required by Engineer or Division, Contractor shall plan to apply ag lime (tons ECCE per acre) at the rate determined by engineer based on the results of soil tests as described in 3.3.D. which are sampled from stockpiles of cover material. The soil tests of cover material should not include acid-base accounting unless it is recommended by Engineer in consultation with Division. This application of agricultural lime may, be in addition to agricultural lime applied immediately prior to seeding.

2. Mulch, Subgrade – If required by Engineer or Division, Contractor shall apply mulch at a rate of five (5) tons per acre to improve soil tilth of the cover material. This application of mulch shall not be considered equivalent to *Mulch, Seeding* described in SECTION 02700.

B. Incorporation of the additional agricultural lime and/or mulch shall proceed as described in 3.6 B. above **except** the depth of incorporation shall not exceed the thickness of the cover material.

PART 4 - MEASUREMENT AND PAYMENT

4.1 UNIT PRICES

A. Construction cost of all work included in this SECTION of the Construction Specifications shall be included in Contractor's unit prices set forth in Proposal and Schedule of Prices (*Document C*) for work items described below. Unit price for each of these several items shall include its pro rata share of overhead so that sum of products obtained by multiplying unit prices so set forth by amount of work actually constructed, measured as described herein, shall constitute full payment to Contractor for performance of work included in this SECTION.

B. Measurement and payment for each work item in this SECTION shall be in accordance with following:

1. *Subgrade Preparation*: Contractor's unit price for Subgrade Preparation shall constitute full payment for Incorporation of agricultural lime and mulch into wetland **and** non-wetland areas. At Contractor's option, it may also include compensation for rock picking and removal.

   The Subgrade Preparation area will be based upon the grading footprint as shown on the plans, rounded to the nearest one-tenth (1/10) acre. Any field adjustments made will be measured jointly by Contractor and Engineer. The total area for payment shall only be counted ***once*** EXCEPT in the case for those measured areas where cover material is placed **and** where that cover material requires additional incorporation of agricultural lime and mulch as determined by the Engineer.

2. *Agricultural Lime:* Contractor's unit price for agricultural limestone used in subgrade preparation work shall represent full payment for furnishing, delivery, and application of the lime in accordance with the specifications. The unit price for *Agricultural Lime* required in this SECTION shall be considered equal to the unit price for *Agricultural Lime* required in SECTION 02700, PERMANENT SEEDING. Submittals required under Item *1.5 Submittals* of this SECTION shall accompany each shipment of agricultural limestone for payment. Actual application rate will vary, pending recommendations of soil tests conducted in accordance with Item *3.3 Soil Testing*, of this SECTION. This pay item will also include lime placed on both the undercut and replaced material within the wetland areas.

   Measurement for payment purposes shall be actual number of tons of ECCE, based upon a dry unit weight, applied by Contractor in complying with requirements of this SECTION.

3. *Mulch, Subgrade*: Contractor's unit price for Mulch, Subgrade shall represent full payment for furnishing approved mulch materials, including freight, delivery and application. This pay item shall also include mulch placed into both the undercut and the replaced material within the wetland areas. No additional adjustment in unit price

will be made if substitute materials are used. No additional payment will be made if additional nitrogen is required with use of approved substituted mulch material.

Engineer will determine in acres, to the nearest one-tenth (1/10) acre, the actual area in which the mulch application was performed. Contractor shall provide field measurements as required to show the limits of the area mulched. Delivery receipts showing certified weight prior to placement will be used to confirm that sufficient mulch required tons per acre incorporation of mulch.

4. *Wetland Fertilizer:* Payment for fertilizer, Nitrogen (N), furnished, delivered, and applied into wetland areas, per requirements of this SECTION, shall be made in accordance with Contractor's unit prices for wetland fertilizer. Bulk weight tickets must accompany each shipment of fertilizer and shall form the basis for measurement and payment. Measurement for payment purposes shall be the actual weight to the nearest one pound (1.0 Lb.) of active ingredient for the nutrient.

5. *Wetland Undercut and Replacement:* Contractor's unit price for wetland undercut and replacement shall constitute full payment for excavation of undercut material, stockpiling the material nearby, and replacement of the undercut material after the initial incorporation is complete and all other incidental work including the incorporation of the fertilizer, mulch, and agricultural lime.

   The wetland undercut and replacement area will be based upon the wetland areas as shown on the plans rounded to the nearest one-tenth (1/10) acre. Any field adjustments made will be measured jointly by Contractor and Engineer. The total area for payment is only counted once.

4.2 SUMMARY – UNITS OF MEASUREMENT

Units of measurement for bid items applicable to work covered by this SECTION are as follows:

Description	Unit
Subgrade Preparation	Acre
Agricultural Lime	Ton (ECCE)
Mulch, Subgrade	Acre
Wetland Fertilizer	Pound (active ingredient)
Wetland Undercut and Replacement	Acre

END OF SECTION 02400