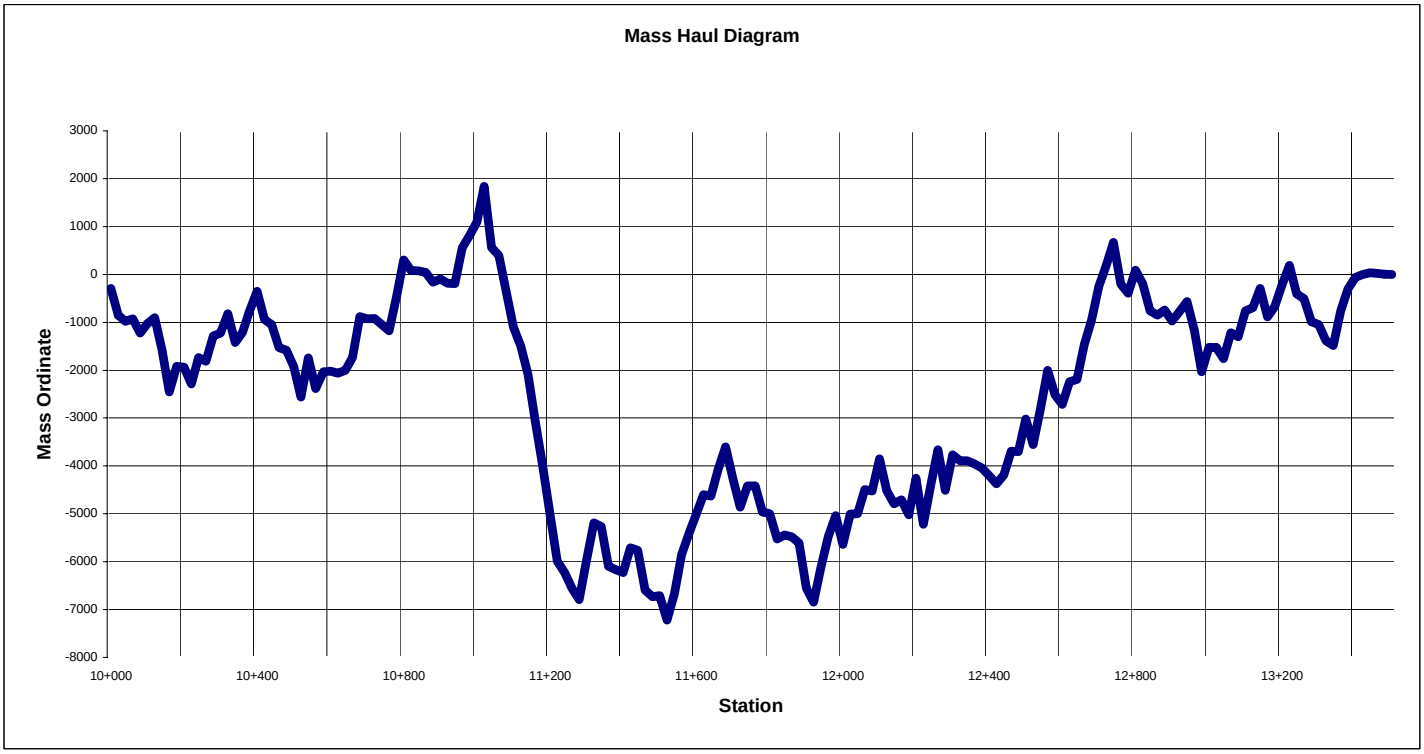
EARTHWORK REPRESENTATION:

GRADING SUMMARIES
&
MASS HAUL DIAGRAMS



October 21, 2004

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I. Introduction

Earthwork operations represent an area of substantial risk to contractors. In CFLHD contracts, the risk is typically associated with one to four pay items, with Item 20401-0000, Roadway excavation, generally being the primary payment item. Under this pay item, the contractor must anticipate and price the work associated with excavation, haul, embankment, benching, adding or subtracting moisture from soils, finishing and other associated operations. Estimating costs is further complicated by the type and variation in the materials to be excavated (rock, clay, soil); if blasting is required and how much; the type of equipment to be used in excavating and hauling material; if the haul is primarily uphill or downhill; coordination of earthwork operations with other installations (culverts, underdrains, etc.); weather considerations and impacts of materials testing.

Currently, information provided in CFLHD Grading Summaries can vary greatly from project to project. Some terminology used in the summaries is confusing and can be interpreted to mean different things depending on perspective. Definitions are not always provided, and the expectation that contractors can read and interpret a GEOPAK earthwork run is optimistic. This guidance is being written in order to standardize Grading Summaries and proper earthwork representation between CFLHD Design Areas and A/E contractors. It will also assist to ensure everyone views earthwork representation in the same light and serve as a training tool for new employees.

II. Perspective

Lacking the distribution of complete earthwork runs and representation with contract packages, the Grading Summary and Mass Haul Diagram are the contractor's primary tools for bidding earthwork. This is especially true since CFLHD uses GEOPAK, which has limited capabilities to handle added and subtracted quantities.

When representing earthwork, the focus is on prism excavation and embankment, added excavation and embankment quantities, removal of materials from quantities available for embankment construction, waste and other details related to the earthwork associated with the construction of a project to design subgrade elevation.

III. Elements of Earthwork Representation

This section discusses **Selection of Primary Pay Item**, **Grading Summary**, **Mass Haul Diagram** and **Cross Sections**. Most of these items play a role in representing earthwork in a contract. At the foundation of some of these items, and as a part of others, lies the Materials Report. A detailed discussion of the Materials Report is not included in this guidance, but it should be recognized that an adequate materials investigation and proper inclusion of the findings in the Grading Summary and the Mass Haul Diagram should be completed. The contract representations of the work to be performed can only be as good as the information upon which the design assumptions are based.

A. Selection of Primary Pay Item

For projects that are balanced from an earthwork standpoint and waste jobs, the primary pay item should be Pay Item 20401-0000, Roadway excavation. For balanced jobs, it is not necessary to include a pay item for construction of embankments. On waste jobs, it is recommended to always include Pay Item 20441-0000, Waste, in addition to the primary roadway excavation pay item.

Selection of a primary pay item for borrow projects, is somewhat more complex. Borrow projects have several inherent drawbacks, including:

1. During the design phase, roadway excavation and borrow pit shrink/swell factors are sometimes estimated without the benefit of a materials investigation. This leads to uncertainty in the final amount of borrow (based on pit measurements) that will be needed to complete the project.
2. When a borrow pay item is used, borrow is generally measured by determining the volume of material removed from the borrow source (this would be a bank cubic meter measurement, not a compacted cubic meter measurement). Payment of the borrow based on pit cross sections places the risk of shrink/swell changes from those estimated above on the Government. This is true whether the source is a Government-designated source or a contractor-selected source.

By using Pay Item 20420-0000, Embankment construction, (instead of a combination of Pay Item 20401-0000, Roadway excavation, and Pay Item 20403-0000, Unclassified borrow) the contractor is paid on a slope stake basis (embankment in its final position). This places the risk of shrink/swell factor changes at the chosen borrow source on the contractor. When borrow constitutes a significant amount of the earthwork to be performed, and particularly when the selection of the borrow source is up to the contractor, it is recommended that an embankment construction pay item be used. Generally, Pay Item 20401-0000, Roadway excavation and Pay Item 20420-0000, Embankment construction, should not be used together in the same contract.

For projects involving excavation below subgrade elevation in cut sections or below the original ground line in embankment sections, the use of a subexcavation pay item is strongly encouraged. In the past, subexcavation has sometimes been paid for as roadway excavation, but this is contradictory to the definitions provided in the FP. The use of a subexcavation pay item assists in eliminating many potential controversies related to selective excavation, disposal, haul and problems pertaining to the suitability of identified backfill materials to serve their intended purpose.

When subexcavation is subsidiary to the roadway excavation pay item, the implication (by virtue of the earthwork balancing routine) is that unsuitable material removed from the excavation can be disposed of within the balance, and that suitable replacement material can be acquired from the nearest available cut. If these assumptions are not valid, the contractor may incur additional costs due to selective excavation and haul.

B. Grading Summary

Grading Summaries are structured to be read in a logical left to right format, and when combined with the corresponding Mass Haul Diagrams and project Cross Sections, provide sufficient information to allow contractors to understand the information being conveyed. Explanations of each column of a Grading Summary are given below. Nearly all projects will contain some unique features and must be dealt with on a case-by-case basis. However, the general format (headings, column titles, and layout of the columns) should remain the same. If a specific column does not apply to a specific project, hide the column within the Excel spreadsheet so as not to cause confusion. Retention of the general format will aid everyone in comprehension and uniformity. It is important to note that the base Excel File in use within CFLHD performs many of the calculations for the Grading Summary once the necessary data is input into the Cross Section Data (XS Data) sheet.

	Roadway Excavation		
Pay Item			**20401-0000** (if primary pay item, blank if not)
Station	**Roadway Prism**	**Approach Roads**	**Roadway Excavation**
Column A	Column B	Column C	Column D

Pay Item Row

A row has been provided directly above the individual column headings to delineate pay items. This aids in communicating how different types of work are paid. For items that are derived by adding quantities (i.e. - Pay Item 20401-0000, Roadway Excavation), the pay item number is placed over the summed quantity only and not over the individual quantities. Do not place pay item numbers in the same block as the column headings as it de-emphasizes the pay item identification. Pay items, or the lack thereof, need to be identified as clearly as possible.

Definition Row

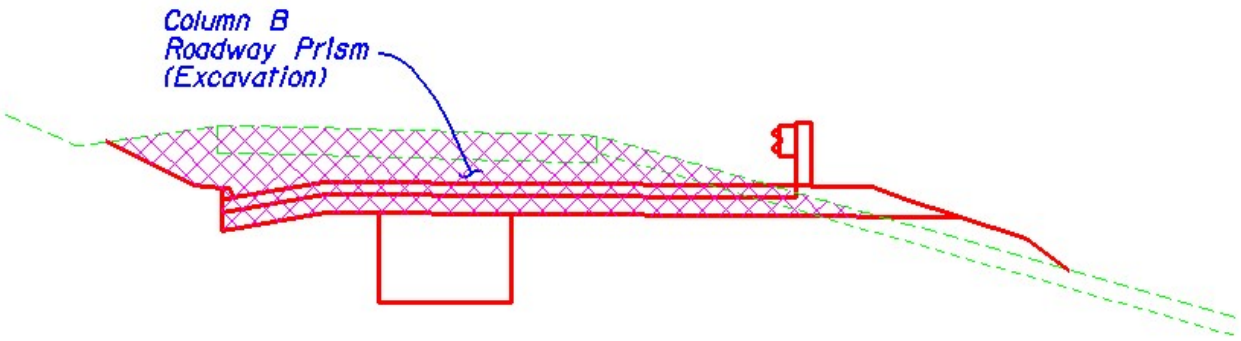
A row has been provided directly below the individual column headings to identify the material state (this row is not shown in the table above). The two descriptors that should generally be used on metric projects are *bank cubic meter (BCM) and compacted cubic meter (CCM)*. For english projects, use *bank cubic yard (BCY) and compacted cubic yard (CCY)*. On rare occasions, such as when an existing stockpile is being used as a materials source, the term *loose cubic meter (LCM) or loose cubic yard (LCY)* may also be used. The use of these descriptors are beneficial in that they describe the material state relevant to each quantity using terminology that is recognized by the heavy construction industry.

Column A: Station

This column identifies the station range for each calculation row. The number of station breaks to be shown within the Grading Summary will vary with the project. On large projects, a good rule of thumb is to show each Plan and Profile Sheet on a separate row. On simple projects, the station ranges can be broken out for each cross section, or every 50 to 100 meters (feet).

Primary Heading: Roadway Excavation

The primary heading, *Roadway Excavation*, provides a location to tabulate the excavation associated with the mainline and approach roads. If the project will not use Roadway excavation as the primary pay item, do not include a pay item number above the Roadway Excavation column.



Column B: Roadway Prism

This quantity represents the volume of roadway excavation for the station range specified in Column A. These values are the unadjusted (the numbers do not account for shrink or swell) volumes calculated directly by GEOPAK and summed for the appropriate interval identified in Column A.

Column C: Approach Roads

Values in this column are the excavation required to construct the approach roads in the station range identified. Although the approach roads have different stationing than the mainline, tabulate the associated excavation volumes under the mainline stationing interval that best represents the approach road location. By doing so, the Mass Haul Diagram will better reflect the anticipated haul of material. In the circumstance where the approach road length is excessive, the volumes can be tabulated in a separate Grading Summary or at the bottom of the mainline summary. If values are tabulated at the bottom of the mainline summary, be sure NOT to include the quantities in the Mass Haul Diagram.

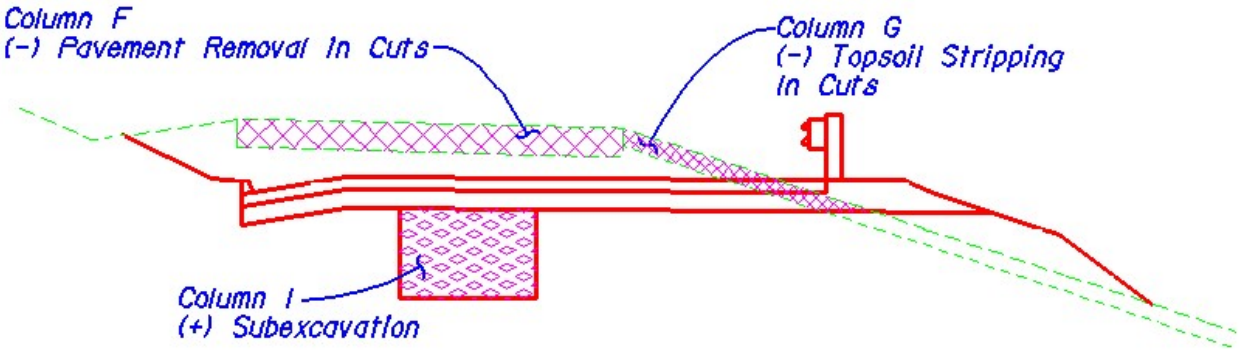
Column D: Roadway Excavation

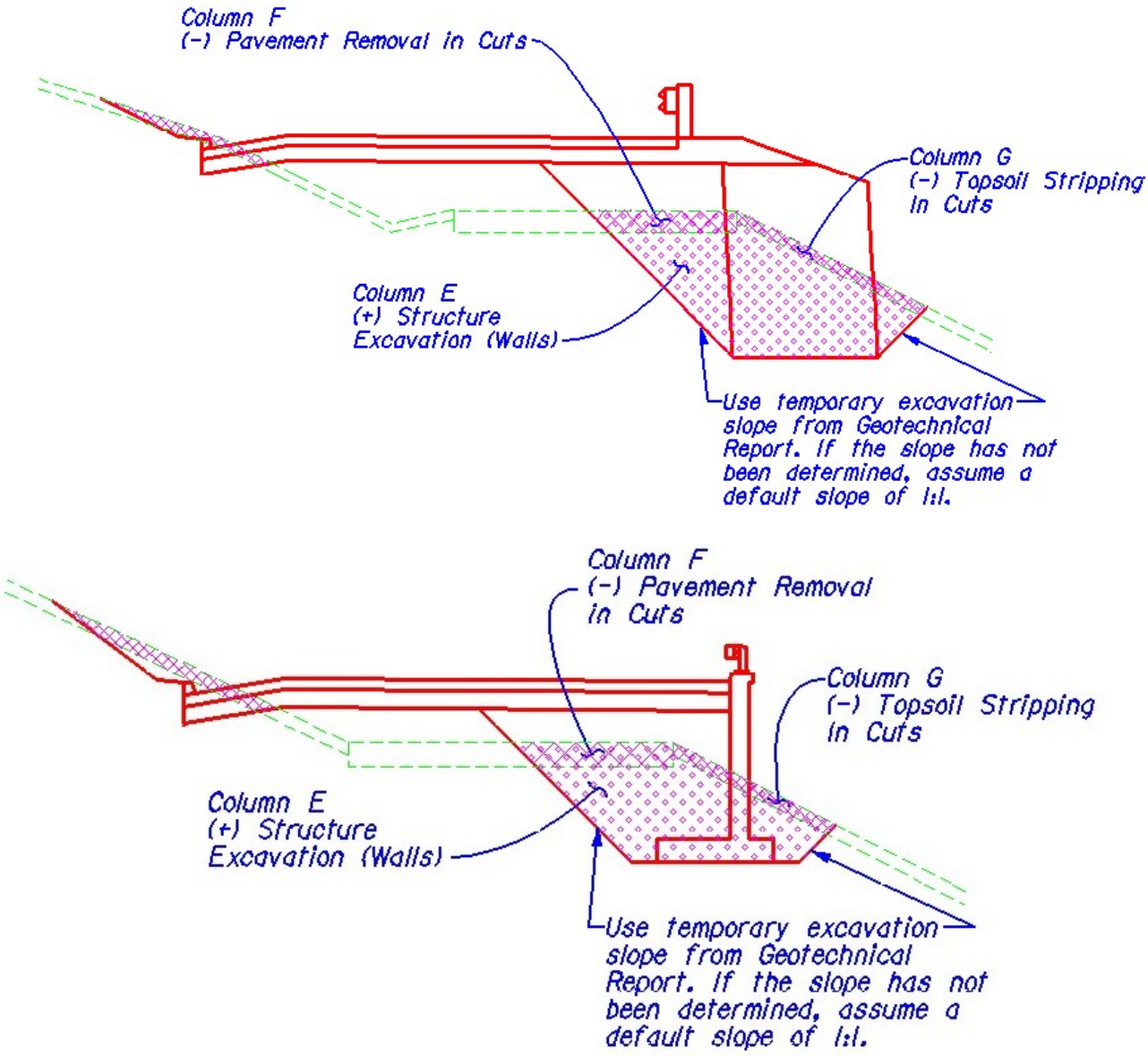
This value is the summation of the mainline roadway excavation and the approach road excavation. The formula for the spreadsheet is Column B + Column C. The number represents the total *unadjusted* excavation for the specified station range.

Primary Heading: Adjustments to Excavation

The primary heading, *Adjustments to Excavation* provides a location to remove (deduct) excavated material such as topsoil and existing pavement from the material quantity that is available for embankment construction operations. *Adjustments to Excavation* can also be used to add material that is available for embankment construction but is not included in the *Roadway Excavation* portion of the table.

	Adjustments to Excavation							
Pay Item					**20402-0000** (if paid)			
	(+) Structure Excavation (Walls)	**(-) Pavement Removal in Cuts**	**(-) Topsoil Stripping in Cuts**	**(+) Excavation From Roadway Oblit-eration**	**(+) Subex-cavation**	**(-) Disposal of Subex-cavation Material**	**Average Shrink/ Swell Factor**	**Total Excavation Available for Fills**
	Column E	Column F	Column G	Column H	Column I	Column J	Column K	Column L





Column E: (+) Structure Excavation (Walls)

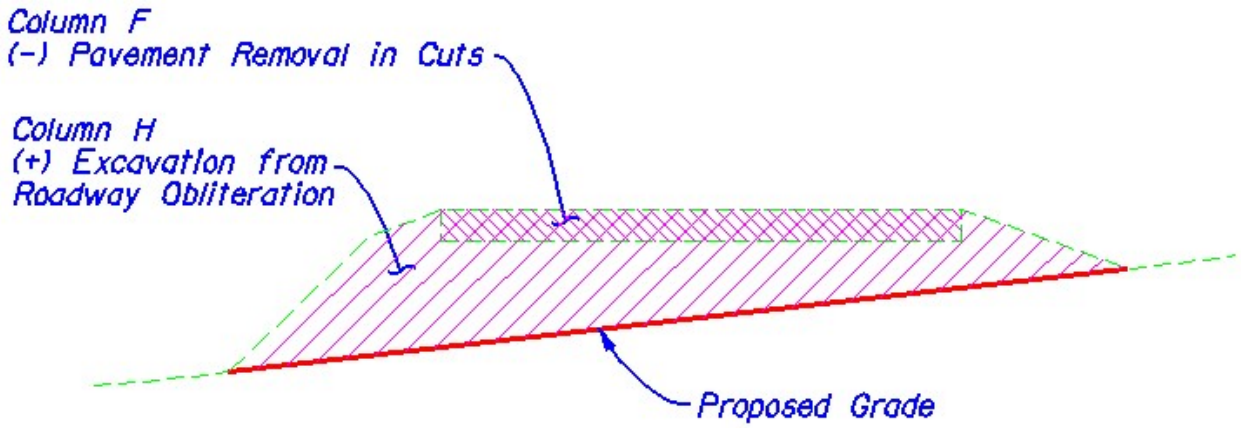
This is the volume of material displaced by the retaining wall and associated backfill below original ground of the existing roadway. Often times, special backfill is required for retaining wall construction, thus the excavated material becomes available for use in construction of embankments.

Column F: (-) Pavement Removal in Cuts

If the existing pavement will be recycled as a base course or hauled away from the project, this value will represent the amount of material lost from excavation. If the project will simply incorporate the existing pavement as fill material, this column is not used within the Grading Summary.

Column G: (-) Topsoil Stripping in Cuts

This quantity represents the amount of topsoil salvaged from excavated areas. Since the material will be salvaged and not available for embankment construction, it is shown with a negative sign. The values used within the Grading Summary are calculated on a station-to-station basis by GEOPAK and input directly into the Cross Section Data (XS Data) worksheet.



Column H: (+) Excavation From Roadway Obliteration

This is the volume of excavation from an obliterated area located outside the project slope stake limits. If the obliterated area is near a specific station range identified in Column A, this volume would be added into the appropriate row. However, in situations of realignment where the new alignment is a significant distance from the old roadway, these volumes should be added on a separate row at the bottom of the Grading Summary and NOT included in the Mass Haul Diagram. Including volumes in the Mass Haul Diagram that do not accurately reflect the true project haul conditions can lead to a misrepresentation of earthwork and claims during construction (Note: excavation for roadway obliteration is not paid for under Section 204. Roadway obliteration is paid under Section 211 and is measured as an area. The obliteration area should be calculated separately and shown in the Tabulation of Quantities).

Column I: (+) Subexcavation

This column reflects the quantity of subexcavation along the station ranges identified in Column A. See **Selection of Primary Pay Item** above for guidance in the use of a subexcavation pay item.

Column J: (-) Disposal of Subexcavation Material

If subexcavation material is unsuitable for embankment construction, use this column to deduct the appropriate volumes from the excavation available for fills. Material

may be unsuitable if it is excessively wet, organic or contains a large volume of deleterious substances. If subexcavated material can be used for embankment construction, do not place a value in this column.

Column K: Average Shrink/Swell Factor

Shrink/swell factors are used to adjust quantities from the BCM (BCY) state to the CCM (CCY) state. These factors are typically estimated in the materials report and are subject to a significant degree of variation. Swell factors (values greater than one) are typically associated with rocky materials and mean that the CCM volume will be greater than the BCM volume. Shrink factors (values less than one) are typically associated with clayey or granular materials and mean that the CCM volume will be less than the BCM volume.

Column L: Total Excavation Available for Fills

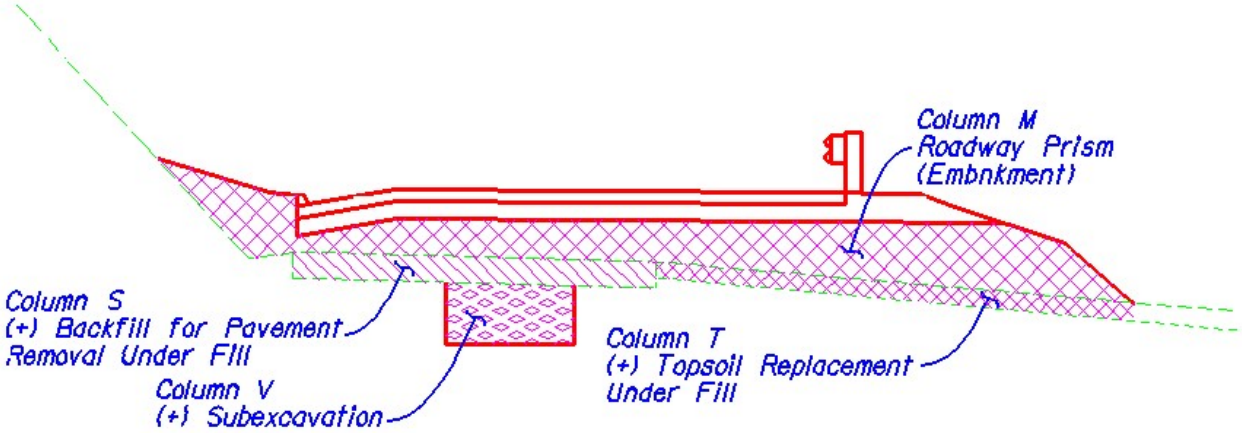
The value in this column represents the total amount of material that is available for embankment construction. The formula for the column is: (Column D + Column E – Column F – Column G + Column H + Column I – Column J) * Column K. The number represents the total *adjusted* excavation for the specified station range.

Primary Heading: Roadway Embankment

The primary heading, *Roadway Embankment* is similar in nature to *Adjustments to Excavation.* The quantities used in these columns allow you to add and subtract the quantities of embankment needed to construct a project to subgrade elevations.

	Roadway Embankment					
Pay Item						
	Roadway Prism	**Approach Roads**	**(+) Wall Backfill**	**(+) Select Wall Backfill**	**(+) Backfill Material**	**(+) Structural Backfill**
	Column M	Column N	Column O	Column P	Column Q	Column R

	Roadway Embankment				
Pay Item					
	(+) Backfill for Pavement Removal Under Fill	**(+) Topsoil Replacement Under Fill**	**(+) Embankment for Roadway Obliteration**	**(+) Subexcavation**	**Total Embankment**
	Column S	Column T	Column U	Column V	Column W

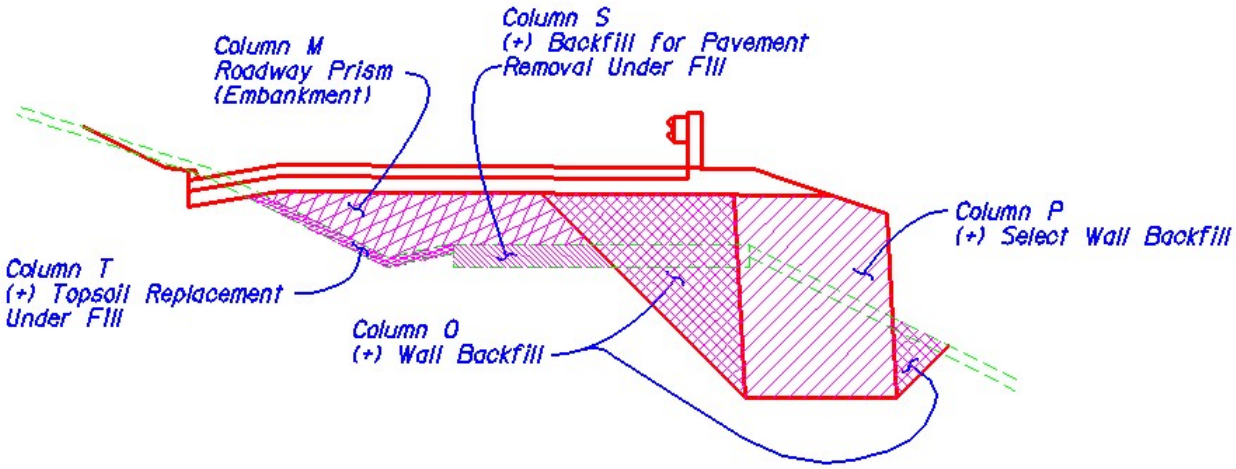


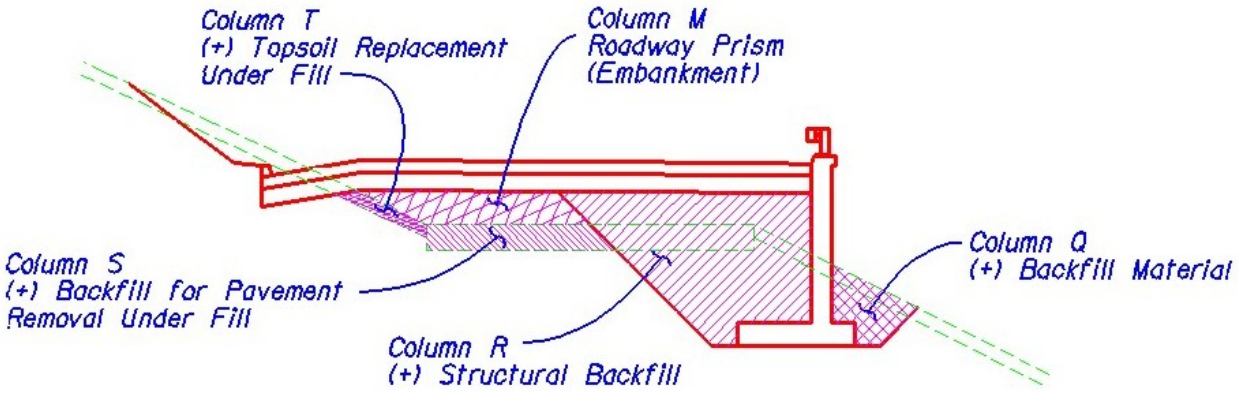
Column M: Roadway Prism

This quantity represents the volume of roadway embankment for the station range specified in Column A. These values are the unadjusted volumes calculated directly by GEOPAK and summed for the appropriate interval.

Column N: Approach Roads

Values in this column represent the embankment required to construct the approach roads in the station range identified. Although the approach roads have different stationing than the mainline, tabulate the associated embankment volumes under the mainline stationing interval that best represents the approach road location. By doing so, the Mass Haul Diagram will better reflect the anticipated haul of material. In the circumstance where the approach road length is excessive, the volumes can be tabulated in a separate Grading Summary or at the bottom of the mainline summary. If they are tabulated at the bottom of the mainline summary, be sure NOT to include the tabulations in the Mass Haul Diagram.





Column O: (+) Wall Backfill

This column represents the amount of material necessary to backfill portions of MSE wall excavations (see cross section above). This column should be used if wall backfill material can be made from on-site excavation. Do not use this column when using reinforced concrete retaining walls.

Column P: (+) Select Wall Backfill

This volume represents the amount of select wall backfill for MSE retaining walls (see cross section). Select wall backfill is typically special processed material that meets a certain gradation (select granular backfill). Use this column only if the select wall backfill will be processed from on-site material. By showing numbers in this column, the designer is representing that material excavated or found on-site WILL meet the gradations and material quality requirements for use as select wall backfill. Make sure that materials tests are performed to verify this requirement. Do not assume the material will meet the specifications. Typically, this material will come from a few isolated excavation areas and will not be spread over the entire project. If select wall backfill will be imported from off-site, do not use this column to show the quantities. Do not use this column when using reinforced concrete retaining walls.

Column Q: (+) Backfill Material

This column represents the amount of material necessary to fill in front of reinforced concrete retaining walls (see cross section above). This material typically comes from on-site excavation, but is subject to gradation requirements (see FP-03 Subsection 704.03). This portion of reinforced concrete retaining wall fill is not required to meet structural backfill requirements. If on-site material cannot meet the gradation requirements in Subsection 704.03, this material must be imported from off-site, so this column is not needed within the Grading Summary. Do not use this column if using MSE walls.

Column R: (+) Structural Backfill

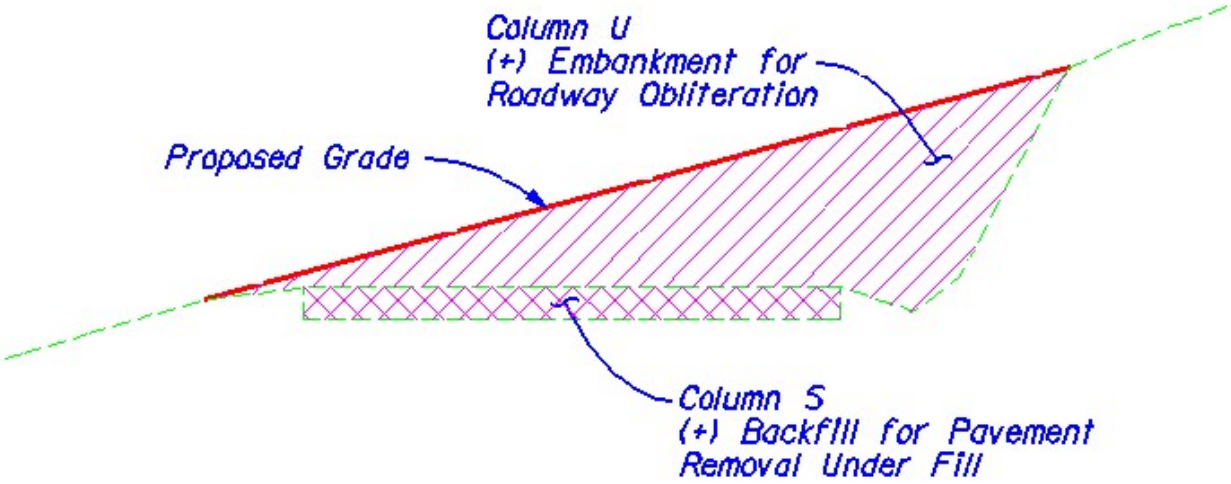
This column represents the amount of material necessary to backfill behind reinforced concrete retaining walls (see cross section on previous page). This material must meet the requirements of Subsection 704.04 of the FP-03. Because this material is specially processed to meet the gradation requirements and is subject to other material requirements, it may not come from on-site excavation. If structural backfill material is imported from off-site, do not use this column within the Grading Summary. Do not use this column when using MSE retaining walls.

Column S: (+) Backfill for Pavement Removal Under Fill

If the existing pavement will be recycled as a base course or hauled away from the project, this value will represent the amount of material needed to backfill the existing pavement area. If the project will simply incorporate the existing pavement as fill material, this column is not used within the Grading Summary.

Column T: (+) Topsoil Replacement Under Fill

These quantities represent the amount of fill material needed to replace topsoil salvaged underneath new fills of the roadway.



Column U: (+) Embankment For Roadway Obliteration

This column accounts for circumstances where additional embankment quantities will be needed to obliterate roadway sections. If the sections of obliterated roadway are directly adjacent to the proposed construction, the quantities should be placed in the row with the appropriate station range to accurately depict the haul that is expected. In cases of realignment, where the obliterated sections are not adjacent to the proposed construction, the quantities should be added as a separate row at the bottom

of the Grading Summary. Quantities shown at the bottom of the Grading Summary should not be used when making the Mass Haul Diagram, as they will not accurately portray the hauling needs of the project.

Column V: (+) Subexcavation

This column should have the same quantities identified in Column I for Subexcavation under the Adjustments to Excavation primary heading. In cases where material will be subexcavated and recompacted in place, Columns I and V still need to have the same value because subexcavated material will typically experience volume changes once it is excavated and recompacted (note the difference in the definition of material, Column I is BCM, while Column V is CCM).

Column W: Total Embankment

The values in this column result from the addition of the values in preceding columns under *Roadway Embankment*. The formula is Column M + Column N + Column O + Column P + Column Q + Column R + Column S + Column T + Column U + Column V. These values should be added across each individual row. The result of this addition is the total volume of material required to construct the embankments in the identified station range.

Primary Heading: Mass Haul

The primary heading, *Mass Haul,* tracks the variations between available excavation and needed embankment. These columns are exceptions to the logical left to right flow of the summary.

	Mass Haul	
Pay Item		
	Excavation – Embankment	**Mass Ordinate**
	Column X	Column Y

Column X: Excavation – Embankment

This column is simply the Total Excavation Available For Fills (Column L) minus Total Embankment (Column W). This operation (Column L – Column W) should occur on each row. The value represents the surplus or shortage of material over the specified station range.

Column Y: Mass Ordinate

This column represents the cumulative mass differential as the project moves from the start through the end. The values in this column are best shown through the use of an example table:

Excavation – Embankment	Mass Ordinate
-518	**-518**
1169	(-518 + 1169) = **651**
2451	(651 + 2451) = **3102**
-1822	(3102 + -1822) = **1280**

The mass ordinate for the first row of the Grading Summary is always identical to the Excavation – Embankment value. To obtain subsequent mass ordinate values, simply add the mass ordinate in the row above to the Excavation – Embankment value in the row you are working in.

Miscellaneous Columns

These columns are used to total the conserved topsoil available for placement on the constructed slopes and other items. The number of columns needed varies from one to three depending on the project earthwork balance and pay items. See scenarios under **Column AA** below for descriptions of each case.

Pay Item	None	**20441-0000, 20420-0000** or None, See Scenarios below	**20403-0000**, See Scenarios below
	Conserved Topsoil	**Waste, Embankment construction or Unclassified Borrow Required**, See Scenarios below	**Unclassified borrow**, See Scenarios below
	Column Z	Column AA	Column AB

Column Z: Conserved Topsoil

The value in this column results from the addition of the values in Column G (Topsoil Stripping in Cuts) and Column T (Topsoil Replacement Under Fill) and represents the volume of topsoil conserved in the specified station range. Add the values from the specific row you are working on. The summation of all the values in Column Z yields the volume of topsoil conserved along the project.

Column AA: Variable

The values obtained in this column vary with the type of project you have. Each scenario is discussed below and is also depicted in an example.

Scenario 1: Balanced Project

Under this scenario, there would be no need for this column since the project is balanced (no waste or borrow).

Scenario 2: Waste Project

Under this case, the pay item number would typically be 20441-0000, Waste (unless paid for in another manner) and the Column Heading would be "Waste". The value in the column would be the same as the value in Column X (Excavation – Embankment) for each row. When all the values in this column are added together in the "Totals" row at the bottom of the summary, this value represents the volume of waste, or excess material, for the entire project.

Scenario 3: Embankment project using Pay Item 20420-0000, Embankment construction as the primary payment item

With this scenario, the pay item would be 20420-0000, Embankment construction, with the same column heading. The value in the column would be the same as the value in Column W (Total Embankment) for each row. When all the values in this column are added together in the "Totals" column at the bottom of the summary, it represents the total volume of embankment needed to construct the project.

Scenario 4: Embankment project using Pay Item 20403-0000, Unclassified borrow as the primary payment item

In this case, this column will actually need to become two columns (Columns AA and AB). The first column would not have a pay item number and would be entitled "Unclassified Borrow Required". The values in this column would be the same as those in Column X (Excavation – Embankment). The second column would have pay item number 20403-0000, Unclassified borrow with a similar column heading. To obtain the values in the second column, you must divide the numbers in the first column with the appropriate shrink/swell factor of the borrow material that will result in taking the material from the CCM stage to BCM (unclassified borrow is measured in its original position). An appropriate note that describes the shrink/swell factor used should be added to the Notes section of the Grading Summary. When the values in the "Unclassified Borrow" column are totaled in the "Totals" row at the bottom of the summary, the resulting value is the total volume of unclassified borrow needed to build the embankments for the entire project. See **Selection of Primary Pay Item.**

General Notes

To facilitate communication regarding Grading Summaries, the following notes should be used at the bottom of the table:

1. The quantities shown herein are approximations. Payment will be made for the actual quantities of work performed and accepted.
2. BCM = Bank Cubic Meter – One cubic meter of material as it lies in the natural state.
3. CCM = Compacted Cubic Meter – One cubic meter of material after it has been compacted to specification density.

The addition of other notes that reference geotechnical investigations, materials studies or other assumptions made, should also be used as appropriate.

Other Column Headings

The column descriptions provided above are not intended to be all-inclusive. There may be other circumstances on a project that require additional columns for conserved or added materials. While this decision needs to be made on a project-by-project basis, some examples of other added columns are:

- (-) Conserved Rock for Riprap
- (+) Government Furnished Borrow
- (-) Conserved Rock for Boulder Placement
- (-) Conserved Excavation for Topping or Select Topping

C. Mass Haul Diagram

Haul can significantly influence the cost of performing contract-related earthwork. Contractors must estimate the total amount of haul to be performed, the equipment to perform the haul and the estimated rate of haul (productivity) as part of the bid price. In the event the work changes as a result of Government error or a differing site condition, equitable adjustments in the price are determined (in part) by comparing the total haul anticipated from the design earthwork with the total haul required as a result of the change.

Productivity (rate of haul) is of critical importance in estimating haul costs. In order to estimate the required haul, the contractor must know where the gross material movements occur. A relatively well-detailed Mass Haul Diagram will provide sufficient information for the contractor to estimate total haul. The Mass Haul Diagram should depict a visual representation of the cut and fill material on the project, as well as indicate the cumulative balance (excess or deficit) of material available to construct the project to subgrade at given locations on the project. The diagram should be detailed enough to show all the peaks and valleys associated with the movement of the material; a simple line diagram showing only a few points along the project is not acceptable.

Much like quantities shown for roadway obliteration in realigned sections of roadway, quantities of material obtained from borrow sources should not be included in the Mass Haul Diagram. By not showing borrow, the contractor can evaluate the on-site material and consider the most cost effective manner of constructing the project by considering existing material placement, haul, scheduling concerns, grading limitations, borrow source location, etc. The contractor may, for example, choose to move the existing material in a manner inconsistent with normal movements so as to reduce borrow haul, provide for culvert pipe or wall placement, to work wet materials in the order and at the time most conducive to deal with them, or for other reasons. If borrow materials or roadway obliteration quantities associated with realignments are shown in the Mass Haul Diagram, the shape of the diagram is altered, thus obscuring the evaluation of what the on-site project dirt can do.

D. Cross Sections

The inclusion of cross sections in the plans adds a significant amount of information. The cross sections provide a graphical representation of the character of the earthwork to be performed. For example, cross sections identify the various construction prisms such as sliver fills requiring major benching and difficult-to-access cuts. Cross sections permit the contractor to more accurately estimate the cost of the earthwork and anticipate operations that will severely impact productivity requiring unusual time or coordination.

IV. Final Thoughts

There are a multitude of situations that can occur when trying to accurately represent project-specific earthwork. Care must be taken to ensure that earthwork is estimated correctly.

The general layout of the Grading Summary (major headings, pay item row, column location within the summary and column headings) and notes are important. When specific conditions result in deviations from the general format, an attempt should be made to preserve as much of the standard template as possible.

There are several questions designers must consider each time to prepare a Grading Summary and Mass Haul Diagram in order to make sure all items of earthwork are accounted for:

1. Does the Grading Summary approximate, as closely as possible, the generic Grading Summary format?
2. Does the Grading Summary and Mass Haul Diagram accurately identify the factors that are important to successfully bid the earthwork? For example:
    - Are materials that will not be available for embankment operations appropriately subtracted?
    - Would the project be best served by including appropriate pay items for waste, embankment, borrow, etc?
    - Is the Grading Summary and Mass Haul Diagram accurately derived from the earthwork run and hand calculations necessary for retaining walls?

- Do the shrink/swell factors match those presented in the materials report? Was sufficient investigation performed to estimate the shrink/swell factors, especially in borrow sites if they are Government-identified?
- Are design assumptions identified and the proper notes used at the bottom of the Grading Summary?

3. Are the Grading Summary and Mass Haul Diagram complete and easily understood?
    - Do calculations run from left to right?
    - Are column headings clear and labeled correctly?
    - Are all pay items clearly identified?
4. Are representative cross sections included in the plans?
5. Do the SCR's adequately describe expectations that are not clear in the Grading Summary and Mass Haul Diagram (such as disposal of unsuitable material, potential waste sites, etc)?