

EARTHWORK SUMMARY GUIDANCE

Purpose:

The primary purpose of the Earthwork Summary is to determine quantities of earthwork for payment – common excavation and common borrow (if required) – using the [Earthwork Computation Worksheet \(ECW\)](#), documenting additions and subtractions to the base excavation and fill quantities. This Guidance will explain how to complete the ECW for use as the Earthwork Summary in the plans.

Guidance:

General

Fill in only the lines that do not display “0” by default. For those lines that display “0” the value will be automatically calculated.

It is acceptable to delete lines where there is no input value, but only delete those that do not display “0” by default. Deleting lines that display “0” will create problems with the formulas in the worksheet.

Common Excavation for Estimate

The following items should be added to the common excavation quantity from the “COMMON EXCAVATION (FROM MODEL OR PLANS)” line in order to determine the total common excavation for the estimate:

GRUBBING IN FILL
LOAM SALVAGE
UNDERCUT
MUCK EXCAVATION
PEAT EXCAVATION
CULVERT INLET AND OUTLET DITCHES
PAVEMENT SALVAGE IN FILL

These items are not normally calculated as part of the original excavation quantity taken from the model or plans and are figured separately. The cost of these “extra” excavations is paid for under common excavation and therefore need to be added in to determine the total common excavation cost. Not all of these are also applicable to every project.

Grubbing

Grubbing is existing surface material that is unsuitable to be used under the roadway as fill. See [Design Guidance - Grubbing in Fill](#) and Standard Specification Section 203 for specific parameters for grubbing.

Grubbing in Fill must be added to the “COMMON EXCAVATION FOR ESTIMATE” calculations since it is not calculated in the normal cut calculations computed from the cross sections and is paid for under common excavation

Grubbing in Cut does not need to be added to the “COMMON EXCAVATION FOR ESTIMATE” calculations since it is already included in the normal cut quantity calculations computed from the cross sections.

Both grubbing in cut and fill need to be estimated because this is excavation that is unsuitable for use under the roadway and embankment and must be deducted from the “AVAILABLE COMMON EXCAVATION FOR BORROW CALCULATIONS” line to determine the amount of suitable available excavation material

Loam Salvage in Fill

In areas of farm fields, large lawn areas etc., loam may be salvaged rather than grubbed and wasted. Check with the Geotechnical Section and/or the project Landscape Architect about the appropriate use of loam salvage on a particular project.

Undercut

Consult the Geotechnical Section for recommendations for undercutting.

Muck Excavation (Peat Excavation)

Consult the Geotechnical Section and the project Environmental Coordinator for recommendations for undercutting.

Pavement Salvage

Pavement salvage is required on all projects as per Section 200 of the Standard Specifications.

Pavement salvage is normally paid for as common excavation unless specifically covered under another process or pay item for pavement recycling or removal

Pavement salvage in cut and fill must be computed separately for the same reasons as for grubbing as explained above.

If the pavement on a project will be utilized on the project as recycled material, the volume of pavement should be deducted from the common excavation quantity because removal of the pavement would be paid for under the pavement recycling item.

Fill for Borrow Calculations

The following items should be added to the common fill quantity from the cross sections in order to determine the total fill material quantity needed to build the project:

GRUBBING IN FILL
LOAM SALVAGE IN FILL
UNDERCUT
MUCK EXCAVATION
PEAT EXCAVATION
PAVEMENT SALVAGE IN FILL
RECYCLED PAVEMENT REMOVAL IN FILL

These items are not normally calculated as part of the original fill quantity taken from the cross

sections and are figured separately. Not all of these are also applicable to every project.

Rock Excavation for Estimate

Rock material will be factored in to available excavation which can be used to meet the fill requirement

See the information under Item 203.21 Rock Excavation – Cubic Yard in the [Estimating Guidance](#).

Available Common Excavation for Borrow Calculations

This section documents deductions from common excavation. The following materials are paid for removal under common excavation but are not available or appropriate for use as fill and must be deducted.

GRUBBING IN CUT
GRUBBING IN FILL
LOAM SALVAGE IN CUT
LOAM SALVAGE IN FILL
UNDERCUT
MUCK EXCAVATION
PEAT EXCAVATION
PAVEMENT SALVAGE IN CUT AND IN FILL

Consider stumps and root balls as part of deductions as undercut.

After these deductions are applied to common excavation to obtain total available common excavation, structural excavations for underdrain only are added in to obtain the total available non-rock excavation.

Computation of Waste Storage and Waste Material

Standard Detail 203(01) Muck Excavation and Waste Storage should be reviewed for potential waste storage locations. Consideration of existing soils combined with potential waste material needs to be discussed with the Geotechnical Section as benching will also be occurring in this area. The combination of existing material and waste material should not produce wet, unstable conditions. The computation of waste material available on the project is separate from the computation from the cross sections to determine the available volume for the potential waste material to be placed.

Computation of Granular Borrow for Estimate

Granular borrow is used for replacing muck, peat, and undercutting, filling in low wet areas and for maintenance of traffic. The combination of the miscellaneous uses for granular borrow will determine the final quantity for the Engineer's Estimate.

Muck

In general, all removed muck shall be replaced with granular borrow. Rock excavation should be used to replace muck only when the available quantities of embankment materials would require the wasting of rock excavation unless it were used to replace muck or when the estimated cost of granular borrow would appear to be excessive. Whenever rock excavation will be used, a 2-foot minimum depth initial layer of granular borrow should be specified.

Low, Wet Areas

Granular borrow shall generally be estimated for the bottom (2-foot) of embankments in low, wet areas. The width of this initial layer should be limited to that area inside the waste area storage lines. The locations and depths required for this usage can generally be determined from the soils report and/or the field inspection. In addition, when grubbing or muck excavation is replaced with granular borrow, the granular borrow shall be brought to a minimum of 1 foot above water level.

Embankment Construction Near Bridge and Box Culverts

The limits of the granular borrow embankments for this usage shall be determined by the Geotechnical Section and appropriately defined on the highway plans.

Maintenance of Traffic

The specifications for most projects that are required to carry traffic during construction will generally require a minimum roadway width of 20 feet two lanes of traffic. In many instances, this specification will cause the widening of the existing roadway or the topping of partially completed embankments to provide the required width. In both instances, granular borrow will be used to accomplish the desired results.

Culvert Bedding

If granular borrow is used for this purpose, a general note should be made on the plan stating that payment will be made as granular borrow and that the material meets the requirements of granular borrow for underwater backfill.

General Embankment Construction

The following applies:

- On some projects a certain percentage of the borrow requirements will be estimated as granular borrow to aid in the construction of embankments by allowing alternate layers of granular material and excavated material to be placed.
- On some projects when a large supply of granular borrow is readily available, the entire borrow requirements may be estimated as granular borrow.

Computation for Surplus Material or Common Borrow for Estimate

Waste and Borrow Projects Definitions:

Waste project – Any project where the volume of cut material exceeds the volume of fill material that is required.

Borrow project – Any project where the volume of fill material exceeds the volume of cut material required.

Instructions:

If there is structural rock excavation on the project, enter the quantity in the “TOTAL AVAILABLE STRUCTURAL ROCK EXCAVATION” line.

For the “TOTAL WASTE MATERIAL TO BE UTILIZED” line, select either 0.90 for “TOTAL WASTE MATERIAL” or 1.10 for “TOTAL AVAILABLE WASTE STORAGE” from the drop-down menu, whichever was used under “COMPUTATION OF WASTE STORAGE & WASTE MATERIAL” above.

If the project is a Borrow project then the line “BORROW NEEDED = TOTAL FILL MINUS TOTAL AVAILABLE EXCAVATION” will have a positive quantity. If the project is a Waste project, this line will be zero

If the project is a Waste project then the line “SURPLUS MATERIAL = AVAILABLE EXCAVATION MINUS TOTAL FILL, PLUS TOTAL WASTE MATERIAL TO BE WASTED” will have a positive quantity. If the project is a Borrow project, this line will be zero

If the project is a Waste project, everything else below this line should be deleted. If the project is a Borrow project continue to fill out the rest of the worksheet below.

If granular borrow is utilized for low wet areas copy the quantity from the “GRANULAR BORROW IN LOW WET AREAS” line under the COMPUTATION OF GRANULAR BORROW FOR ESTIMATE CALCULATION” section. If the line for “GRANULAR BORROW TO MAINTAIN TRAFFIC” is utilized check with Construction Support to see what quantity if any could be utilized as fill for this line

The “COMMON BORROW” quantity is not swelled since borrow is paid for in place, and this is the common borrow quantity that should be listed on the Estimated Quantities sheet.