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Sustainability of stone quarrying in protected environment: the case study of Adamello Brenta Natural Park (Trento Province, Italy)

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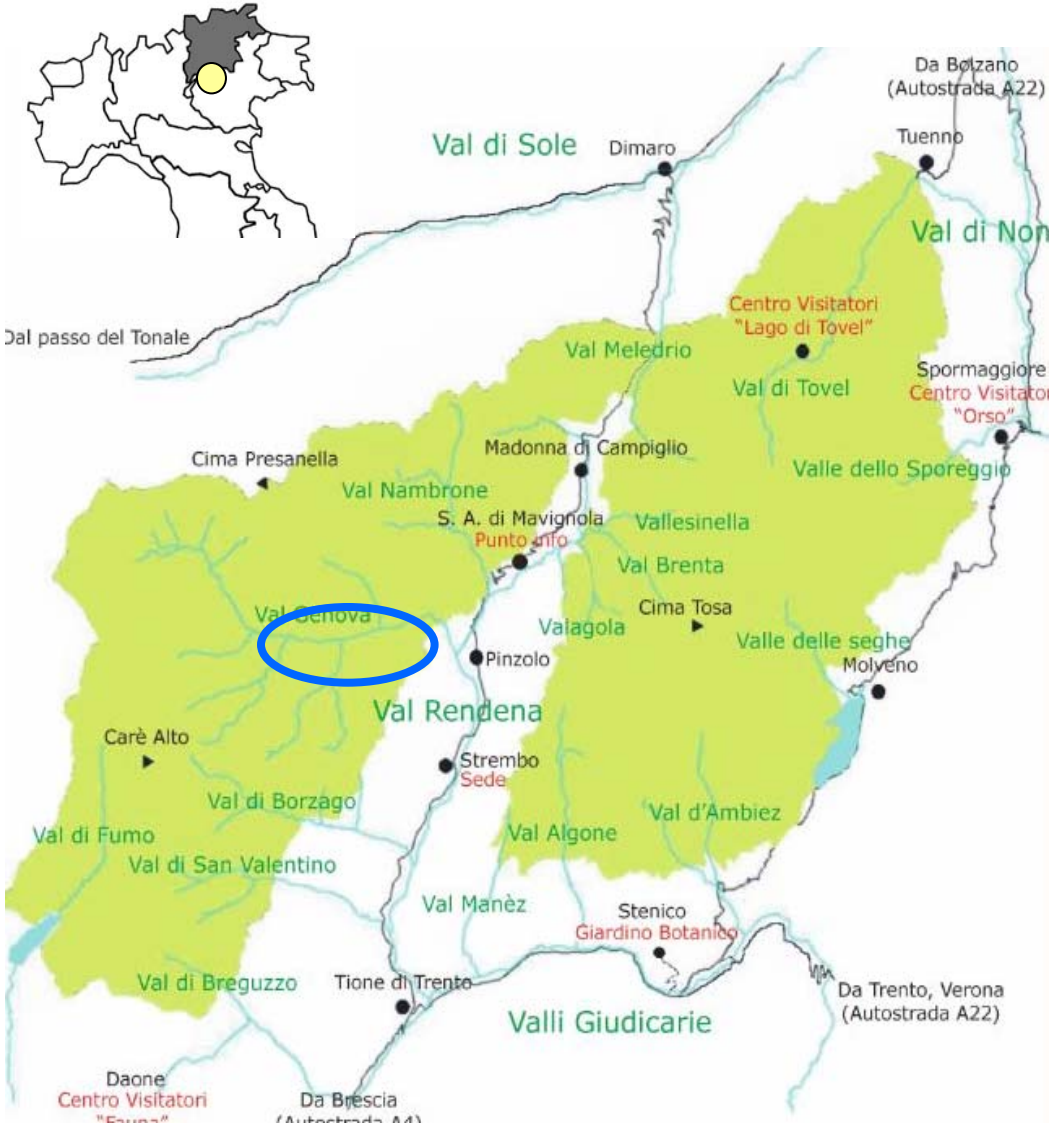


Parco Naturale Adamello-Brenta

established 1967

Protected area: 618 km^2

Active quarries: 3

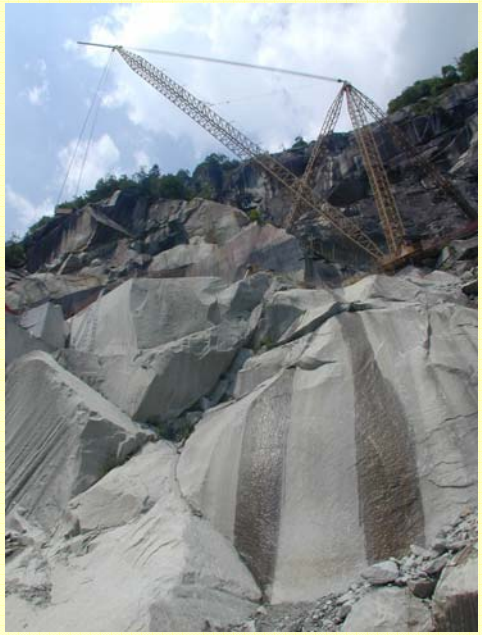
Elev. a.s.l.: 1100 – 1300 m

Exploited stone: tonalite

Commercial name: granito dell'Adamello

Average annual block production: < 10.000 m^3

CONFLICT

Productive activity: open cast stone quarrying	Outstanding natural beauty: protected area
	

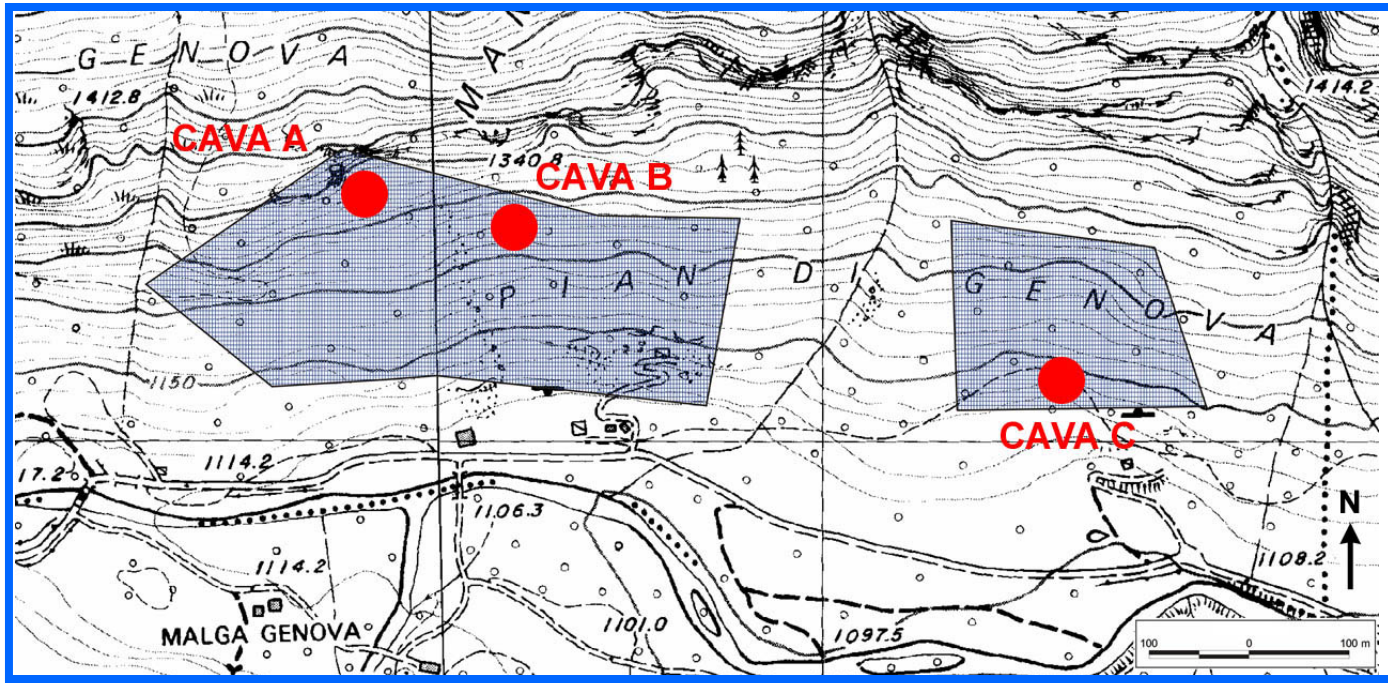
AIM OF THE STUDY:

define if and how the quarries could co-exist with the park, beyond the “administrative results” of a classic environmental impact assessment - definition of technical guidelines for the quarrying activities

Existing Planning documents:

Piano Provinciale di Utilizzazione delle Sostanze Minerali Pr. Aut. Trento - 1999

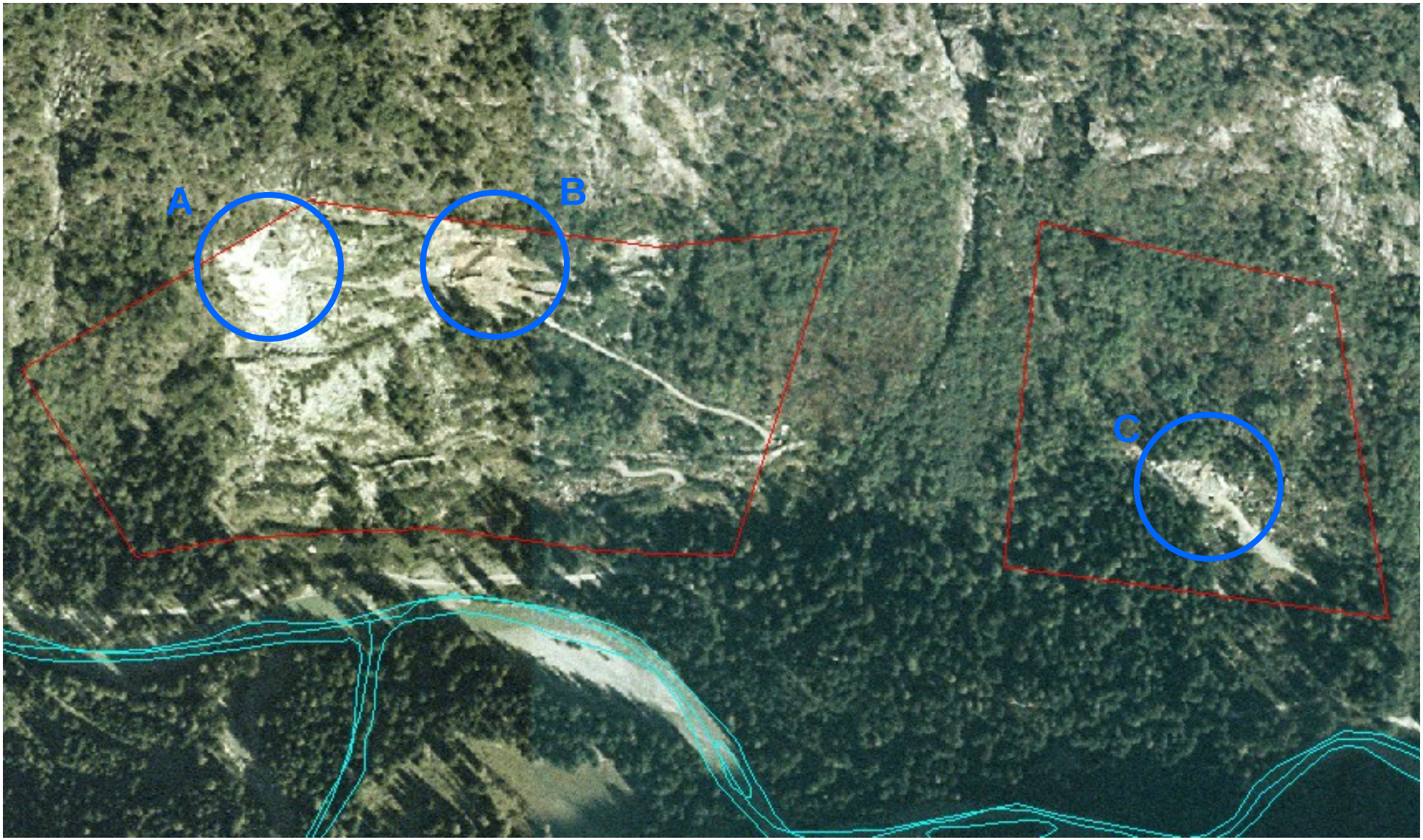
- localisation of areas suitable for mining activities, defined according to known deposits, considered to be economically exploitable and evaluating the raw material needs for approx. 20 years
- general technical prescriptions for the exploitation and environmental restoration of the sites



Mining area:
"Ponte Rosso"

139.800 m^2

Annual exploitable volume:
50.000 m^3/year


A
B
C

Quarry A

Production: 3.500 - 4.300 m^3/year
Manpower: 5 workers

Operational area is approx. 15.000 m^2
Faces elev: 1255 and 1330 m a.s.l., benches 6-7 m high

Primary cuts: diamond wire saw,
Secondary cuts: drilling and det. cord.

Quarry B

Production: 450-500 m^3/year

Operational area: 3.500 m^2
Faces elev: 1210 and 1240 m a.s.l

Blocks are cut from the rock mass bench using controlled splitting (drilling and blasting of detonating cord and small amount of black powder), and following the natural joints of the rock.., with an average yield of 50%.

Only 2 people are working in the quarry.

Quarry C

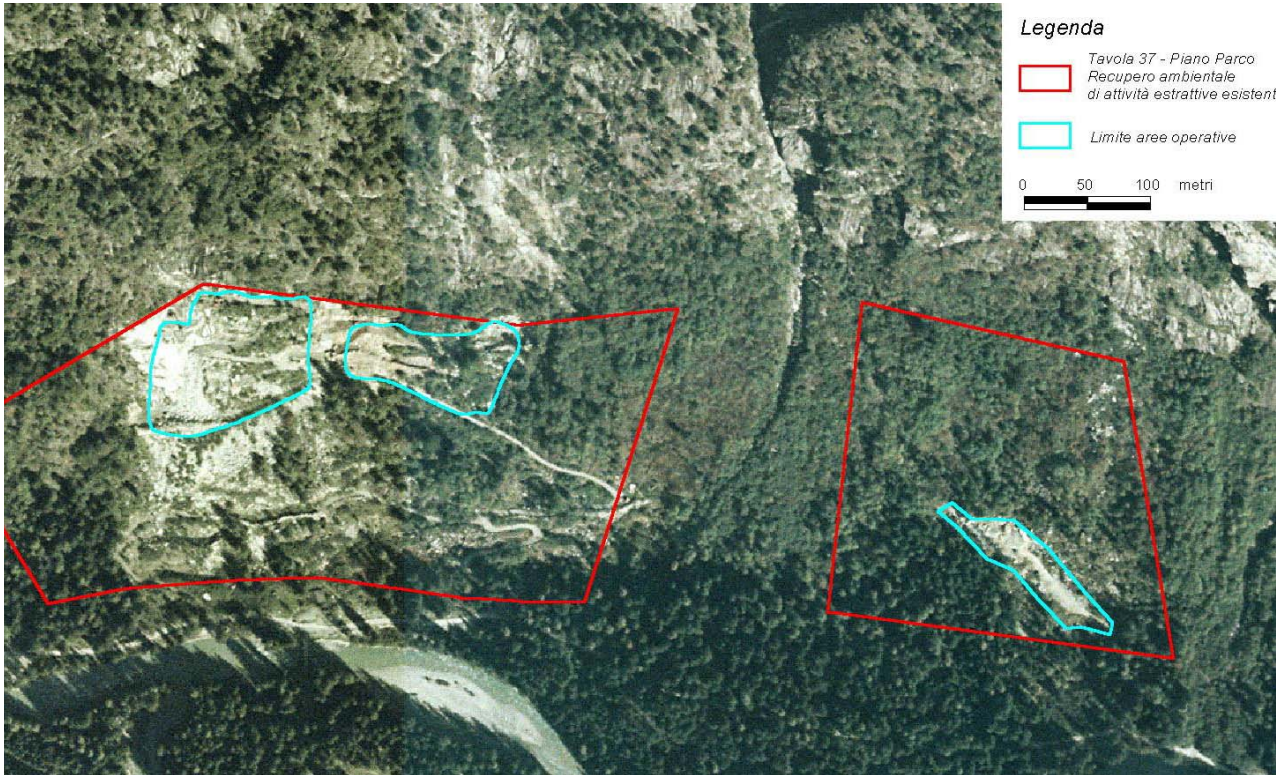
Production: an overall amount of 1.500 m^3 is averagely worked per year

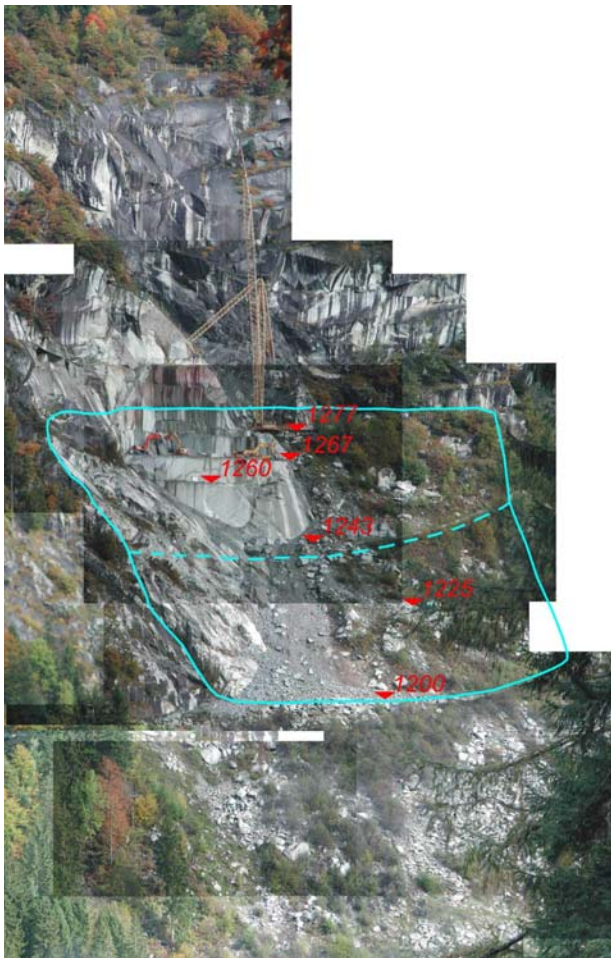
Operational area: 2.500 m^2
Faces elev: 1150 – 1180 m a.s.l.

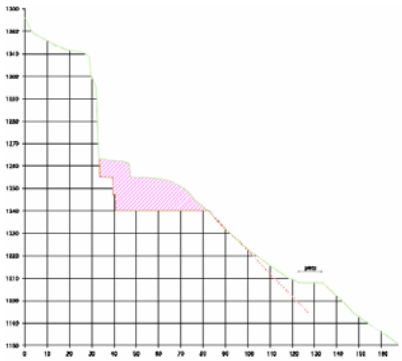
The deposit is made by big boulders (> 10 m3) covered by fine detritus and soil materials. The incoherent overburden has to be removed by mechanical equipment (hydraulic shovel) and after that the stones are broken in more regular blocks by either small blasts or hydraulic hammering, to be finally shaped by manual work.

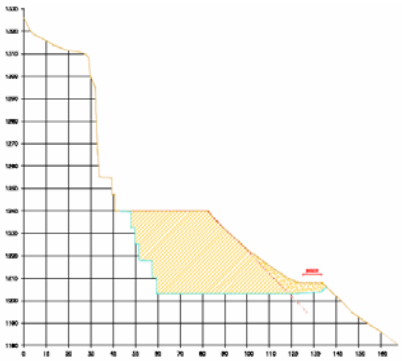
3 people are working in the quarry.

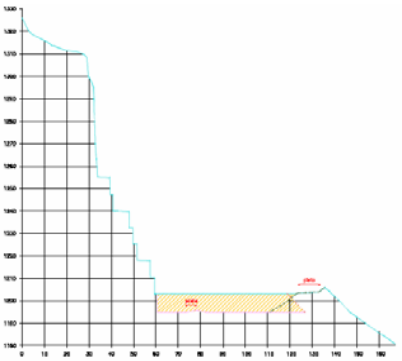
FIRST RESULT: Definition of suitable spatial and temporal limits (operational areas), based on the deposit characteristics, logistic matters and mainly the final environmental restoration









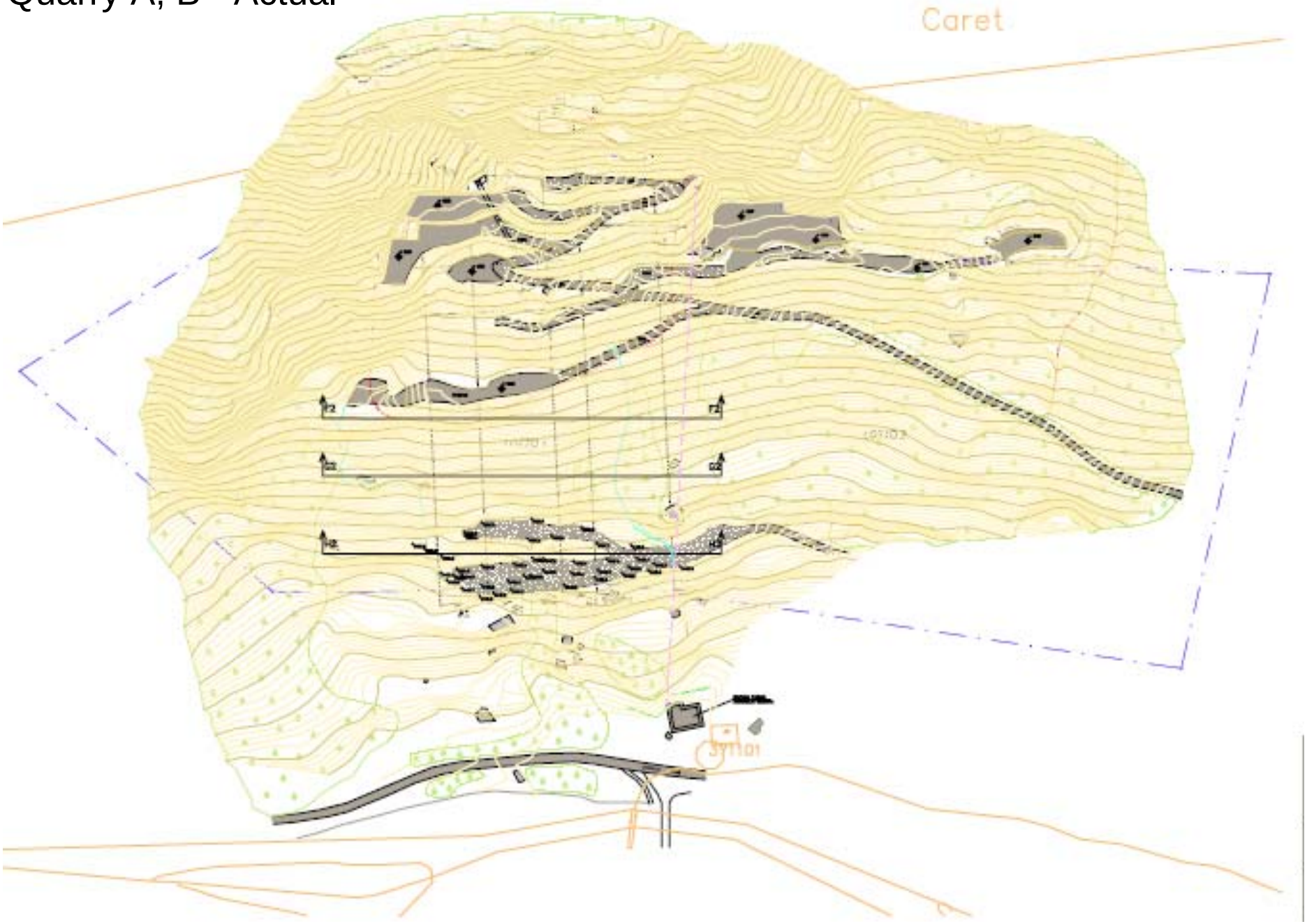


Scenario: 25 y to reach the final environmental rehabilitation

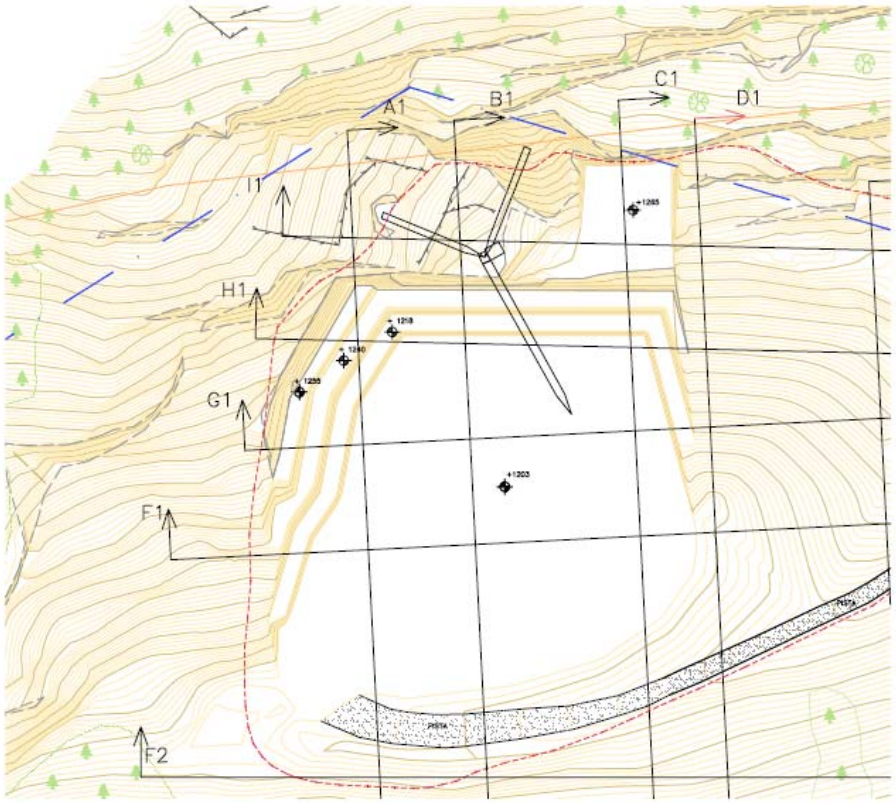
Total operational area: approx. 15.000 m^2

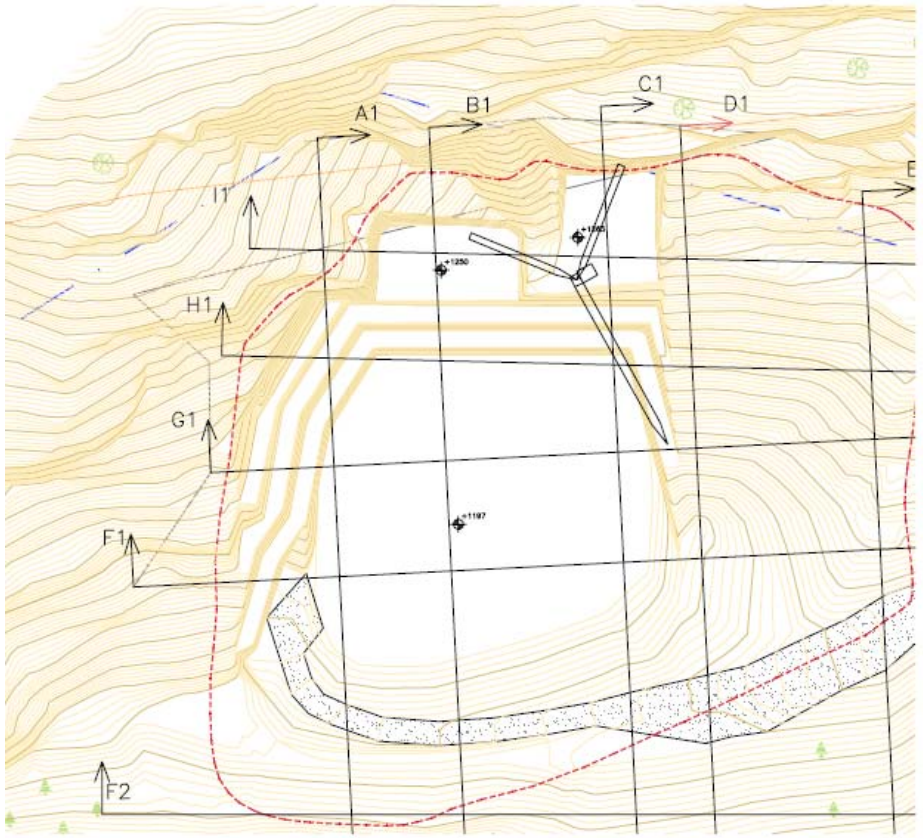
Max. volume per year: 7.500 m^3

Quarry A, B - Actual

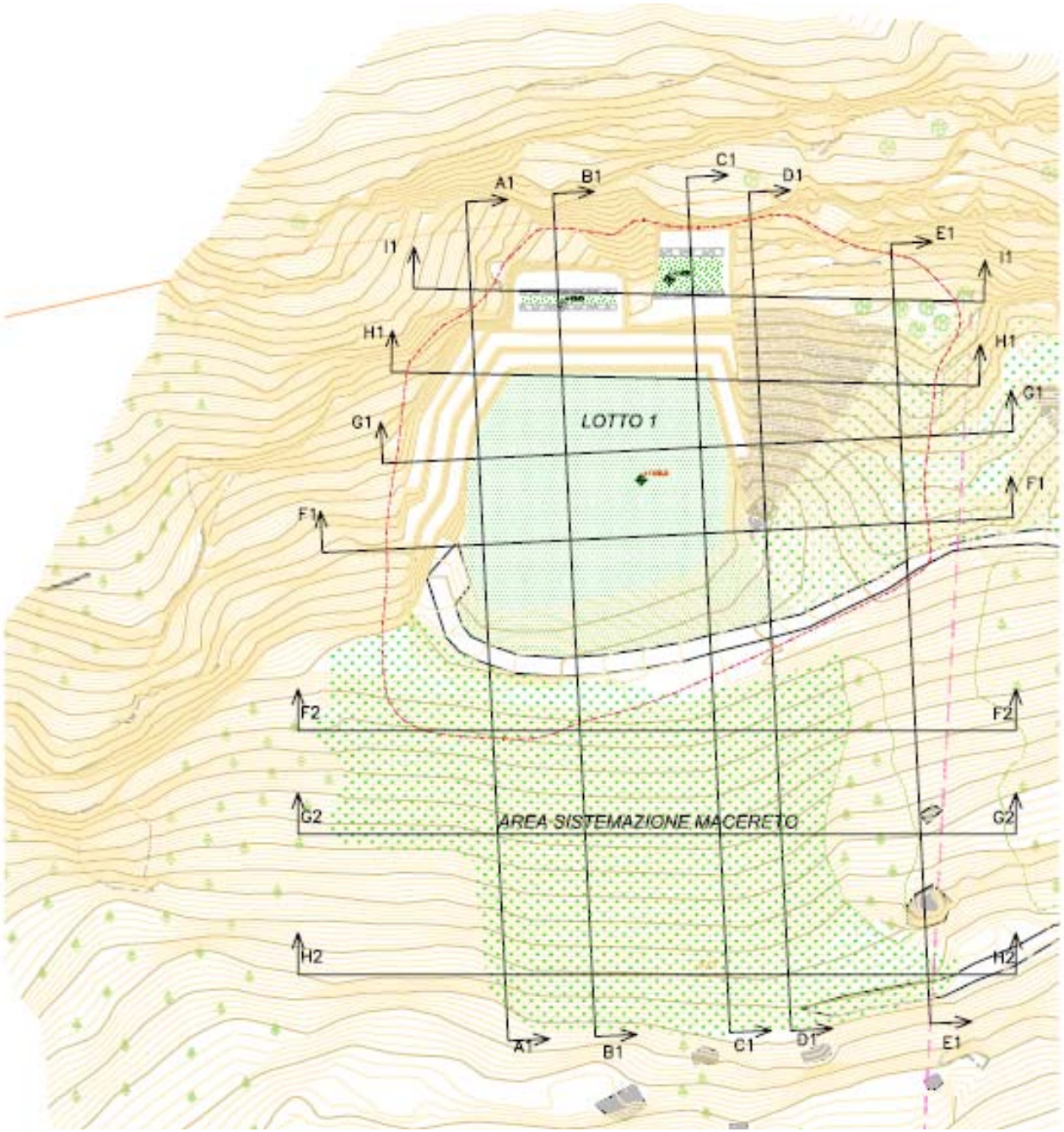


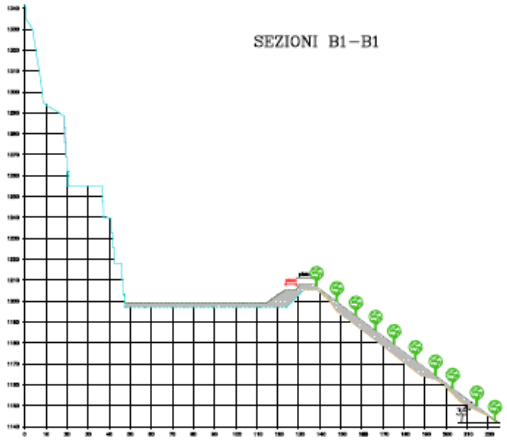
Quarry A - Phase 1





Quarry A - Phase 2





Quarry A

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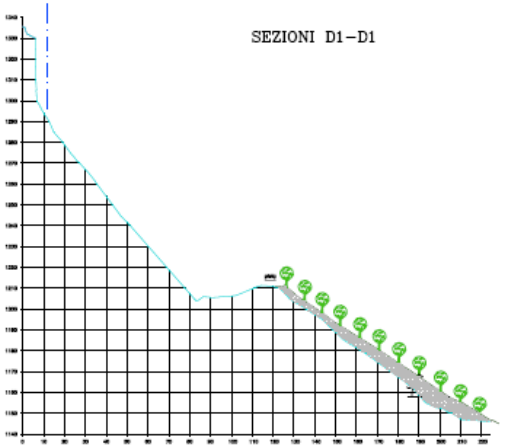
Final



SECOND RESULT: definition of specific prescriptions, and selection of best practices to be implemented. Some examples

Respect of strict noise emission limits by all the equipment used in quarry; the respect of restricted working hours; the reduction to the minimum and the proper control of the works with explosives.

⬇

selection of “silenced” equipment, which should be regularly and properly maintained; electrical equipment – e.g. derrick crane – when possible should be preferred to diesel engines; transport of blocks by trucks in the public road should be contained in the less frequented days and hours; blast should be made in specific hours and are not allowed in some days.

Dust emissions should be controlled and reduced, adopting suitable actions both on "natural" dust and on "artificial" one (due to operating equipment).

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e.g. mined out areas, temporarily inactive areas and dumping areas should be promptly rivegetated.

Water quality should be protected, avoiding direct leakage of "quarry waters" into the valley creeks.

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e.g. water used for diamond cuts or drilling, etc… should be collected and diverted to "filtering" areas; natural water flowing through the quarry area should be drained too and diverted to the same filtering areas.

Common facilities and infrastructures between the different quarries should be planned in order to reduce their impact.

Visual impact of the quarry areas should be mitigated as much as possible during operations.

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e.g. the metallic body of the derrick crane installed in “Quarry A” should be painted with a “mimetic” colour selected by the Park, and anyway it has to be immediately removed when no more used; quarry faces progressively abandoned should be rehabilitated by mean of specific superficial treatment, in order to make them, as soon as possible, similar to the natural rocky faces; the pattern of tree planting on horizontal quarry floors or berms should be absolutely not regular.

It should be maintained a balance between the area under exploitation and the area under environmental restoration.

Quarrying projects should be finalised to the environmental rehabilitation of the sites, and the correspondence between plans and what is effectively made in the field should be regularly monitored

⬇

A “technical and scientific committee” has been established to evaluate the projects and follow up quarry operations.

Stone productions should be limited within the volumes and the area previously defined, and anyway the final environmental restoration of the sites must be concluded, according to the approved projects, within 25 years.

Stone wastes and by-products (e.g. unshaped blocks, usable as river-blocks, or finer gravel from fractured areas, usable as aggregate, etc…), exceeding the volume necessary to environmental restoration, may be transported away and used in other approved locations, both inside the Park area or outside.

CONCLUSIONS

Mining activity is not a priori incompatible with environmental protection, but of course a common effort has to be done by all the parties involved.

In this case, the sustainability of the local mining activity is supported by

- the commitment of the private enterprises to adopt on the one hand the most environmental friendly and effective technologies, and on the other maintaining traditional skills and handicraft working methods);

- the understanding that this mining commodity has been traditionally exploited and locally used since a long time, representing an important link between Man-Work-Environment

This study finally proved to be the key to find an agreement based on the understanding that the suitable target for the Park was not just the search for the mere “compatibility” of the quarries but the comprehensive “sustainability” of the activities.

Environmental protection should of course be guaranteed, since the projects phase, by the Incidence Assessment (according to ECC 92/43); but it is during the daily operations that the adoption of the best techniques and practices must reduce to the practical minimum all the interferences with the environment.

A controlled and limited-in-time development of the quarries should help the economical development of the local communities, allowing the existence of family enterprises and providing the supply of a natural construction material which has been used in the area since ancient times, and which characterises the traditional architectures of the valley.

A responsible quarry management, which must take inspiration from the care given to environment by traditional alpine productive activities (e.g. the use of water, of the wood, and of the stone itself), and take advantage of modern technologies in terms of emissions and safety, can be considered not only compatible with the protected area, but even able to positively contribute to the protection of the land and environment