FACTSHEET 3

# Additional stone details to report

On 26 January 2020, updated regulations came into effect for the Victorian quarrying (extractive) industry. The *Mineral Resources (Sustainable Development) (Extractive Industries) Regulations 2019* introduced changes to annual reporting requirements for all Victorian extractive industry work authorities.

The new requirements apply to all annual reports submitted by work authorities from the 2020–21 financial year onward. For more information on the new regulations, visit **earthresources.vic.gov.au/extractivesregs**.

Guidance materials have been developed to explain the new reporting requirements and to assist the extractive industry in adjusting to the changes.

This fact sheet provides an outline of some of the additional information required – density before extraction, maximum depth of extraction, and stratigraphic unit.

## Additional information to be included in annual reports

Under the new regulations, additional details to report about each type of stone include the following:

- **density before extraction**: This is the mass per unit volume of the stone, expressed in tonnes per cubic metre.
- **maximum depth of extraction**: This is the maximum depth from which the work authority has extracted the stone type, expressed as a height in metres relative to the natural surface of the ground.
- **stratigraphic (or geological) unit**: This is the mapped, formally recognised and discrete body or bodies of rock from which the work authority is producing (see *Fact sheet 4: Determining stratigraphic unit*).

In some cases, these additional details might be similar across multiple stone types, but some details will vary significantly by stone type. For example, stone may come from the same maximum depth, but two different stone types are unlikely to originate from the same stratigraphic unit.

The 20 types of stone (and their associated product types) have not changed from previous years. See Table 1 for a guide to estimating the density of stone types outlined in Schedule 4 of the regulations.

## Density before extraction

Density is the mass per unit volume of a substance. In quarrying, it is usually expressed in tonnes per cubic metre ($t/m^3$). The new density information required is specifically that of the stone in the ground before it is extracted (also known as 'in situ', 'whole rock' or 'bulk rock' density). It is not the density after extraction, as the density of an extracted product in a truck bed or on a stockpile will be different (usually lower).

Density is calculated by taking a representative sample of the stone type as it naturally occurs before extraction, measuring its mass (using scales) and volume (by measuring how much water it displaces when put in a measuring

Table 1: Stone types and indicative density ranges (before extraction) as a guide to the parameters within which to estimate density.

| Stone type | Common range of in situ density ($t/m^3$) |
|---|---|
| Basalt old | 2.4 – 3.2 |
| Basalt new | 2.4 – 3.2 |
| Trachyte | 2.4 – 2.8 |
| Dolerite | 2.8 – 3.1 |
| Granite (including granodiorite, porphyry, microgranites) | 2.5 – 2.8 |
| Rhyodacite (including dacite, rhyolite) | 2.15 – 2.6 |
| Scoria | 1.4 – 2.4 |
| Tuff | 1.3 – 2.4 |
| Gneiss | 2.5 – 2.9 |
| Hornfels | 2.5 – 3.1 |
| Marble | 2.6 – 2.75 |
| Quartzite | 2.55 – 2.7 |
| Schist | 2.5 – 2.9 |
| Slate | 2.7 – 2.9 |
| Sedimentary (usually rippable rocks, including sandstone, shale, siltstone, chert, mudstone, claystone) | 2.0 – 2.7 |
| Limestone | 2.3 – 2.7 |
| Sand and gravel (naturally occurring gravels, not crushed sedimentary rocks) | 1.4 – 2.3 |
| Clay and clay shale | 1.2 – 2.2 |
| Soil | 1.2 – 2.4 |
| Peat | 1.1 – 1.5 |

Sources:


Schön, J.H., 2015. *Physical properties of rocks: Fundamentals and principles of petrophysics*, 2nd Edition. Elsevier. pp. 116-117.

Berkman, D.A., 2011. Field geologist's manual, 5th edition. Australasian Institute of Mining and Metallurgy. Carlton, Victoria.

Peck, W.A., Neilson, J.L., Olds, R.J. and Seddon, K.D. eds., 1992. *Engineering Geology of Melbourne*. CRC Press. pp. 293.

Tenzer, R., Sirguey, P., Rattenbury, M. and Nicolson, J., 2011. A digital rock density map of New Zealand. *Computers & Geosciences*, 37(8), pp.1181-1191.


container of water), and then dividing the mass by the volume. A larger sample and a greater number of samples will give a more accurate measurement. To convert between units, 1 mL of water (at room temperature and pressure) occupies a volume of 1 $cm^3$, and 1 $g/cm^3$ converts directly to 1 $t/m^3$, which is the required unit of measure for annual reporting.

Alternatively, density is often reported in test results from drill hole samples, and reports prepared by technical specialists may also refer to in situ density of the stone. Work authorities need only report the average or most representative overall density of the stone before extraction. Table 1 presents guidance on the ranges of densities commonly observed for stone types. While the ranges provided are not prescriptive, departures from these of more than one tonne per cubic metre are likely to be incorrect.

## Maximum depth of extraction

The maximum depth of extraction is the deepest level from which the work authority has extracted the stone type during the reporting period. This should be expressed as a height, in metres, relative to the natural surface of the ground.

## Further information

For more information on the new reporting requirements, contact Earth Resources Regulation:
Email: **errfeedback@ecodev.vic.gov.au**
Phone: 1300 366 356
Web: **earthresources.vic.gov.au/extractivesreporting**