WorksOS Volume Calculations

Trimble Civil Construction

March 2022

WorksOS Volumes Calculations

Objects used in performing volume calculations:

Machine ‘As Built’ Surfaces

- Surfaces using machine data, usually last past of prior date to last pass of current date

Surveyed Surfaces

- Surveyed Surfaces are not required for Volume Calculations, as you can always calculate volume from one machine surface to another machine surface by date filtering.
- If Surveyed Surfaces are not imported into the project, we cannot calculate volumes where machines have not completed more than one pass.
- A Surveyed Surface can now be imported with a date prior to any machine data and it will be the ‘Start Date’ for any ‘Project Extents’ date filters.

Composite Surfaces

- Composite Surfaces are a combination of machine as built surfaces and the surveyed surface.

Designs

- Designs are required for Work Remaining Volume Calculations. Without a Design, the system does not know what surface you are building to.
- Multiple designs (Subgrade, Finish Grade, Utilities, etc.) can be imported and used to filter Work Remaining.
- You can create offset designs in WorksOS.

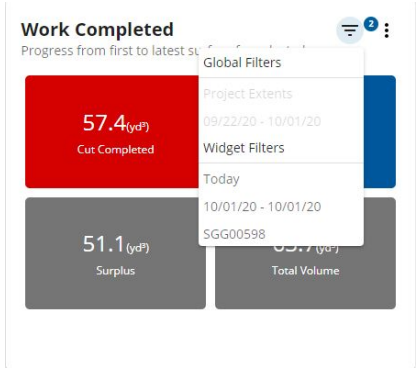
WorksOS Volume Filters

Filters that include Surveyed Surfaces:

- **Date/Time** - provided you select a Date/Time that includes the Survey Date of a Surveyed Surface.
- **Custom Area**

All other Filters exclude Surveyed Surfaces when applied, i.e., they snap to Machine data only and automatically 'filter out' Surveyed Surfaces as they all look for machine data values only.

Machine Filter Applied



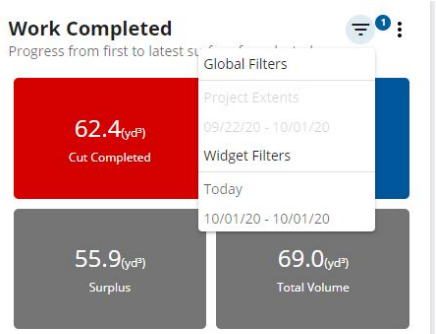
Machine Last Pass

Previous Machine Passes

Surveyed Surface

Volume we Calculate

Date Filter Only Applied



Machine Last Pass

Previous Machine Passes

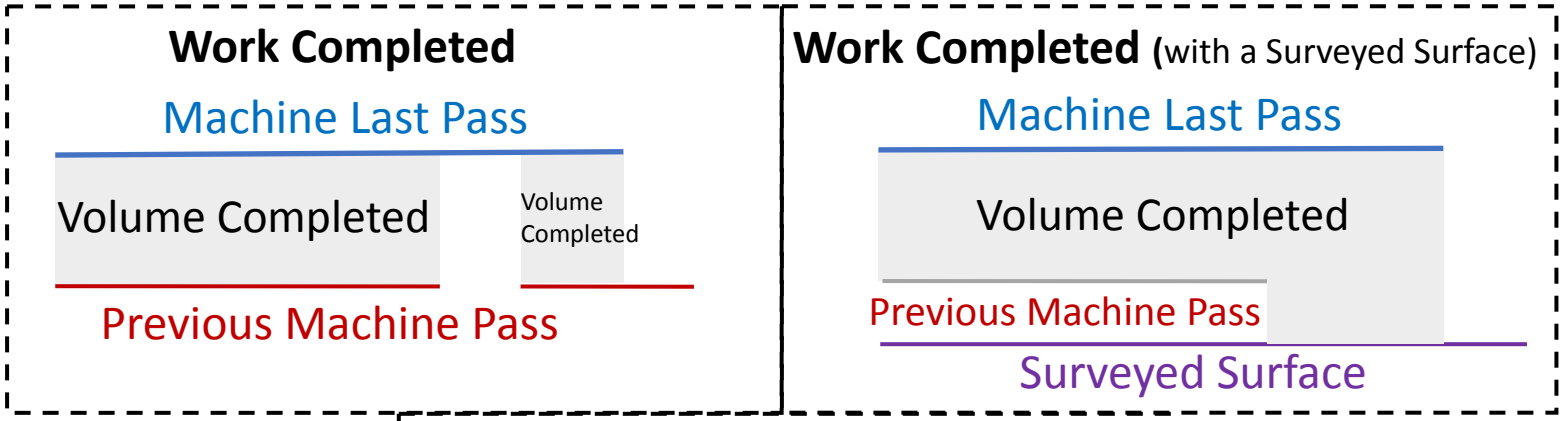
Volume we Calculate

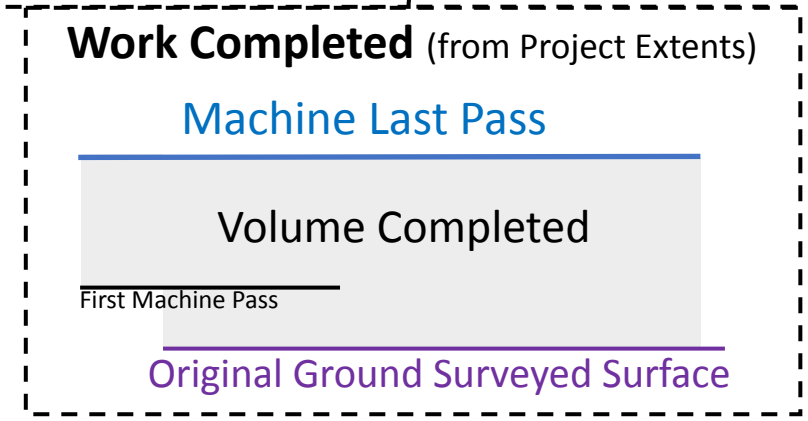
Surveyed Surface

WorksOS Work Completed

Work Completed calculates the volume in place between a past machine surface and the latest machine surface.

When a Surveyed Surface is included it will also the volume in place between the surveyed surface and the latest machine surface.

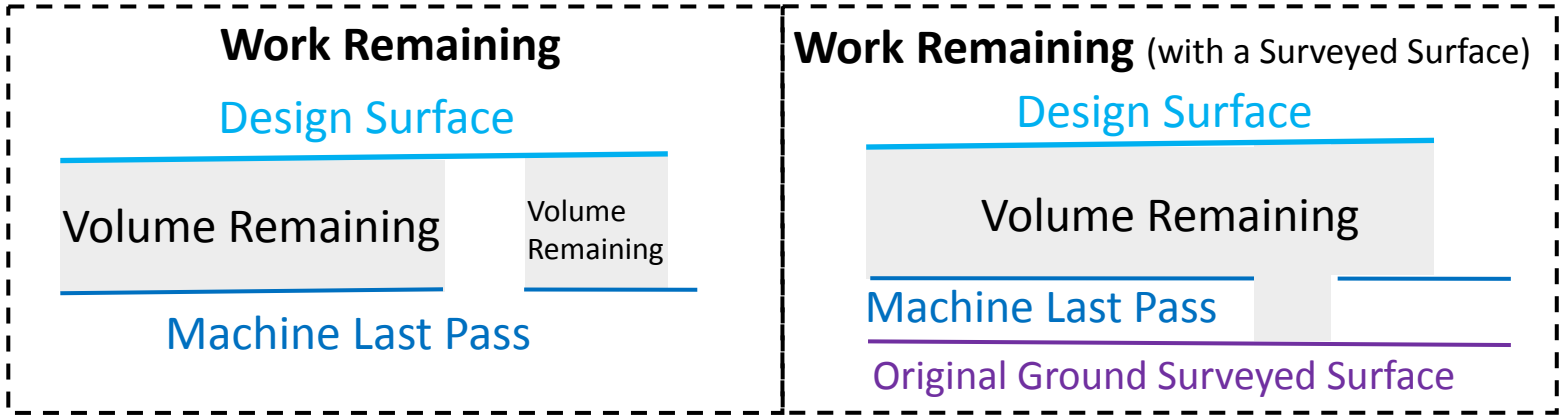




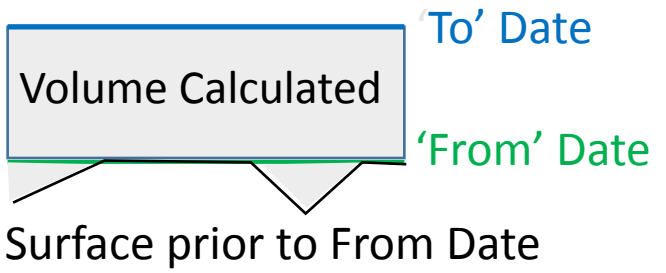
WorksOS Work Remaining

Work Remaining calculates the volume remaining between machine surfaces and design surfaces

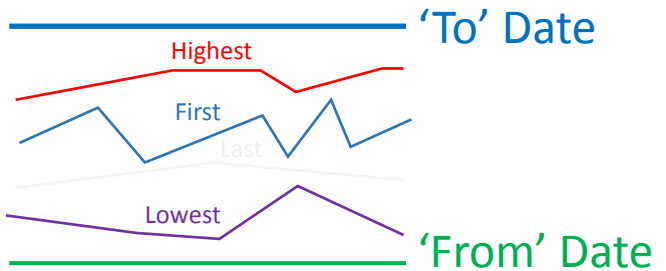
When a Surveyed Surface is included it will also calculate the volume between the surveyed surface and the design boundary



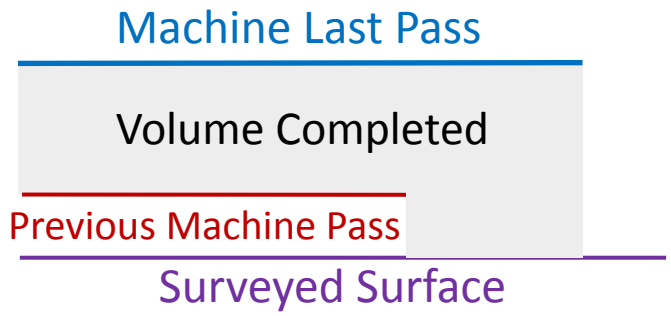
Preset Date Range Filters in Volumes



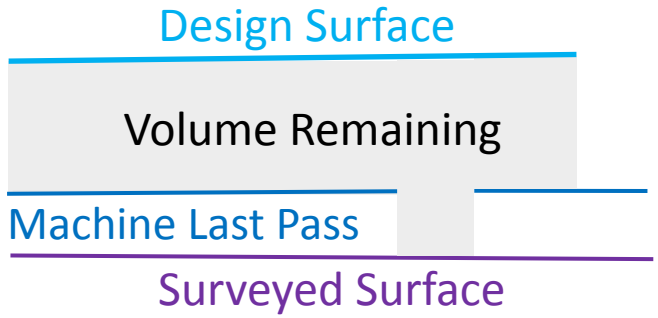
Elevation Filters in Volumes



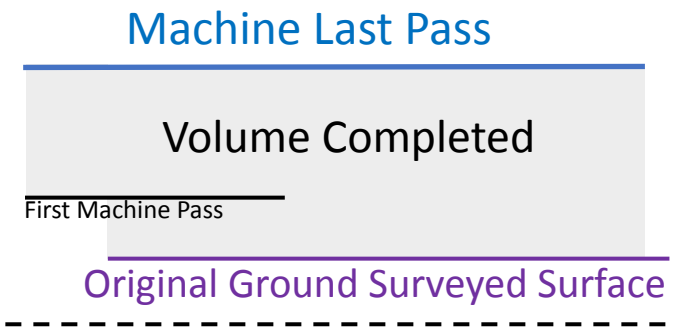
Work Completed (with a Surveyed Surface)



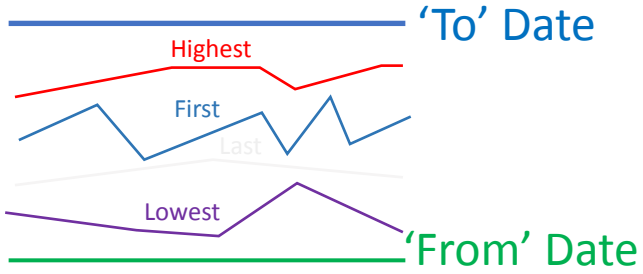
Work Remaining (with a Surveyed Surface)



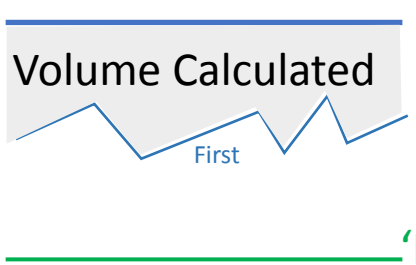
Work Completed (from Project Extents)



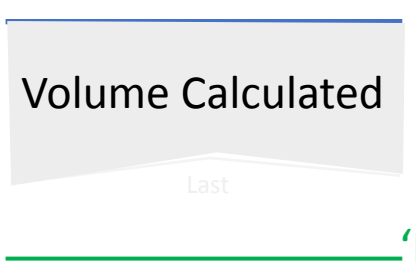
Elevation Filters in Volumes



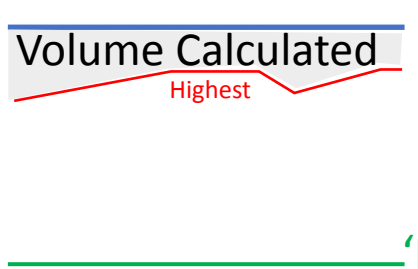
First Elevation Filter in Volumes



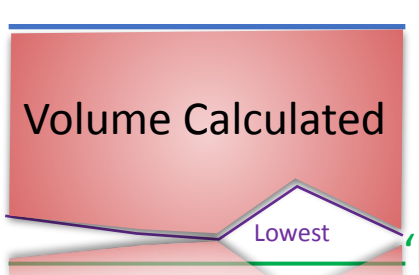
Last Elevation Filter in Volumes



Highest Elevation Filters in Volumes



Lowest Elevation Filters in Volumes



WorksOS Machine Settings

Earthworks Excavators

- Minimum Elevation: Most recent Lowest Pass
- Last Pass: Last pass regardless of elevation

GCS Excavators

- Blade On Ground (BOG) maps data when true and does not map it when it is false

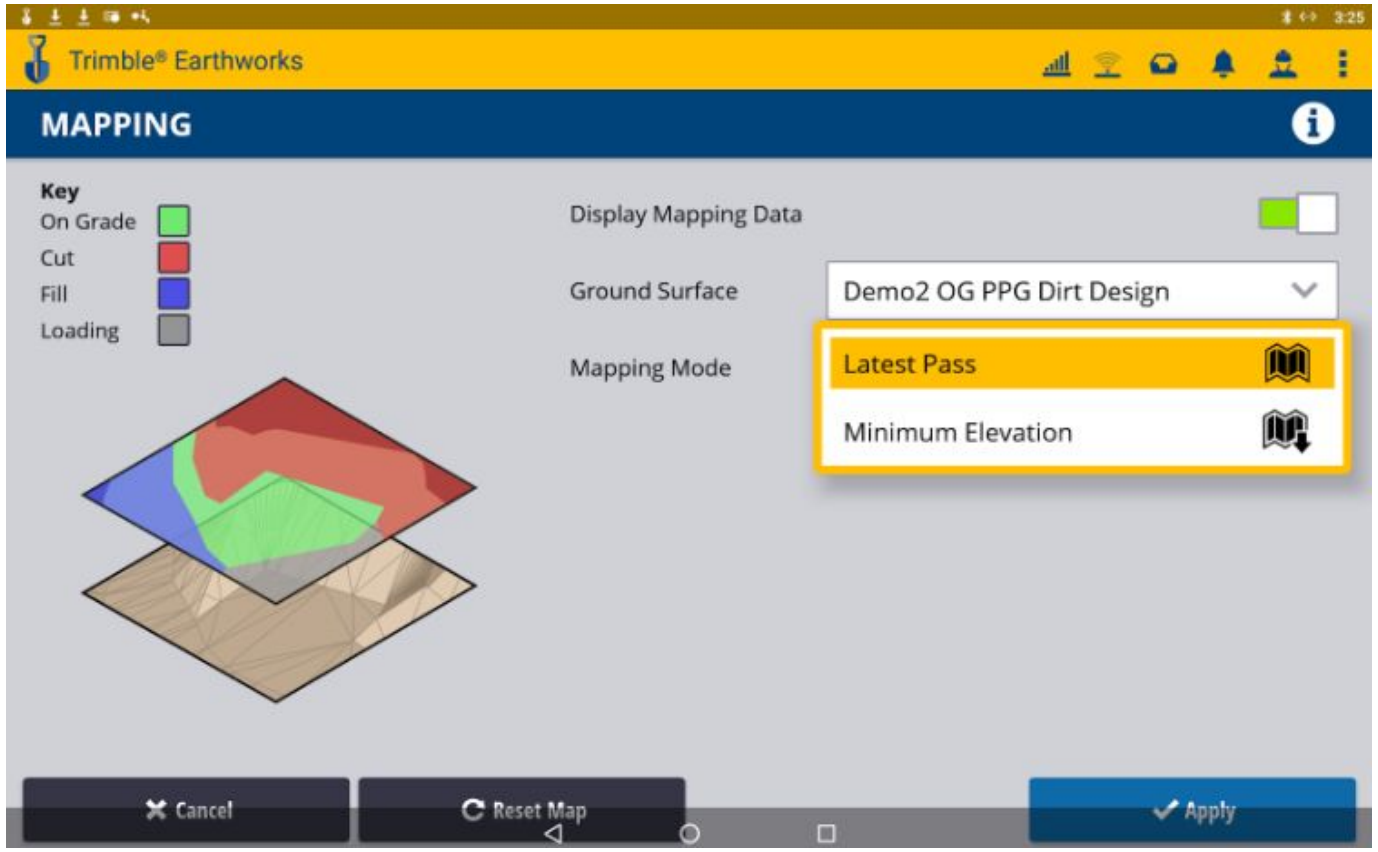
Earthworks or GCS Dozers

- Blade On Ground (BOG) maps data when true and does not map it when it is false.

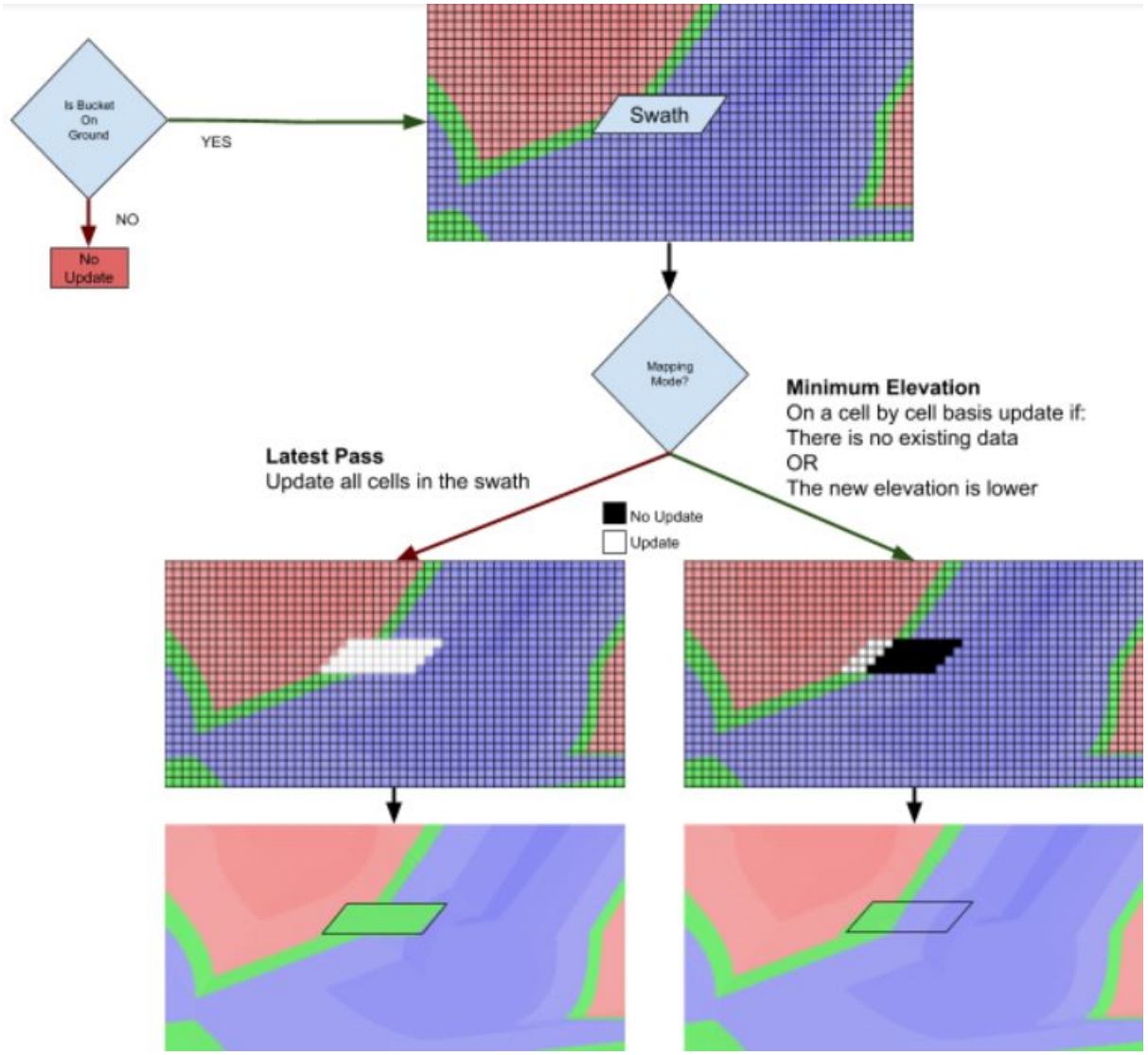
Calculating Volumes for Minimum Elevation Mapping

In conjunction with Trimble Earthworks Release 1.8, Minimum Elevation Mapping is supported in Tag Files going into WorksOS.

For a full explanation on Minimum Elevation Mapping for Trimble Earthworks, please refer to the Trimble Earthworks Version 1.8 Release notes.



- The mapping mode dictates how cells are updated as a swath (from a bucket pass) and rendered into the database. In Latest Pass mode, every cell covered by the swath is updated. In Minimum Elevation mode, a cell is updated if there was no existing value or the new value has a lower elevation. This means Lowest Pass is essentially only recorded for Trimble Earthworks 1.8 TAG Files and to ignore higher passes on the same cell.
- Production data (tag files) in 1.8 provide sufficient information for WorksOS to process the mapping mode (minimum elevation vs latest pass) correctly and support for the specific ‘minimum elevation’ tag in VisionLink has been completed.



Note: The logic for calculating Volumes using Minimum Elevation Passes differs from calculating Volumes using Latest Passes due to the nature of a Minimum Elevation looking for the most recent Lowest Pass “as-at” the stated From and and To periods entered in the Volume calculation.

Exceptions include:

1. Minimum Elevations will look back to the time prior to the “From” period to determine the last known pass, this may be a Surveyed Surface or a cell pass. If it's a cell pass and in min elevation mapping mode it will continue to look back until the lowest pass is found.
2. The look back through min elevation passes will stop once a Latest Pass found. In that case it will use the lowest pass found up until that point.
3. If however from the “From” period there is no prior elevation from production, or surveyed surface then the first pass looking forward is used.

- Calculating a Volume for Project Extents using Minimum Elevation Pass data will calculate ‘From’ the First (not Lowest) Machine in the Project ‘To’ the Minimum Elevation (Lowest) Pass.

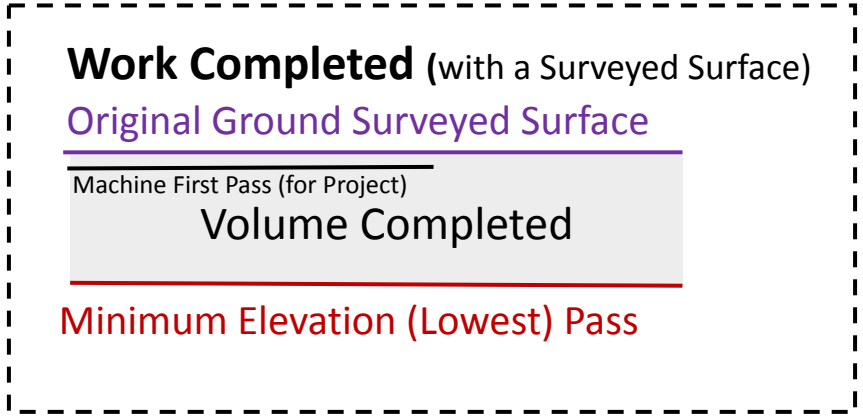
Work Completed (for Project Extents)

Machine First Pass (for Project)

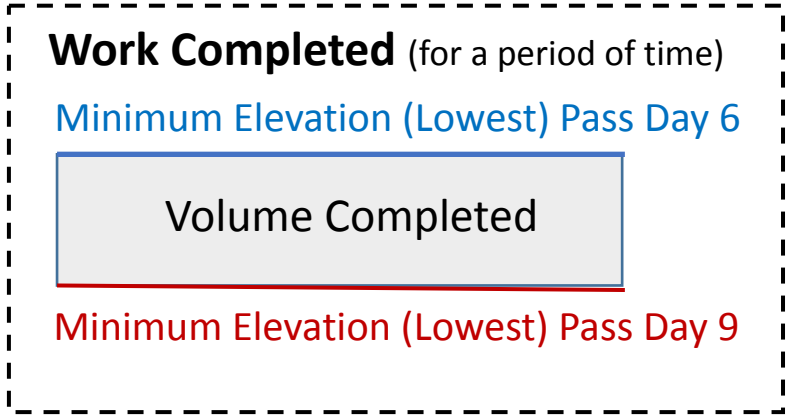
$$\frac{\text{Volume Completed}}{\text{Initial Machine Lowest Pass (for Project)}}$$

Minimum Elevation (Lowest) Pass

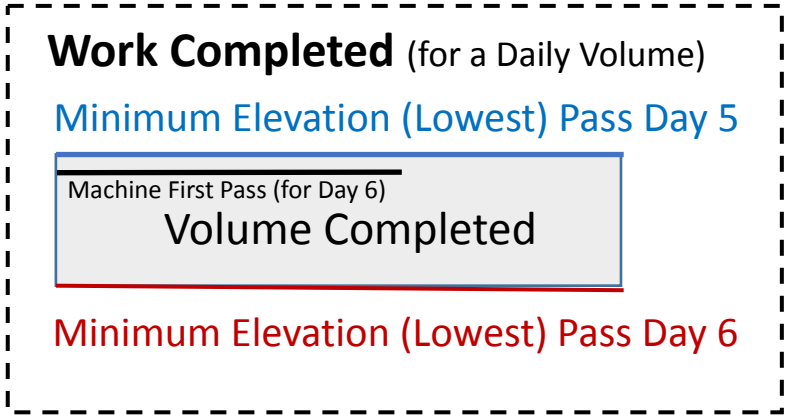
- If there is a Surveyed Surface present (dated prior to Machine Passes) Calculating a Volume using Minimum Elevation Pass data will calculate ‘From’ the Surveyed Surface ‘To’ the Minimum Elevation (Lowest) Pass.



- Calculating a Volume for set period of time ie Day 6 to Day 9 of Project using Minimum Elevation Pass data will calculate ‘From’ Minimum Elevation (Lowest) Pass Day 6 ‘To’ the Minimum Elevation (Lowest) Pass for Day 9.
- Note the ‘From’ Lowest Pass from Day 6 could come prior to it as stated in the rules.



- Calculating a Volume for a single day ie just Day 6 to Day 6 of Project using Minimum Elevation Pass data will calculate ‘From’ the prior Minimum Elevation (Lowest) Pass which is Day 5 in this case ‘To’ the Minimum Elevation (Lowest) Pass for Day 6.
- Note this is the look back logic going back to the previous period before Day 6 to determine the ‘From’ Minimum Elevation pass.



Thank you.