Republic of the Philippines
Department of Environment and Natural Resources
MINES AND GEOSCIENCES BUREAU
MIMAROPA Region
7/F DENR Building, 1515 Roxas Boulevard, Ermita, Manila
Telefax No. (+632) 536-0215 / (+632) 310-1369
Email: region4b@mgb.gov.ph

ISO 9001:2015 CERTIFIED

MEMORANDUM

FOR : **The Regional Executive Director**
Department of Environment and Natural Resources
MIMAROPA Region

THRU : **The Regional Director**
Environmental Management Bureau
MIMAROPA Region

FROM : **The Regional Director**
This Office

SUBJECT : **Evaluation of the Rehabilitation Plans for Mountain Quarry Sites Located at Brgys. Decalachao, San Nicolas and Poblacion 6 in the Municipality of Coron, Palawan prepared and submitted by BCT Trading and Construction, Inc., 428 Hi-tech Group, Inc. and the Local Government Unit of Coron, Palawan, respectively**

DATE : 25 July 2022

Respectfully furnishing herewith the above-mentioned subject results on the evaluation taken by the personnel of this Office, for consideration by the said contractors and the Local Government Unit (LGU) - Coron, Palawan.

In addition, the said contractors and LGU shall submit a detailed work program/s for the rehabilitation of the three (3) quarry sites with corresponding topographic plans (results of the actual survey) and site development plans.

For your information and reference, please.

GLENN MARCELO C. NOBLE

Enc'l: As stated

072622-R04B-1879 Memorandum 7/25/2022

Republic of the Philippines
Department of Environment and Natural Resources
MINES AND GEOSCIENCES BUREAU
MIMAROPA Region
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EVALUATION OF THE REHABILITATION PLAN FOR MOUNTAIN QUARRY SITUATED IN SITIO DIPULAO, BRGY. POBLACION 6, CORON, PALAWAN, AS SUBMITTED BY LOCAL GOVERNMENT UNIT (LGU) – CORON, PALAWAN

The subject area for rehabilitation is a 6-hectare land identified by the local government as a site for the construction of various government buildings (e.g. Stadium, Red Cross, etc.). Since the site was highly sloping, a local construction company was contacted to quarry and flatten the site in exchange for the utilization of the quarried materials in a reclamation project. Due to various violations of the existing ENR laws, rules and regulations, CENRO-Coron issued an order on 30 June 2020 to stop the extraction activity in the area. In addition, the EMB MIMAROPA Region released a Notice of Violation for infringing Presidential Decree No. 1586.

After multiple safety and environmental infractions have been identified in connection with the quarry and reclamation activity, a technical meeting between the LGU, contractor, and DENR was held. A consensus was reached wherein the DENR ordered the LGU to rehabilitate the site and submit a rehabilitation plan to be reviewed by the MGB.

Hereunder are the following comments and recommendations and/or necessary points that should be considered and addressed by the LGU of Coron which is based on the result of the evaluation:

Topic	Comments	Recommendations
Overall document	The submitted documents lack a detailed description of how the rehabilitation will be achieved and what information to be used (e.g., actual topography and area of the mine, soil/rock classification)	Present detailed work program and site development plan for the rehabilitation. Should more material be removed to achieve slope stability, proper estimates of the total area should be included. A topographic survey using instruments such as RTK or total station may be employed to acquire appropriate ground data.

Background/ Rationale		Add a location map and plot the boundaries of the said lot. Trace the quarry site and present the total area to be rehabilitated.
Objectives		"To help address and mitigate the impacts of quarrying to the ecosystem by conducting a rehabilitation and slope stabilization of the quarry area in a timely manner."
Stakeholders	The stakeholders were listed, however, no description of roles or purpose of inclusion was mentioned.	Write a brief description of the possible contribution of the stakeholders (e.g. Local Residents - provide continuous monitoring of the quarry area after the rehabilitation). Properly coordinate with the concerned bodies to ensure the long-term success of the rehabilitation plan. A consultation with all the stakeholders must be conducted as they are also part of this plan.
Project Design	The design presented is not based on the actual area.	An actual ground survey must be first conducted to determine the exact dimension of the area. Upon the acquisition of the actual data, plan a detailed plan design and present how this will be attained. The reason for using Eco Net Technology was not explained apart from a generic illustration. Basic data of the current situation which must include a topographic measurement by geodetic professionals are not subscribed to in planning the rehabilitation. The applicability of the method for slope protection therefore was not established. The problem must first be identified scientifically before the appropriate solution can be identified.

		Engineering plans, in this instance benching, must also correspond to the rock type, rock quality and other significant information from the ground. Dimensions of the benching and other project aspects must be planned with field-based information. The focus must be on slope stabilization and the plan and expected result must reflect this.
	It was mentioned that vegetation cover will be undertaken using appropriate species.	The use of native species is highly recommended. A combination of grasses for short-term protection and trees for long-term stabilization may be utilized. If topsoil will be used, add information on where the material will be sourced out. A proper drainage plan should also be considered to control the erosion rate of loose rocks and soil. A siltation pond of appropriate size may be employed.
	Eco net is only suitable for preventing the erosion of small loose materials and overburden. It is not enough to stabilize steep slopes and prevent the mass movement of materials.	In view of the site being utilized for government facilities, the safety of the people should be a priority in the project design. Consider reducing the slope angle to improve the slope stability. The removal of overhanging and over-steepened slopes should be a priority. Also, consider the use of other slope stabilization methods.

Project Strategies		Present the mentioned "Quarry Rehabilitation Plan/ Detailed Engineering Design." The preparation of the Quarry Rehabilitation Plan/ Detailed Engineering Design by the Municipal Engineering Office should be urgent considering the possible risk of the overhanging rocks in the area. Provide a maintenance plan for the area. Proper and continuous monitoring of the site must be included in the maintenance plan to ensure long-term success of the endeavor.
Financial Details	There is no basis, explanation, or breakdown for the listed budgetary requirement.	Provide a detailed budgetary breakdown once the actual work program and site development plan have been completed. The fund utilization must also reflect this work program. Without a proper plan on the method of rehabilitation, it will be difficult to come up with a corresponding budget that will sufficiently cover the expenses of the project.
Project Component and Implementation Schedule	The table presented is not easy to understand. Site preparation was listed for two months but there is no description regarding the activity within the submitted document.	Use the proper/common abbreviations of the months to avoid confusion. Provide detailed description of the activities that are included in this stage given that a two-month period is allocated in the timeline. The project timeline must be adjusted once the site development plan and work program have been prepared.

Sustainability		Consider the cooperation of other stakeholders in the monitoring such as the BLGU.
Implementation Arrangements		It should be noted the should no commercial utilization and disposition in connection to the rehabilitation program. The extracted material should be utilized as part of the rehabilitation activity.

During the Interagency Task Force for Coron meeting held at the Office of Regional Executive Director of DENR MIMAROPA on June 23, 2022, it was recommended by MGB MIMAROPA that an actual topographic survey of the quarry sites be undertaken by the proponent to have detailed ground information and data necessary for the rehabilitation plan/design. A site development plan and work program must also be submitted.

Furthermore, it is recommended that the mined mountain quarry area should be prioritized for rehabilitation by the LGU – Coron and its contractor since there are structures and settlements built within its vicinity that may be impacted by landslide, rockfall, soil erosion, and other environmental-related hazards.

Prepared by:

CASANDRA LYNDA L. JALAC
Science Research Specialist II
MGB MIMAROPA Region

VANN IAN O. CADALSO
Science Research Specialist II
MGB MIMAROPA Region

Republic of the Philippines
Department of Environment and Natural Resources
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ISO 9001:2015 CERTIFIED

June 27, 2022

MEMORANDUM

FOR : **The Regional Director**
Mines and Geosciences Bureau
MIMAROPA Region

THRU : **The Chief**
Geosciences Division

The Chief
Mine Management Division

The Chief
Mine Safety, Environment and
Social Development Division

FROM : **The Undersigned**
Science Research Specialist II
MGB Embedded Personnel

SUBJECT : **Evaluation on the submitted Rehabilitation Plan for the Mountain Quarries in Brgys. San Nicolas, Decalachao and Poblacion 6, Coron, Palawan**

This pertains to the above-cited subject plan submitted through CENRO Calamianes by BCT Trading and Construction Inc. and 428 Hi-Tech Group Inc., which was received by this Office on June 23, 2022 through electronic mail.

Based on the result of the evaluation, below are the following points that should be considered and be addressed.

Topic	Comments	Recommendations
Overall document	The submitted documents lack a detailed description of the actual rehabilitation plans. The information is more of theoretical knowledge rather field-based information.	Present detailed estimates of the total material removed from the planned benching of the slopes. Proper survey and modeling may be done to achieve accurate estimates. Ground survey using

		instrument such as RTK or Total Station may be employed.
	Various parts of the document do not fit the main narrative as those were directly copied from another report/document. Images and figures lack labels and captions.	Proper citations must be followed, and a reference list must be provided in the document. To add, a table of contents and a list of figures are suggested.
		Arrange sections and sub-sections accordingly and the ideas must have a logical flow, building up to the main goal of the rehabilitation plan.
Identification of Stakeholders	The stakeholders were listed, however, no description or purpose was mentioned.	Write a brief description of the possible contribution of the stakeholders (e.g. Barangay and Local Residents - provide continuous monitoring of the quarry area after the rehabilitation). Properly coordinate with the concerned bodies to ensure the long-term success of the rehabilitation plan. A consultation with all the stakeholders must be conducted as they are also part of this plan.
Rehabilitation Program	*Site Preparation and Quarry Activity* The content seems to be not based on the activity of the actual quarry site based on the observations in the submitted reports. Its content seems copied from other reports/ documents. *Quarry Rehabilitation Works* As one of the highlights of the rehabilitation plan please avoid	*Site Preparation and Quarry Activity* Revise the presentation of data so it better fits the actual quarry activity. Possibly highlight how it connects to the rehabilitation program. *Quarry Rehabilitation Works* The list of items mentioned must be applicable to the site and are to be strictly followed. Its content

	copying the items listed from another report/ document. *Slope Stabilization* Full reference for the provided methods of slope stabilization is not listed. Also, no data regarding the mentioned strength and stability analysis for the area.	must be based on a projected work plan. *Slope Stabilization* The chosen method/s of stabilization must be applicable to the site as determined by the ground survey. *Reduction of driving forces* may be included in the slope stabilization section.
Design Consideration	The factors that determine the design consideration was only mentioned but the actual plan/design is vague.	An actual survey must first be conducted to specifically determine the appropriate design for the rehabilitation of the quarry area.
Factor of Safety	It was mentioned that the factor of safety in this area ranges from 1.25 to 1.50.	Provide the calculations for the factor of safety and it must be based on data/results of the actual ground survey. This may be included as a subsection of Design Consideration.
Removal of Materials	The reasons listed for the removal of materials are not clear. Further removal of materials should only be done in connection with the final rehabilitation plan.	There shall be no commercial utilization of any removed materials. Should the removal be necessary, only the minimum amount will be extracted and proper clearance and/or permit is required for its utilization.
Benching	Descriptions regarding the bench width, face height and face maintenance are more relevant to an ongoing large-scale quarry and does not fit well with the main objective.	The focus of benching should be to achieve a stable and safe slope as part of the rehabilitation plan. It should fit the results of conducted surveys and be based on actual ground data.

Vegetative and Biotechnical Stabilization	There is no description of plant species and what measures will be taken to ensure its growth and survival after planting.	Determine appropriate species of the plants to be used in the rehabilitation - the use of native species is highly recommended. A combination of grasses for short-term protection and trees for long-term stabilization may be utilized.
	The layer of topsoil should allow quick recolonization of flora on the site. However, given that the original topsoil was lost in the quarrying activity it must be sourced from another location.	Ensure that no further damage will be done in the sourcing of topsoil. Extraction in areas where it accumulates naturally, such as river floodplains, is recommended. Provided, however, proper permit and/or clearance must be taken for the source soils.
Rehabilitation Timescale		The project timeline must be adjusted based on the site development plan and work program.
Proposed Final Landform	The proposed final landform has no proper description. Also, the image presented is of another quarry site.	A proper description of the proposed final landform is recommended. It should also match with the actual site of rehabilitation.

Further, during the Interagency Task Force for Coron meeting held at the Office of Regional Executive Director of DENR MIMAROPA on June 24, 2022, it was recommended by MGB MIMAROPA that an actual topographic survey of the quarry sites be undertaken by the proponent to have a detailed ground information and data necessary for the rehabilitation plan/design. A site development plan and work program must also be submitted.

For the Regional Director's information and instruction.

Casandra Lynda L. Jalac
Science Research Specialist II
MGB MIMAROPA Region

Vann Ian O. Cadalso
Science Research Specialist II
MGB MIMAROPA Region

Enc'l: As stated

Department of Environment and Natural Resources
Environmental Management Bureau
MIMAROPA Region

08 July 2022

MEMORANDUM

FOR : **The Regional Executive Director**
DENR MIMAROPA REGION

The Regional Director
MGB MIMAROPA Region

FROM : **The Regional Director**
EMB MIMAROPA Region

SUBJECT : **ENDORSEMENT OF THE SUBMITTED QUARRY REHABILITATION PLAN OF THE LOCAL GOVERNMENT OF CORON, PALAWAN RELATIVE TO THE EXCAVATED MOUNTAIN AT SITIO DIPULAO, BRGY. POBLACION 6, CORON, PALAWAN FOR THE CONSTRUCTION OF THE CORON STADIUM, TERMINAL, AND OTHER GOVERNMENT FACILITIES**

This is with reference to the disposition made during the Coron Taskforce meeting on 26 May 2022 held at Function Hall, Coron Westown Resort, Brgy. Poblacion 6, Coron, Palawan. Accordingly, the Local Government of Palawan shall submit a Quarry Rehabilitation Plan, including the environmental impact assessment, for the excavated mountain at Sitio Dipulao, Brgy. Poblacion 6, Coron, Palawan. Please be informed that the excavated material from the site is being utilized by the Coron Bay Development Project for its 49 Hectares reclamation activity.

In this regard, the office of the undersigned is respectfully forwarding the submitted quarry rehabilitation plan dated 07 July 2022 of the LGU Coron, Palawan for the said area. Please be informed that this Office has already instructed LGU Coron to submit the Environmental Impact Assessment (EIA) Report of the rehabilitation programs as well.

Attached is the submitted rehabilitation plan for perusal.

For the Regional Executive Director and Regional Director's information, review, and comments.

Department of Environment and Natural Resources
Environmental Management Bureau
Regional Office No. IV - B MIMAROPA
08 JULY 2022 MEMORDSALINO-063

JOE AMIL M. SALINO

PENRO Compound, Brgy. Suqui, Calapan City, Oriental Mindoro
Regional Satellite Office: 6th Floor DENR by the Bay Bldg., 1515 Roxas Blvd., Ermita, Manila
Office of the Regional Director: **(02) 8536 9786**; Administrative and Finance Division: **(02) 8536 9786**
Environmental Management and Enforcement Division: **(02) 8633 2587**; Clearance and Permitting Division: **(02) 8633 2587**
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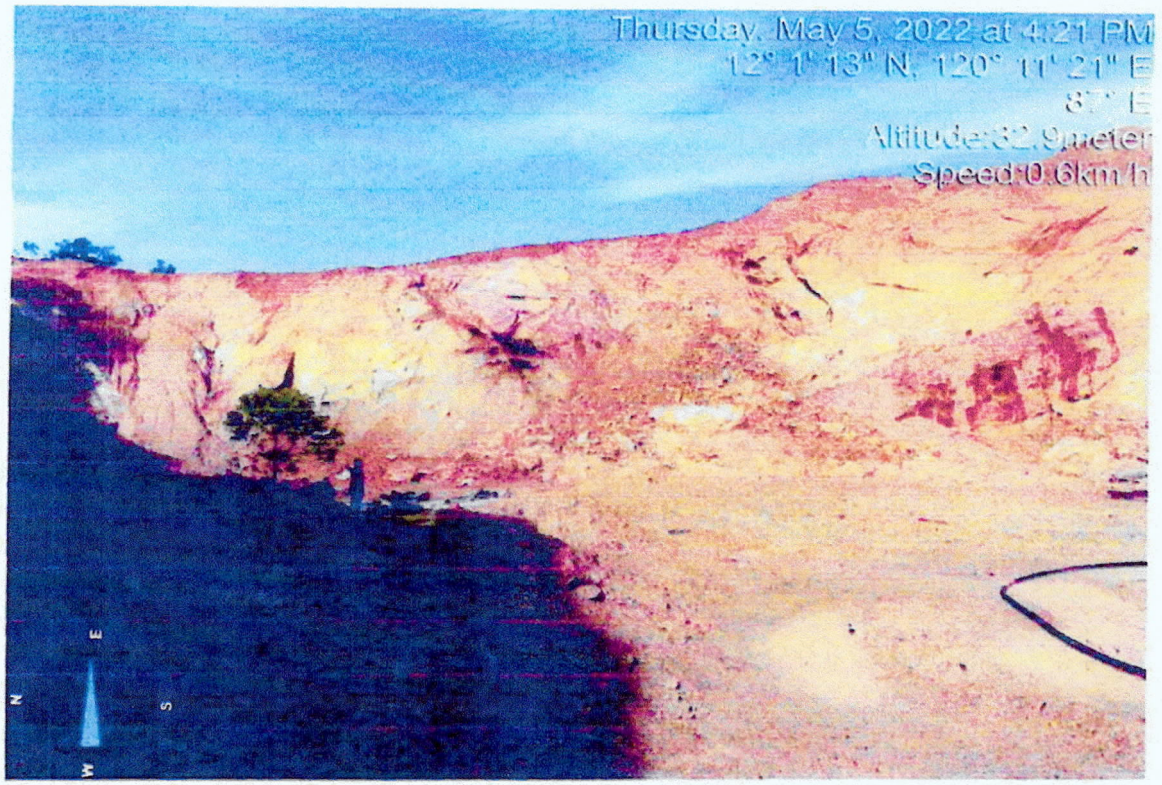
E-mail Address: embmimaropa@emb.gov.ph
Website: www.mimaropa.emb.gov.ph

R4B-2022-012494

QUARRY REHABILITATION PLAN



Barangay Poblacion 6, Coron, Palawan

Prepared by: Municipal Planning and Development Office

I. PROJECT IDENTIFICATION

Project Title	:	**QUARRY REHABILITATION**
Proponent	:	**MUNICIPAL GOVERNMENT OF CORON, PALAWAN,**
Location	:	**BARANGAY POBLACION 6, CORON, PALAWAN**
Total Project Cost	:	**THREE MILLION PESOS (P3,000,000.00)**

II. PROJECT DESCRIPTION

A. Background/Rationale

The Municipal Government identified an area for the proposed Government Buildings and Facilities at Barangay Poblacion 6, Coron, Palawan. A total of 6 hectares were identified and portion of which are mountainous and hilly which need to be excavated and quarry to flatten the surface. The local government ask assistance to the local construction firm, 428 to quarry the area and in return the waste materials will be utilized for the reclamation at Barangay Poblacion 3 and Poblacion 5. Buildings and Facilities that will be establish in the area are 1. Stadium, 2. LTO Building 3. Regional Supreme Court 4. Integrated Terminal 5. STP 6. RAC Site.

The DENR MGB MIMAROPA had issued a Cease-and-Desist Order to the Mountain Quarry at the above-mentioned area. During the technical conference with the DENR and other stake holders, the DENR instructed the Local Government to submit a rehabilitation Plan prior to MGBs review and approval.

The Municipal Government of Coron is committed to prepare rehabilitation plan of the quarry sites at the proposed Government Buildings and Facilities at Bgy. Poblacion 6 and implement it as per plan and submit it to other concerned agencies.

B. Objectives

1. To rehab the quarry area
2. To ensure that the slope of the extracted area is safe and stable.
3. To help addressed and mitigate the impacts of the quarry to the ecosystem

C. Stakeholders

a. Local Residence near the area
b. Local Government Unit
c. Barangay
d. DENR MGB
e. DENR EMB
f. DENR CENRO
g. PMRB
h. PCSD
i. DPWH
j. LTO
k. Supreme Court
l. TIEZA
m. ADB

D. Project Design

In rehabilitating and stabilizing the quarry area, the LGU will use Eco Net Technology for the Slope Protection (see attach design) in order to prevent erosion and rock fall as well. After stabilize, appropriate vegetation cover will undertake using appropriate species.

E. Project Strategies

The Quarry Rehabilitation Plan Detailed Engineering Design will be prepared by the Municipal Engineering Office. It will be subjected to competitive bidding process to ensure transparency and accountability. Maintenance of the project will be supervised by the Municipal Engineering Office and appropriate measure if necessary will be included in the plan.

III. FINANCIAL DETAILS

Budgetary Requirements

GRAND TOTAL	**P/3,000,000.00**

IV. PROJECT COMPONENTS AND IMPLEMENTATION SCHEDULE

	A	S	O	N	D	J	F	M	A	M	J	J
1.Site Preparation												
2.Quarry Rehabilitation Works												
3.Slope Stabilization												
4.Monitoring and Evaluation												

V. SUSTAINABILITY

Regular monitoring and maintenance will be regularly done by the Municipal Engineering Office and EMB-DENR

VI. IMPLEMENTATION ARRANGEMENTS

The Quarry Rehabilitation will be supervised by the Municipal Engineering Office with technical assistance from the 428 Construction Firm. While monitoring and evaluation of the project will be lead by the Municipal Engineering Office and the Municipal Planning and Development Office.

VII. PROJECT OUTPUT/OUTCOME

Once the rehabilitation is complete will result in significant environmental and social benefits and the area will be safer and stable for any future development.

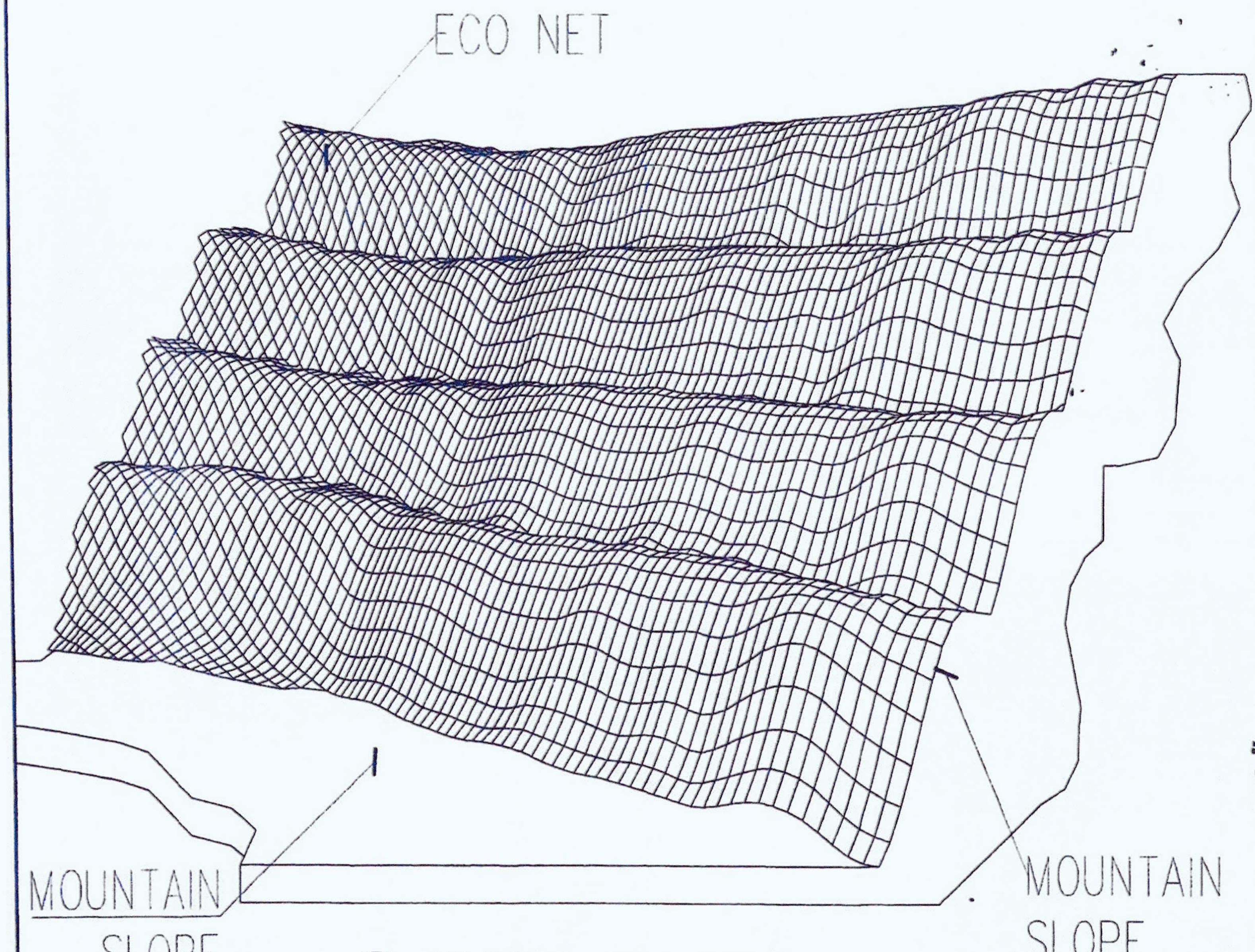
Prepared by:

ENP/ENGR. MICHAEL ADRIAN FABABEIR, *MPA, MAURP*
MPDC

ENGR. IKE D. PARANGUE
Municipal Engineer

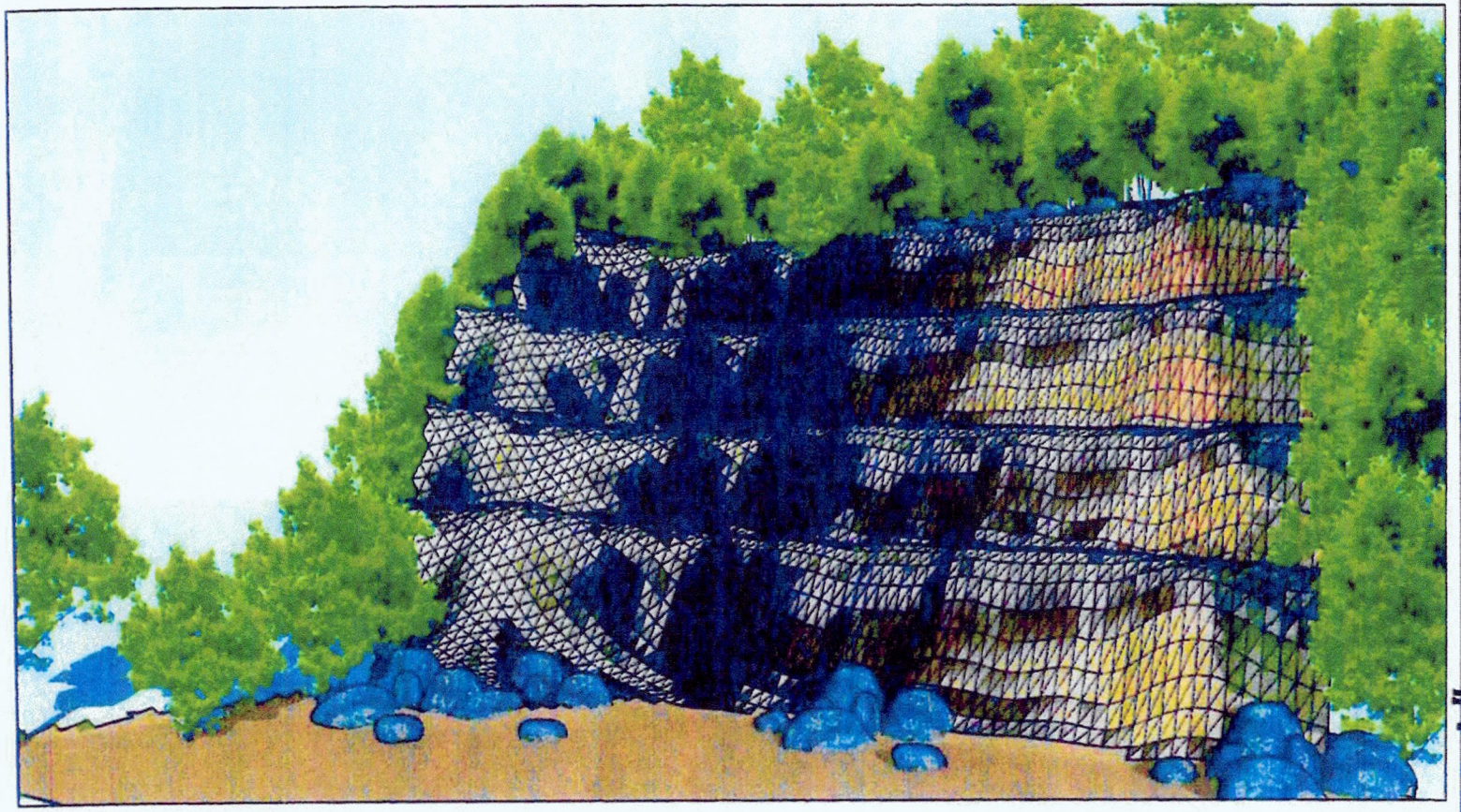
Noted and Approved:

MARIO T. REYES, JR.
Municipal Mayor



A ISOMETRIC VIEW & DETAIL
SCALE NOT TO SCALE

REVISIONS	
PREPARED BY:	CHRISTIAN JAY GALLEGO AUTOCAD OPERATOR
CHECKED BY:	MUNICIPAL ENGINEER
PROJECT TITLE:	PROPOSED ECO NET SLOPE PROTECTION
APPROVED BY:	REYES JR. MUNICIPAL MAYOR
CONTRACTOR	
SHEET CONTEAS SHOWN	AS SHOWN
DESIGNED/CHECKED BY: COG	DATE: 01-05-2021
SCALE: AS SHOWN / DRAWN BY: COG	DATE: 01-05-2021
SHEET NO. / APPROVED BY:	DATE:
A-02 / REVISION:	DATE:



A PERSPECTIVE
SCALE NOT TO SCALE

REVISIONS

NO.	DESCRIPTION	DATE
A		
B		
C		

PREPARED BY:

CHRISTIAN JAY GALLEGO
AUTOCAD OPERATOR

CHECKED BY:

ENGR. D. [illegible]
MUNICIPAL ENGINEER

PROJECT TITLE:

PROPOSED ECO NET SLOPE PROTECTION

APPROVED BY:

[illegible]
MUNICIPAL MAYOR

CONTRACTOR

SHEET CONTENTS SHOWN

AS SHOWN

DESIGNED/CHECKED BY:	DATE:
CDG	01-05-2021
SCALE: AS SHOWN / DRAWN BY: CDG	DATE: 01-05-2021
SHEET NO. APPROVED BY:	DATE:
REVISION:	DATE:
A-02	

QUARRY REHAB PLAN

BRGY. SAN NICOLAS, CORON, PALAWAN

BCT TRADING & CONSTRUCTION INC.
428 HI TECH GROUP INC.

BACKGROUND

The DENR MGB MIMAROPA and the DENR MGB MIMAROPA had issued a Cease-and-Desist Order to the Mountain Quarry operated by the BCT trading at Brgy. Decalachao, Brgy. San Nicolas, Coron, Palawan. And result of the technical conference is the DENR instructed the company to submit a rehabilitation plan prior for the MGBs review and approval. The purpose of the rehabilitation is to ensure that the slope of the extracted area is safe and stable.

The current occupant of the area is the 428 Hi-Tech Group which the extracted materials is formerly used by the BCT during the road construction at the Brgy. San Nicolas, Coron, Palawan.

The extraction of raw materials from the area– inevitably impacts on the surrounding natural and social environment. In particular, the removal of soil and changes in topography of the area are likely to affect local ecosystems and watersheds. However, these impacts can be successfully addressed and mitigated through the development and implementation of an effective quarry rehabilitation plan. In some cases, the effective implementation of a well-designed rehabilitation plan can result in significant environmental and social benefits. Quarrying activity carries with it the obligation to rehabilitate both the site and, wherever necessary, the surrounding area while operating and upon completion of operations. BCT Trading & Construction Inc. is committed to draw up rehabilitation plans for operating quarries and sites identified by the DENR, and communicating these plans to concerned agencies.

FRAMEWORK

- Legal Compliance must be the minimum requirement when establishing each quarry rehabilitation plan. The rehabilitation guidelines should never be in conflict with, but should always complement and go beyond legal compliance especially on the Mining Act in the Philippines.
- The rehabilitation plan will ensure site is left in a safe and stable condition. The safety of the rehabilitated quarry includes the stability of slopes, roads, and raw material piles. Safety will always be considered as paramount for the rehabilitation plan.
- Stakeholders and Concerned agencies will be listened to and relevant stakeholders will be involved in all stages. The quarry rehabilitation plan must address stakeholders expectation, and be aligned with or leverage from, the stakeholder view, experience, culture and customs.
- An assessment of the baseline conditions will enable identification of the impacts and measurement of the changes that may arise as a result of quarrying activity. The assessment of baseline conditions will include air and water, flora and fauna, site safety, landscape integration, human activities and cultural heritage.
- A monitoring plan and appropriate corrective measures (if necessary) will be included in the rehabilitation plan, thereby ensuring the documentation and measurement of performance against the objectives.
- The rehabilitation plan will be developed prior to the commencement of activity for new sites, but should also be developed for operating quarries, where such as plan does not already exist. It will be aligned with the mining plan. Depending on the objectives and priorities set.

1. LEGISLATIVE ENVIRONMENT

These guidelines promote an overall consistent approach to quarry rehabilitation management. They are a complement to applicable local or international legislation, and must not be used as a substitute. The guidelines should be applicable to quarry closure programs without any conflicts with legal compliance. It should be clearly understood and accepted that the legislative requirements are the minimum standard required, which best practice should exceed wherever possible.

The DENR MGB MIMAROPA through the PMRB Palawan is the regulatory agency regarding the extraction of non-metallic materials and also in the quarry rehabilitation in the Palawan.

1.1 IDENTIFICATION OF STAKEHOLDERS

- Local Residents near the area
- DENR FMB-Busuanga Pasture Reserve
- DENR CENRO Calamianes
- DENR MGB
- DENR EMB
- PMRB
- PCSD
- LGU
- Barangay
- Non-Government Organizations

2. REHABILITATION PROGRAM

2.1 SITE PREPARATION AND QUARRYING ACTIVITIES

. The Quarry operations comprising the following activities:

- The use of suitable on-Site material to create the perimeter bunds
- Development of the Quarry Pit area, extending from the existing Quarry, including the removal of topsoil and subsoil overburden material, and the development of a working pit.
- Construct and maintain Quarry Pit access roads.
- Extraction and processing of gravel in stages.
- The rehabilitation of worked out areas, using cleanfill, covered with clean topsoil, battering all residual slopes and grassing.

2.2 QUARRY REHABILTATION WORKS

Following completion of filling in an area, rehabilitation involves re-spreading and contouring of topsoil materials and stored overburden materials to a minimum depth of 300 mm (300 – 400 mm), stabilization of battered slopes and grassing in completed and restored extraction areas to create a free draining and stable landform. Monitoring of revegetation will occur to ensure the success of the rehabilitation. Key principles of rehabilitation include:

- Reinstallation of topsoil to ensure the soil can be used for agricultural or other uses. This may require the topsoil to be mixed with organic material or a soil conditioner.
- Appropriate vegetation cover undertaken using appropriate low-seeding grass species. Topsoil and re-grassing should be undertaken during September to November or March to May.
- Development of a free draining stable landform.
- The removal of all quarry operating machinery, equipment and buildings at the conclusion of all extraction activities.
- Maintaining the Site through controlling weeds and grazing, as appropriate.
- Monitor and where necessary, maintain rehabilitated areas to ensure they are functioning appropriately post-rehabilitation for a period of 24 months.
- Rehabilitation planning that is integrated with extraction sequences will ensure rehabilitation can commence, in areas where extraction activity has concluded. This will ensure that vegetation can be established, or a return to other land use (e.g. pasture), as soon as possible rather than leaving a

disused quarry area on part of the Site. It also ensures that rehabilitation effort is not wasted on areas which will be disturbed again later.

- Owing to the relatively small area of the Quarry, BCT sees the Site as providing the potential to be an exemplar in terms of Quarry rehabilitation. Additionally, as only part of the Site will ever be actively used for quarrying at one time, there are opportunities to re-establish stock grazing on the Site as stages of the Quarry are progressively rehabilitated.
- While the final use is unlikely to be determined until sometime in the future, SOL Quarries Ltd will restore the Site to a form in that it can be used for a variety of activities. These range from farming, to animal boarding, recreation and other uses provided for within the Rural zones.

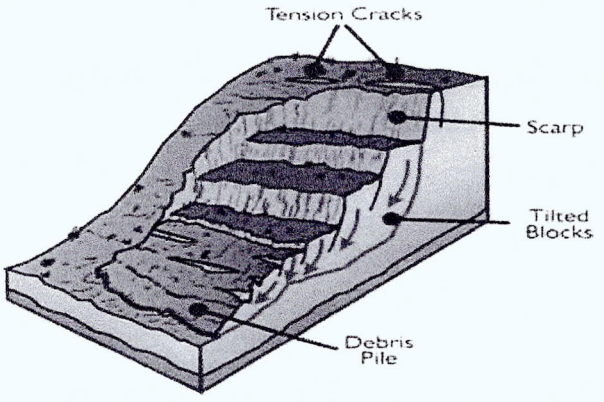
2.2.1 SLOPE STABLIZATION

Table 17-1
Summary of Approaches to Potential Slope Stability Problems (modified from Gedney and Weber 1978)

CATEGORY	PROCEDURE	BEST APPLICATION	LIMITATIONS	REMARKS
Avoid problem	Relocate facility	As an alternative anywhere	Has none if studied during planning phase; has large cost if location is selected and design is complete; also has large cost if reconstruction is required	Detailed studies of proposed relocation should ensure improved conditions
	Completely or partially remove unstable materials	Where small volumes of excavation are involved and where poor soils are encountered at shallow depths	May be costly to control excavation; may not be best alternative for large landslides; may not be feasible because of right-of-way requirements	Analytical studies must be performed; depth of excavation must be sufficient to ensure firm support
	Install bridge	At sidehill locations with shallow soil movements	May be costly and not provide adequate support capacity for lateral forces to restrain landslide mass	Analysis must be performed for anticipated loadings as well as structural capability
Reduce driving forces	Change line or grade	During preliminary design phase of project	Will affect sections of roadway adjacent to landslide area	—
	Drain surface	In any design scheme; must also be part of any remedial design	Will only correct surface infiltration or seepage due to surface infiltration	Slope vegetation should be considered in all cases
	Drain subsurface	On any slope where lowering of groundwater table will increase slope stability	Cannot be used effectively when sliding mass is impervious	Stability analysis should include consideration of seepage forces
	Reduce weight	At any existing or potential slide	Requires lightweight materials that may be costly or unavailable; excavation waste may create problems; requires right-of-way	Stability analysis must be performed to ensure proper placement of lightweight materials

Increase resisting forces				
Apply external force	Use buttress and counterweight fills; toe berms	At an existing landslide; in combination with other methods	May not be effective on deep-seated landslides; must be founded on a firm foundation; requires right-of-way	Consider reinforced steep slopes for limited right-of-way
	Use structural systems	To prevent movement before excavation; where right-of-way is limited	Will not stand large deformations; must penetrate well below sliding surface	Stability and soil-structure analyses are required
	Install anchors	Where right-of-way is limited	Requires ability of foundation soils to resist shear forces by anchor tension	Study must be made of in situ soil shear strength; economics of method depends on anchor capacity, depth, and frequency
Increase internal strength	Drain subsurface	At any landslide where water table is above shear surface	Requires experienced personnel to install and ensure effective operation	—
	Use reinforced backfill	On embankments and steep fill slopes; landslide reconstruction	Requires long-term durability of reinforcement	Must consider stresses imposed on reinforcement during construction
	Install in situ reinforcement	As temporary structures in stiff soils	Requires long-term durability of nails, anchors, and micropiles	Design methods not well established; requires thorough soils investigation and properties testing

The basic principles for design and construction of stable slopes in soils are quite well known. The engineering properties of soils as they relate to slope stability are generally understood. Analysis capabilities for slope stability have improved markedly in recent years because of the digital computer. In this report, Investigation, Strength and Stability Analysis, provide important background information. Specifically, (Soil Strength Properties and Their Measurement) gives the procedures for determination of the appropriate soil parameters utilized in the stability analyses that are discussed. The procedures are also appropriate for the analysis of preconstructed slopes, as well as for design of remedial works and correction of existing landslides.



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The BCT engineers must also consider the probable consequences of failure. In most transportation situations, slope designs generally require safety factors in the range of 1.25 to 1.50. Higher factors may be required if slope movements have the potential for causing loss of human life or great economic loss or if there is considerable uncertainty regarding the pertinent design parameters, construction quality control, potential for seismic activity, and so forth. Likewise, lower safety factors may be used if the engineer is confident of the accuracy of the input data and if good construction control may be relied upon.

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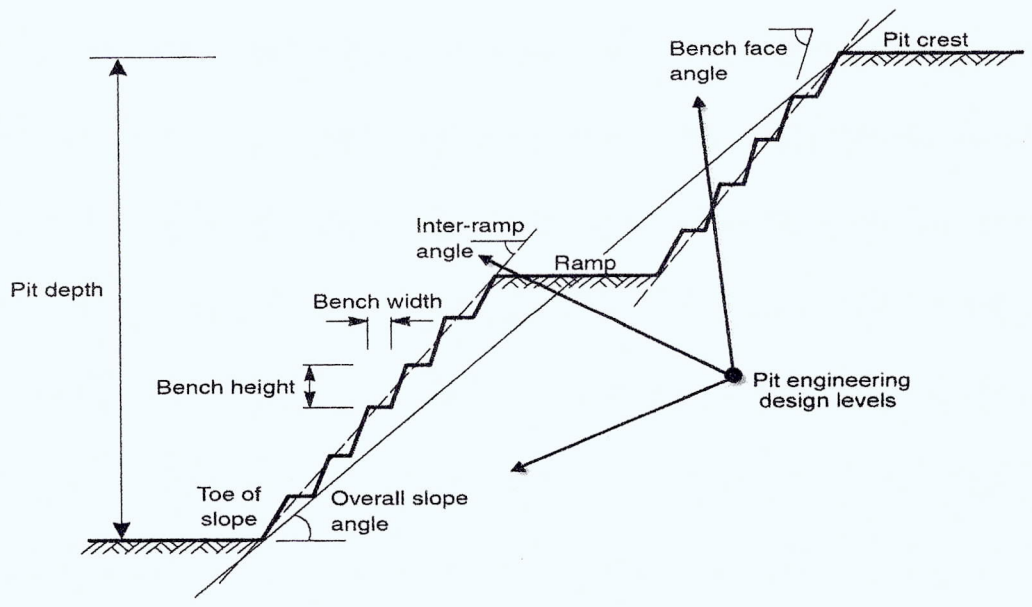
If relocation or realignment of a proposed facility is not practical in the area, complete or partial removal of the unstable materials will be considered. Removal of potentially unstable materials can range from simple stripping of near surface materials a few meters thick. The extracted area during slope stabilization will temporarily stock to the designated stockpile on the area, however due to possible environmental effect of the stockpile because of rain, wind and etc. The BCT plans to apply for a separate clearance from the PMRB and MGB, if this extracted materials can be use in other government projects but in prior for the PMRBs or MGBs approval.

REDUCTION OF DRIVING FORCES

Since the forces tending to cause movements downslope are essentially gravitational, a simple approach to increasing stability is to reduce the mass of soil involved in the slope. Techniques for this include flattened slopes, benched slopes, reduced excavation depths, surface and subsurface drainage, and lightweight fill.



BENCHING

a **bench** or **benchland** is a long, relatively narrow strip of relatively level or gently inclined land that is bounded by distinctly steeper slopes above and below it. Benches can be of different origins and created by very different geomorphic processes. For the quarry area at Brgy. Decalachao, benching will be conducted and to meet the safe slope of the area, however, factor of safety is considered.

BENCH WIDTH

The effect of increasing bench width on quarry slope with faces at 60°. The reserves sterilized/lost increase progressively to 1000 tonnes for each 10m length of face as the bench width increases from 5.5m to 10.5m.

FACE HEIGHT

The effect of reducing face height by introducing a bench on a single 20m face is illustrated in figure 3. The reserves sterilized/lost by splitting a 10 m face at 70° into 2 x 10m faces with one 5m bench amounts to 1000 tonnes for every 8m length of face. It should be noted that the above calculations relating to face angle, bench width and face height are based on relatively short (8m) lengths of quarry slope and simple geometry; they will need to be increased many times to take into account actual quarry dimensions. The outcome is that very large quantities of material are involved which are likely to have a significant impact on quarry viability. Consequently, it is financially important to a quarry operator to have faces as steep and as high as possible and to have benches as narrow as possible; this results in steep slope angles which maximize reserves.

FACE MAINTENANCE

A requirement that face maintenance must be able to be carried out throughout the life of a quarry would have profound implications for quarry design and costs. It is suggested that the only safe and practical method of maintaining a face is by mechanical plant. On a final benched quarry slope plant access to each bench must, therefore, be possible and, since the building of ramps or pads on the bench below an unstable face is unlikely to be accomplished safely, that plant must be able to reach the crest of the face. This means that the bench width needed to allow safe plant access and the relationship between face height and plant reach must be considered. In this scenario, the maximum reach of excavators will, therefore, determine the maximum theoretical face height.

VEGETATIVE AND BIOTECHNICAL STABILIZATION

Stabilization of slopes by the combined use of vegetation and manufactured structural elements working together in an integrated manner is known as biotechnical slope stabilization. This relatively new concept is generally cost-effective as compared with the use of structures alone; it has increased the environmental compatibility of such treatments and allows the use of indigenous nat- ural materials. Although vegetative treatments alone are usually much less expensive than earth-retaining structures or other constructed slope protection systems, their effectiveness in arresting slope movement or preventing soil loss under ex- treme conditions may be much lower than that of the structures (Gray and Leiser 1982).

Grasses and woody plants are used most often in biotechnical stabilization. They have a true reinforcing function and should not be considered merely cosmetic adjuncts to the structure. They may be planted on a slope above a low retaining wall, or the interstices of the structure may be planted with vegetation whose roots bind together the soil within and behind the structure. The stability of all types of retaining structures with open gridwork or tiered facings benefits from such vegetation.

The BCT and 428 Hi-Tech Group Inc. will introduce grasses on the area after the benching process to help in the stability of the bench slopes.

3. REHABILITATION TIMESCALE

Time frames for rehabilitation of the Site will be driven largely by the rate of extraction and will occur progressively over the Site in conjunction with the completed stages. It is anticipated, that rehabilitation of each worked-out stage will be completed within Six to twelve months of the stage being finished (i.e. within a year of filling concluding).

Rehabilitation Stage	Area	Date of Completion (Indicative Only)
San Nicolas Quarry	8 hectares	January-August 2023

4. PROPOSED FINAL LANDFORM

The volume and infill rate of clean fill will guide the final land form of the rehabilitated Site. The minimum finished floor level for the Site, following operational rehabilitation and clean fill activities, is expected to be at least 5.0 – 8.0 meters (this includes a minimum topsoil of 200 mm) .This would result in an irregular contoured depth of 1.0 – 4.0 meters below natural ground level.

5. ENVIRONMENTAL MANAGEMENT

SITE MANAGEMENT

The overall management of Site rehabilitation will be the responsibility of the BCT TRADING AND CONSTRUCTION or by delegated authority. Responsibilities include:

- Managing daily quarry operations – extraction and manufacturing of aggregates to supply orders
- Ensuring constant compliance with the Conditions of all Resource Consents pertaining to the Site.

- Communicating resource consent requirements to staff, contractors and all other relevant parties.
- Overseeing implementation of the Site Rehabilitation Plan and other management plans.
- Billboard will be posted also on the entrance of the area to notify the public that the area is under rehabilitation.

PREPARED BY:

MRS. BELLA C. TIOTANGCO
BCT Trading & Construction Inc.
Proprietor

ENGR. CESARIO REYES
428 Hi-Tech Group Inc.
Engineer

PREPARED BY

BCT TRADING &
CONSTRUCTION INC

QUARRY REHAB PLAN 2022

Brgy. Decalachao, Coron, Palawan

BACKGROUND

The DENR MGB MIMAROPA and the DENR MGB MIMAROPA had issued a Cease-and-Desist Order to the Mountain Quarry operated by the BCT trading at Brgy. Decalachao, Brgy. Poblacion 6, Coron, Palawan. And result of the technical conference is the DENR instructed the company to submit a rehabilitation plan prior for the MGBs review and approval. The purpose of the rehabilitation is to ensure that the slope of the extracted area is safe and stable.

BCT Trading and Construction Inc. is willing to participate and to follow the instruction from the DENR, the quarry materials that is operated in the Brgy. Decalachao is used for the Busuanga Expansion Airport. The airport is a project by the DPWH to cater booming capability of Municipality of Coron in the field of tourism.

The aerial distance of the quarry site from the Busuanga Airport is around 1.5 km. The quarry area that is operated by the company having a total of 4.9 Hectares which is located inside the Busuanga Pasture Reserve.

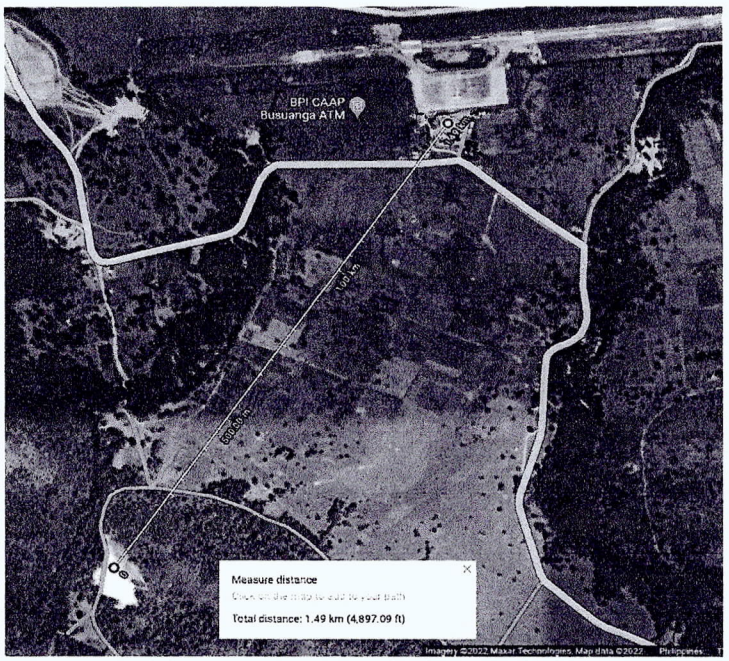


Figure 1-Distance from the Airport to the quarry area

the extraction of raw materials from the earth's crust – inevitably impacts on the surrounding natural and social environment. In particular, the removal of soil and changes in topography of the area are likely to affect local ecosystems and watersheds. However, these impacts can be successfully addressed and mitigated through the development and implementation of an effective quarry rehabilitation plan. In some cases, the effective implementation of a well-designed rehabilitation plan can result in significant environmental and social benefits. Quarrying activity carries with it the obligation to rehabilitate both the site and, wherever necessary, the surrounding area while operating and upon completion of operations. BCT Trading & Construction Inc. is committed to draw up rehabilitation plans for operating quarries and sites identified by the DENR, and communicating these plans to concerned agencies. A Key Performance Indicator (KPI) reporting the percentage of sites with quarry rehabilitation plans in place has been developed to support this commitment. Successful quarry rehabilitation also carries commercial benefits for operating companies. The license to operate for both the industry as a whole and for individual companies is dependent on ensuring that land used for quarrying purposes is rehabilitated in an effective and responsible manner, taking into account the needs and expectations of stakeholders, and the influence of regional and local planning requirements. Companies that adopt the best practice in this regard can expect to realize significant benefits, including competitive advantage and long-term sustainability of their operations, which outweigh the short term financial costs of a rehabilitation program.

FRAMEWORK

- Legal Compliance must be the minimum requirement when establishing each quarry rehabilitation plan. The rehabilitation guidelines should never be in conflict with, but should always complement and go beyond legal compliance especially on the Mining Act in the Philippines.
- The rehabilitation plan will ensure site is left in a safe and stable condition. The safety of the rehabilitated quarry includes the stability of slopes, roads, and raw material piles. Safety will always be considered as paramount for the rehabilitation plan.
- Stakeholders and Concerned agencies will be listened to and relevant stakeholders will be involved in all stages. The quarry rehabilitation plan must address stakeholders expectation, and be aligned with or leverage from, the stakeholder view, experience, culture and customs.
- An assessment of the baseline conditions will enable identification of the impacts and measurement of the changes that may arise as a result of quarrying activity. The assessment of baseline conditions will include air and water, flora and fauna, site safety, landscape integration, human activities and cultural heritage.
- A monitoring plan and appropriate corrective measures (if necessary) will be included in the rehabilitation plan, thereby ensuring the documentation and measurement of performance against the objectives.
- The rehabilitation plan will be developed prior to the commencement of activity for new sites, but should also be developed for operating quarries, where such as plan does not already exist. It will be aligned with the mining plan. Depending on the objectives and priorities set.

1. LEGISLATIVE ENVIRONMENT

These guidelines promote an overall consistent approach to quarry rehabilitation management. They are a complement to applicable local or international legislation, and must not be used as a substitute. The guidelines should be applicable to quarry closure programs without any conflicts with legal compliance. It should be clearly understood and accepted that the legislative requirements are the minimum standard required, which best practice should exceed wherever possible.

2. STAKEHOLDERS

Stakeholders are people or institutions that feel they may be affected by, or may affect, an organization's activity. Stakeholders can be either internal to the organization (e.g. employees, shareholders) or external (e.g. land owners, local communities, authorities, NGOs).

2.1 IDENTIFICATION OF STAKEHOLDERS

Stakeholders will be specific to each project, and should be extended beyond the immediate area of the quarry site, depending on the natural and social environment and circumstances. In addition, there are a number of legally prescribed statutory consultees in some countries, and consultation processes should reflect this. A list of stakeholders could include:

- Local Residents near the area
- DENR FMB-Busuanga Pasture Reserve
- DENR CENRO Calamianes
- DENR MGB
- DENR EMB

- PMRB
- PCSD
- LGU
- Barangay
- Non-Government Organizations

3. REHABILITATION PROGRAM

3.1 SITE PREPARATION AND QUARRYING ACTIVITIES

. The Quarry operations comprising the following activities:

- The use of suitable on-Site material to create the perimeter bunds
- Development of the Quarry Pit area, extending from the existing Quarry, including the removal of topsoil and subsoil overburden material, and the development of a working pit.
- Construct and maintain Quarry Pit access roads.
- Extraction and processing of gravel in stages.
- The rehabilitation of worked out areas, using cleanfill, covered with clean topsoil, battering all residual slopes and grassing.

3.2 QUARRY REHABILTATION WORKS

Following completion of filling in an area, rehabilitation involves re-spreading and contouring of topsoil materials and stored overburden materials to a minimum depth of 300 mm (300 – 400 mm), stabilization of battered slopes and grassing in completed and restored extraction areas to create a free draining and stable landform. Monitoring of revegetation will occur to ensure the success of the rehabilitation. Key principles of rehabilitation include:

- Reinstallation of topsoil to ensure the soil can be used for agricultural or other uses. This may require the topsoil to be mixed with organic material or a soil conditioner.
- Appropriate vegetation cover undertaken using appropriate low-seeding grass species. Topsoil and re-grassing should be undertaken during September to November or March to May.
- Development of a free draining stable landform.
- The removal of all quarry operating machinery, equipment and buildings at the conclusion of all extraction activities.
- Maintaining the Site through controlling weeds and grazing, as appropriate.
- Monitor and where necessary, maintain rehabilitated areas to ensure they are functioning appropriately post-rehabilitation for a period of 24 months.
- Rehabilitation planning that is integrated with extraction sequences will ensure rehabilitation can commence, in areas where extraction activity has concluded. This will ensure that vegetation can be established, or a return to other land use (e.g. pasture), as soon as possible rather than leaving a disused quarry area on part of the Site. It also ensures that rehabilitation effort is not wasted on areas which will be disturbed again later.

- Owing to the relatively small area of the Quarry, BCT sees the Site as providing the potential to be an exemplar in terms of Quarry rehabilitation. Additionally, as only part of the Site will ever be actively used for quarrying at one time, there are opportunities to re-establish stock grazing on the Site as stages of the Quarry are progressively rehabilitated.
- While the final use is unlikely to be determined until sometime in the future, SOL Quarries Ltd will restore the Site to a form in that it can be used for a variety of activities. These range from farming, to animal boarding, recreation and other uses provided for within the Rural zones.

3.2.1 SLOPE STABLIZATION

Table 17-1
Summary of Approaches to Potential Slope Stability Problems (modified from Gedney and Weber 1978)

CATEGORY	PROCEDURE	BEST APPLICATION	LIMITATIONS	REMARKS
Avoid problem	Relocate facility	As an alternative anywhere	Has none if studied during planning phase; has large cost if location is selected and design is complete; also has large cost if reconstruction is required	Detailed studies of proposed relocation should ensure improved conditions
	Completely or partially remove unstable materials	Where small volumes of excavation are involved and where poor soils are encountered at shallow depths	May be costly to control excavation; may not be best alternative for large landslides; may not be feasible because of right-of-way requirements	Analytical studies must be performed; depth of excavation must be sufficient to ensure firm support
	Install bridge	At sidehill locations with shallow soil movements	May be costly and not provide adequate support capacity for lateral forces to restrain landslide mass	Analysis must be performed for anticipated loadings as well as structural capability
Reduce driving forces	Change line or grade	During preliminary design phase of project	Will affect sections of roadway adjacent to landslide area	—
	Drain surface	In any design scheme; must also be part of any remedial design	Will only correct surface infiltration or seepage due to surface infiltration	Slope vegetation should be considered in all cases
	Drain subsurface	On any slope where lowering of groundwater table will increase slope stability	Cannot be used effectively when sliding mass is impervious	Stability analysis should include consideration of seepage forces
	Reduce weight	At any existing or potential slide	Requires lightweight materials that may be costly or unavailable; excavation waste may create problems; requires right-of-way	Stability analysis must be performed to ensure proper placement of lightweight materials

Increase resisting forces				
Apply external force	Use buttress and counterweight fills; toe berms	At an existing landslide; in combination with other methods	May not be effective on deep-seated landslides; must be founded on a firm foundation; requires right-of-way	Consider reinforced steep slopes for limited right-of-way
	Use structural systems	To prevent movement before excavation; where right-of-way is limited	Will not stand large deformations; must penetrate well below sliding surface	Stability and soil-structure analyses are required
	Install anchors	Where right-of-way is limited	Requires ability of foundation soils to resist shear forces by anchor tension	Study must be made of in situ soil shear strength; economics of method depends on anchor capacity, depth, and frequency
Increase internal strength	Drain subsurface	At any landslide where water table is above shear surface	Requires experienced personnel to install and ensure effective operation	—
	Use reinforced backfill	On embankments and steep fill slopes; landslide reconstruction	Requires long-term durability of reinforcement	Must consider stresses imposed on reinforcement during construction
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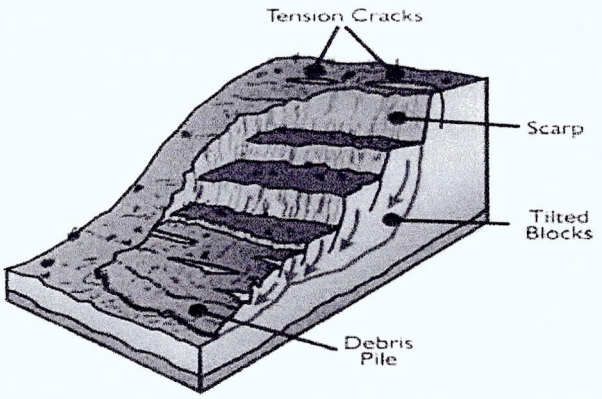

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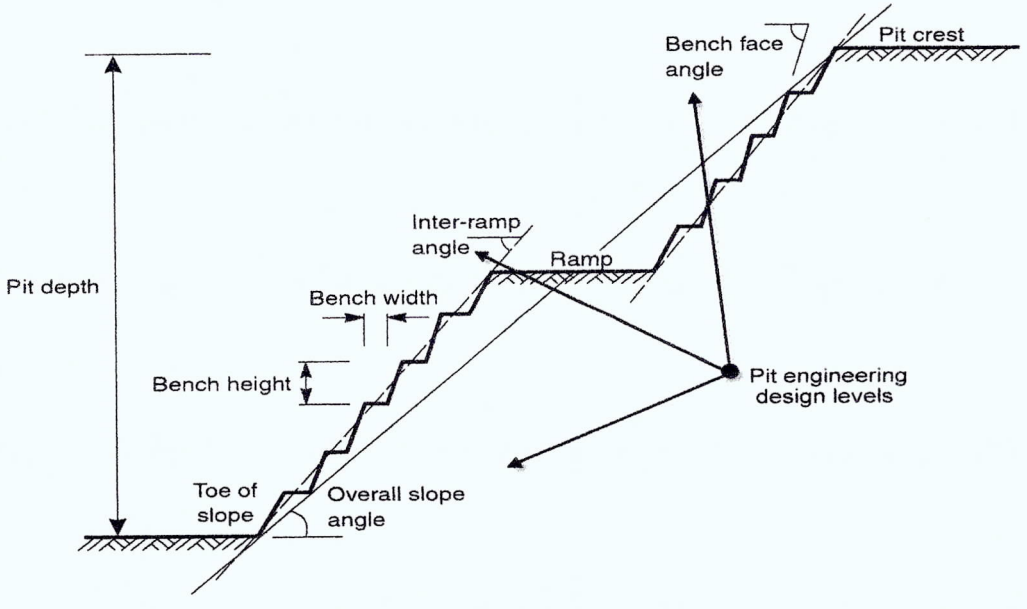

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BENCH WIDTH

The effect of increasing bench width on quarry slope with faces at 70°. The reserves sterilized/lost increase progressively to 1000 tonnes for each 10m length of face as the bench width increases from 5.5m to 10.5m.

FACE HEIGHT

The effect of reducing face height by introducing a bench on a single 20m face is illustrated in figure 3. The reserves sterilized/lost by splitting a 20m face at 70° into 2 x 10m faces with one 7m bench amounts to 1000 tonnes for every 10m length of face. It should be noted that the above calculations relating to face angle, bench width and face height are based on relatively short (10m) lengths of quarry slope and simple geometry; they will need to be increased many times to take into account actual quarry dimensions. The outcome is that very large quantities of material are involved which are likely to have a significant impact on quarry viability. Consequently, it is financially important to a quarry operator to have faces as steep and as high as possible and to have benches as narrow as possible; this results in steep slope angles which maximize reserves.

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A requirement that face maintenance must be able to be carried out throughout the life of a quarry would have profound implications for quarry design and costs. It is suggested that the only safe and practical method of maintaining a face is by mechanical plant. On a final benched quarry slope plant access to each bench must, therefore, be possible and, since the building of ramps or pads on the bench below an unstable face is unlikely to be accomplished safely, that plant must be able to reach the crest of the face. This means that the bench width needed to allow safe plant access and the relationship between face height and plant reach must be considered. In this scenario, the maximum reach of excavators will, therefore, determine the maximum theoretical face height.

VEGETATIVE AND BIOTECHNICAL STABILIZATION

This method is also consider after the bench method apply in the area.

Slope stabilization provided directly by vegetation and by biotechnical slope protection (the use of vegetation combined with structural slope- stabilization elements) is reviewed briefly. The basic concepts of vegetative stabilization are not new, but recent research and development now enable more effective use of this technique than in the past. Additional information about bio- stabilization was provided by Gray (1970), Gray and Leiser (1982), Greenway (1987), and Wu (1994a, 1994b).

Vegetation contributes to stability of slopes through (a) root reinforcement and *(b)* rainfall interception and evapotranspiration, which reduce pore pressures. Case studies have shown that slope failures can be attributed to the loss of reinforcement provided by tree roots (Wu et al. 1979; Riestenberg and Sovonick-Dunford 1983; Riestenberg 1987). In spite of the fact that Greenway (1987), in his ex- tensive summary of the effects of vegetation on slope stability, included reports that vegetation tends to reduce slope stability, most

researchers believe that vegetation is by far a positive aspect in the protection of slopes. Wu (1 994b) quantified this protection in terms of root reinforcement and reduction of soil moisture and pore pressures.

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4. REHABILITATION TIMESCALE

Time frames for rehabilitation of the Site will be driven largely by the rate of extraction and will occur progressively over the Site in conjunction with the completed stages. It is anticipated, that rehabilitation of each worked-out stage will be completed within Six to twelve months of the stage being finished (i.e. within a year of filling concluding).

Rehabilitation Stage	**Area**	**Date of Completion (Indicative Only)**
Decalachao Quarry	4.9 hectares	January 2023

5. PROPOSED FINAL LANDFORM

The volume and infill rate of clean fill will guide the final land form of the rehabilitated Site. The minimum finished floor level for the Site, following operational rehabilitation and clean fill activities, is expected to be at least 5.0 – 10.0 meters (this includes a minimum topsoil of 200 mm) .This would result in an irregular contoured depth of 1.0 – 4.0 meters below natural ground level.

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PREPARED BY:

MRS. BELLA C. TIOTANGCO

BCT Trading & Construction Inc.

Proprietor

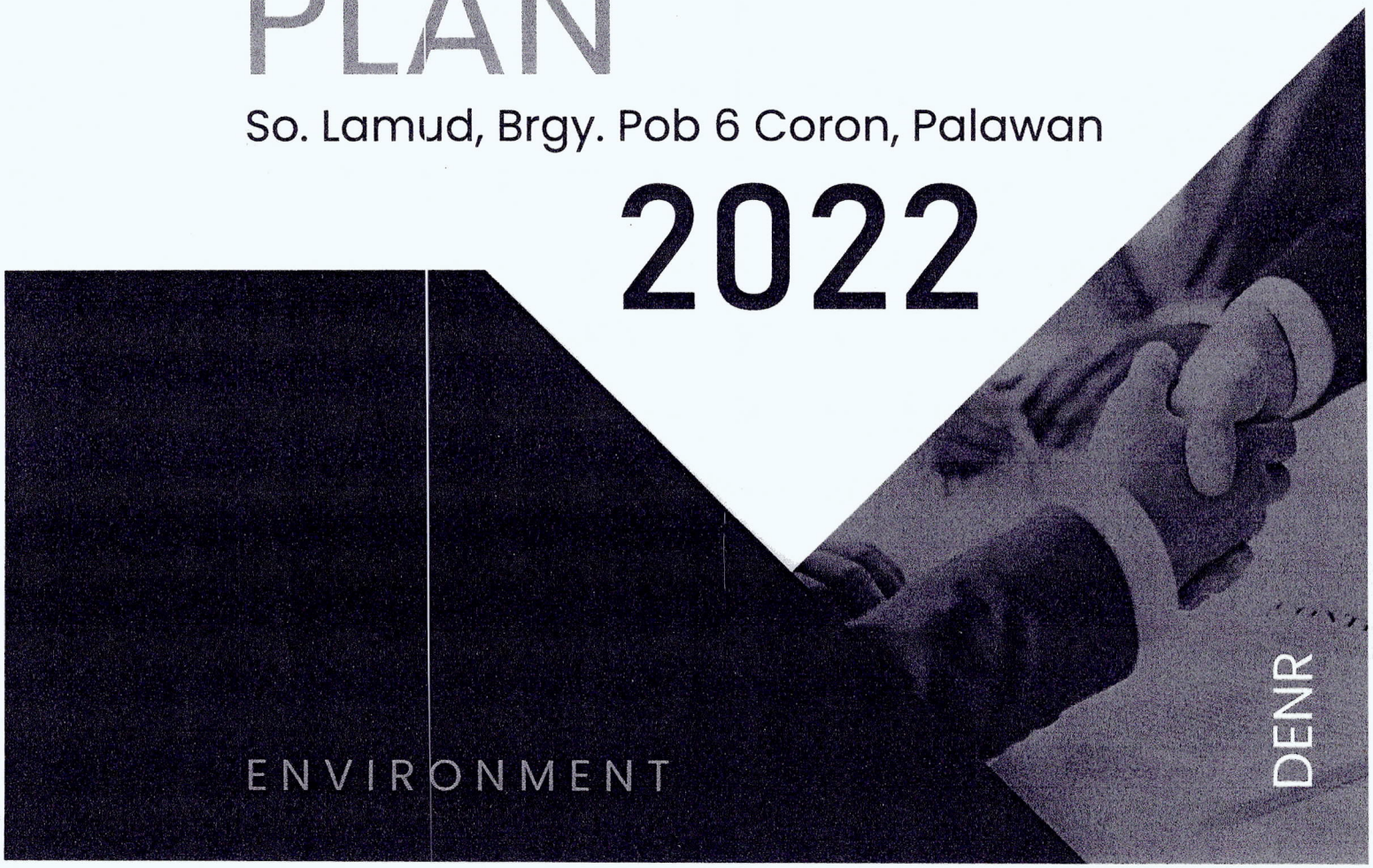
BCT Trading &
Construction Inc.

Mountain Quarry

REHAB PLAN

So. Lamud, Brgy. Pob 6 Coron, Palawan

2022



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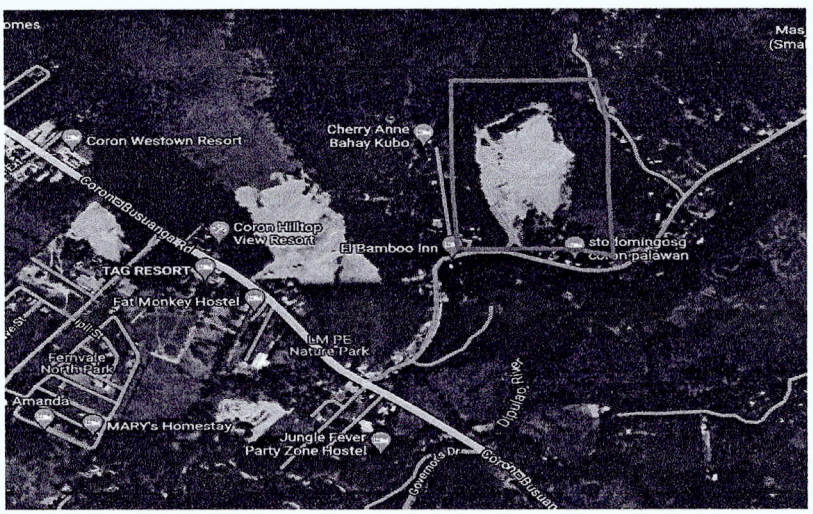
The DENR MGB MIMAROPA and the DENR MGB MIMAROPA had issued a Cease-and-Desist Order to the Mountain Quarry operated by the BCT trading at Brgy. Decalachao, Brgy. Poblacion 6, Coron, Palawan. And result of the technical conference is the DENR instructed the company to submit a rehabilitation plan prior for the MGBs review and approval. The purpose of the rehabilitation is to ensure that the slope of the extracted area is safe and stable.

The quarry area at Sitio Lamud, Brgy. Poblacion 6, Coron, Palawan had permits such as PCSD Clearance, PMRB Quarry Permit, and ECC. However, the DENR had determine that the process of excavation is not proper and can possibly result to danger in the nearby resident in the area. Therefore, the BCT should conduct rehabilitation on the area beyond the approved site and to conduct slope stabilization the active quarry area.

The quarry is owned by Ms. Bella C. Tiotangco, with an area of 4.99 Hectares and intended for the reclamation project of the Provincial Government of Palawan. The annual extraction approved by the PMRB is around 40,000 m3.



the extraction of raw materials from the earth's crust – inevitably impacts on the surrounding natural and social environment. In particular, the removal of soil and changes in topography of the area are likely to affect local ecosystems and watersheds. However, these impacts can be successfully addressed and mitigated through the development and implementation of an effective quarry rehabilitation plan. In some cases, the effective implementation of a well-designed rehabilitation plan can result in significant environmental and social benefits. Quarrying activity carries with it the obligation to rehabilitate both the site and, wherever necessary, the surrounding area while operating and upon completion of operations. BCT Trading & Construction Inc. is committed to draw up rehabilitation plans for operating quarries and sites identified by the DENR, and communicating these plans to concerned agencies. A Key Performance Indicator (KPI) reporting the percentage of sites with quarry rehabilitation plans in place has been developed to support this commitment. Successful quarry rehabilitation also carries commercial benefits for operating companies. The license to operate for both the industry as a whole and for individual companies is dependent on ensuring that land used for quarrying purposes is rehabilitated in an effective and responsible manner, taking into account the needs and expectations of stakeholders, and the influence of regional and local planning requirements. Companies that adopt the best practice in this regard can expect to realize significant benefits, including competitive advantage and long-term sustainability of their operations, which outweigh the short term financial costs of a rehabilitation program.

FRAMEWORK

- Legal Compliance must be the minimum requirement when establishing each quarry rehabilitation plan. The rehabilitation guidelines should never be in conflict with, but should always complement and go beyond legal compliance especially on the Mining Act in the Philippines.
- The rehabilitation plan will ensure site is left in a safe and stable condition. The safety of the rehabilitated quarry includes the stability of slopes, roads, and raw material piles. Safety will always be considered as paramount for the rehabilitation plan.
- Stakeholders and Concerned agencies will be listened to and relevant stakeholders will be involved in all stages. The quarry rehabilitation plan must address stakeholders expectation, and be aligned with or leverage from, the stakeholder view, experience, culture and customs.
- An assessment of the baseline conditions will enable identification of the impacts and measurement of the changes that may arise as a result of quarrying activity. The assessment of baseline conditions will include air and water, flora and fauna, site safety, landscape integration, human activities and cultural heritage.
- A monitoring plan and appropriate corrective measures (if necessary) will be included in the rehabilitation plan, thereby ensuring the documentation and measurement of performance against the objectives.
- The rehabilitation plan will be developed prior to the commencement of activity for new sites, but should also be developed for operating quarries,

where such as plan does not already exist. It will be aligned with the mining plan. Depending on the objectives and priorities set.

1. LEGISLATIVE ENVIRONMENT

These guidelines promote an overall consistent approach to quarry rehabilitation management. They are a complement to applicable local or international legislation, and must not be used as a substitute. The guidelines should be applicable to quarry closure programs without any conflicts with legal compliance. It should be clearly understood and accepted that the legislative requirements are the minimum standard required, which best practice should exceed wherever possible.

2. STAKEHOLDERS

Stakeholders are people or institutions that feel they may be affected by, or may affect, an organization's activity. Stakeholders can be either internal to the organization (e.g. employees, shareholders) or external (e.g. land owners, local communities, authorities, NGOs).

2.1 IDENTIFICATION OF STAKEHOLDERS

Stakeholders will be specific to each project, and should be extended beyond the immediate area of the quarry site, depending on the natural and social environment and circumstances. In addition, there are a number of legally prescribed statutory consultees in some countries, and consultation processes should reflect this. A list of stakeholders could include:

- Local Residents near the area
- DENR CENRO Calamianes
- DENR MGB
- DENR EMB
- PMRB
- PCSD
- LGU
- Barangay
- Non-Government Organizations

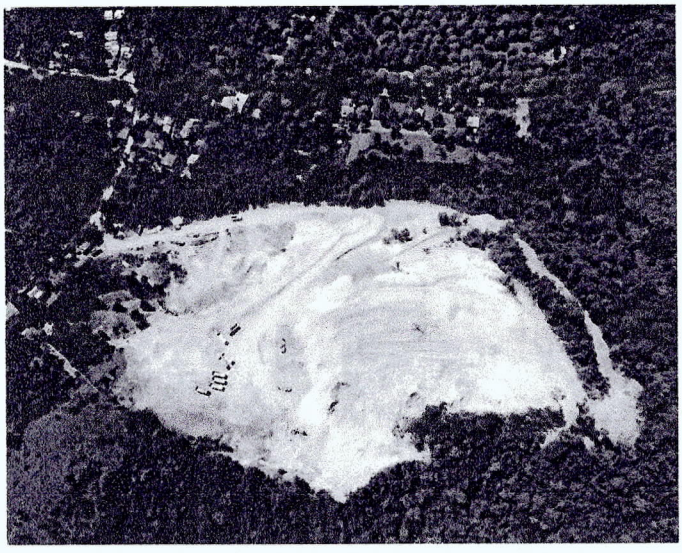
3. REHABILITATION PROGRAM

3.1 SITE PREPARATION AND QUARRYING ACTIVITIES

. The Quarry operations comprising the following activities:

- The use of suitable on-Site material to create the perimeter bunds
- Development of the Quarry Pit area, extending from the existing Quarry, including the removal of topsoil and subsoil overburden material, and the development of a working pit.
- Construct and maintain Quarry Pit access roads.
- Extraction and processing of gravel in stages.
- The rehabilitation of worked out areas, using cleanfill, covered with clean topsoil, battering all residual slopes and grassing.

ACTUAL PHOTOS OF THE AREA



3.2 QUARRY REHABILTATION WORKS

Following completion of filling in an area, rehabilitation involves re-spreading and contouring of topsoil materials and stored overburden materials to a minimum depth of 200 mm (200 – 300 mm), stabilization of battered slopes and grassing in completed and restored extraction areas to create a free draining and stable landform. Monitoring of revegetation will occur to ensure the success of the rehabilitation. Key principles of rehabilitation include:

- Reinstallation of topsoil to ensure the soil can be used for agricultural or other uses. This may require the topsoil to be mixed with organic material or a soil conditioner.
- Appropriate vegetation cover undertaken using appropriate low-seeding grass species. Topsoil and re-grassing should be undertaken during September to November or March to May.
- Development of a free draining stable landform.
- The removal of all quarry operating machinery, equipment and buildings at the conclusion of all extraction activities.
- Maintaining the Site through controlling weeds and grazing, as appropriate.
- Monitor and where necessary, maintain rehabilitated areas to ensure they are functioning appropriately post-rehabilitation for a period of 24 months.

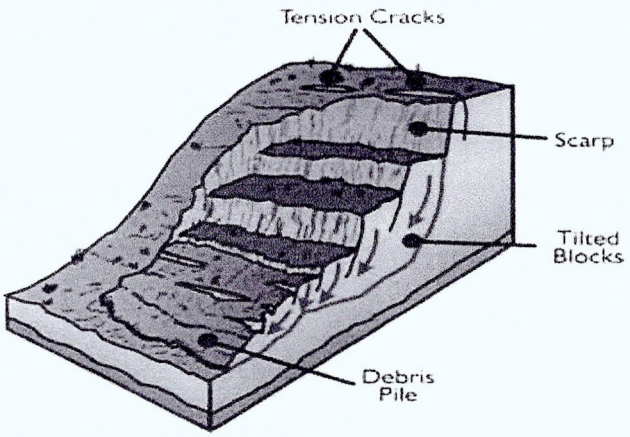
- Rehabilitation planning that is integrated with extraction sequences will ensure rehabilitation can commence, in areas where extraction activity has concluded. This will ensure that vegetation can be established, or a return to other land use (e.g. pasture), as soon as possible rather than leaving a disused quarry area on part of the Site. It also ensures that rehabilitation effort is not wasted on areas which will be disturbed again later.
- Owing to the relatively small area of the Quarry, BCT sees the Site as providing the potential to be an exemplar in terms of Quarry rehabilitation. Additionally, as only part of the Site will ever be actively used for quarrying at one time, there are opportunities to re-establish stock grazing on the Site as stages of the Quarry are progressively rehabilitated.
- While the final use is unlikely to be determined until sometime in the future, SOL Quarries Ltd will restore the Site to a form in that it can be used for a variety of activities. These range from farming, to animal boarding, recreation and other uses provided for within the Rural zones.

3.2.1 SLOPE STABLIZATION

Table 17-1
Summary of Approaches to Potential Slope Stability Problems (modified from Gedney and Weber 1978)

CATEGORY	PROCEDURE	BEST APPLICATION	LIMITATIONS	REMARKS
Avoid problem	Relocate facility	As an alternative anywhere	Has none if studied during planning phase; has large cost if location is selected and design is complete; also has large cost if reconstruction is required	Detailed studies of proposed relocation should ensure improved conditions
	Completely or partially remove unstable materials	Where small volumes of excavation are involved and where poor soils are encountered at shallow depths	May be costly to control excavation; may not be best alternative for large landslides; may not be feasible because of right-of-way requirements	Analytical studies must be performed; depth of excavation must be sufficient to ensure firm support
	Install bridge	At sidehill locations with shallow soil movements	May be costly and not provide adequate support capacity for lateral forces to restrain landslide mass	Analysis must be performed for anticipated loadings as well as structural capability
Reduce driving forces	Change line or grade	During preliminary design phase of project	Will affect sections of roadway adjacent to landslide area	—
	Drain surface	In any design scheme; must also be part of any remedial design	Will only correct surface infiltration or seepage due to surface infiltration	Slope vegetation should be considered in all cases
	Drain subsurface	On any slope where lowering of groundwater table will increase slope stability	Cannot be used effectively when sliding mass is impervious	Stability analysis should include consideration of seepage forces
	Reduce weight	At any existing or potential slide	Requires lightweight materials that may be costly or unavailable; excavation waste may create problems; requires right-of-way	Stability analysis must be performed to ensure proper placement of lightweight materials
Increase resisting forces				
Apply external force	Use buttress and counterweight fills; toe berms	At an existing landslide; in combination with other methods	May not be effective on deep-seated landslides; must be founded on a firm foundation; requires right-of-way	Consider reinforced steep slopes for limited right-of-way
	Use structural systems	To prevent movement before excavation; where right-of-way is limited	Will not stand large deformations; must penetrate well below sliding surface	Stability and soil-structure analyses are required
	Install anchors	Where right-of-way is limited	Requires ability of foundation soils to resist shear forces by anchor tension	Study must be made of in situ soil shear strength; economics of method depends on anchor capacity, depth, and frequency
Increase internal strength	Drain subsurface	At any landslide where water table is above shear surface	Requires experienced personnel to install and ensure effective operation	—
	Use reinforced backfill	On embankments and steep fill slopes; landslide reconstruction	Requires long-term durability of reinforcement	Must consider stresses imposed on reinforcement during construction
	Install in situ reinforcement	As temporary structures in stiff soils	Requires long-term durability of nails, anchors, and micropiles	Design methods not well established; requires thorough soils investigation and properties testing

The basic principles for design and construction of stable slopes in soils are quite well known. The engineering properties of soils as they relate to slope stability are generally understood. Analysis capabilities for slope stability have improved markedly in recent years because of the digital computer. In this report, Investigation, Strength and Stability Analysis, provide important background information. Specifically, (Soil Strength Properties and Their Measurement) gives the procedures for determination of the appropriate soil parameters utilized in the stability analyses that are discussed. The procedures are also appropriate for the analysis of preconstructed slopes, as well as for design of remedial works and correction of existing landslides.



DESIGN CONSIDERATION

Several factors are basic and must be considered in the design of stable slopes. First, because of the nature of soils and the geologic environments in which they are found, virtually every slope design problem is unique (Peck and Ireland 1953;Hutchinson 1977). Second, the procedures used to estimate the stability of an excavated slope are the same as those used to estimate the stability of an embankment slope. These first two factors are true for the analysis of newly constructed slopes as well as for existing slopes and for the design of remedial measures. Third, designing a stable slope includes field investigations, laboratory tests, stability analyses, and proper construction control. Because most of the details involved in this work cannot be standardized, good engineering judgment, experience, and intuition must be coupled with the best possible data gathering and analytical techniques to achieve a safe and economical solution to slope stabilization.

FACTOR OF SAFETY

The BCT engineers must also consider the probable consequences of failure. In most transportation situations, slope designs generally require safety factors in the range of 1.25 to 1.50. Higher factors may be required if slope movements have the potential for causing loss of human life or great economic loss or if there is considerable uncertainty regarding the pertinent design parameters, construction quality control, potential for seismic activity, and so forth. Likewise,

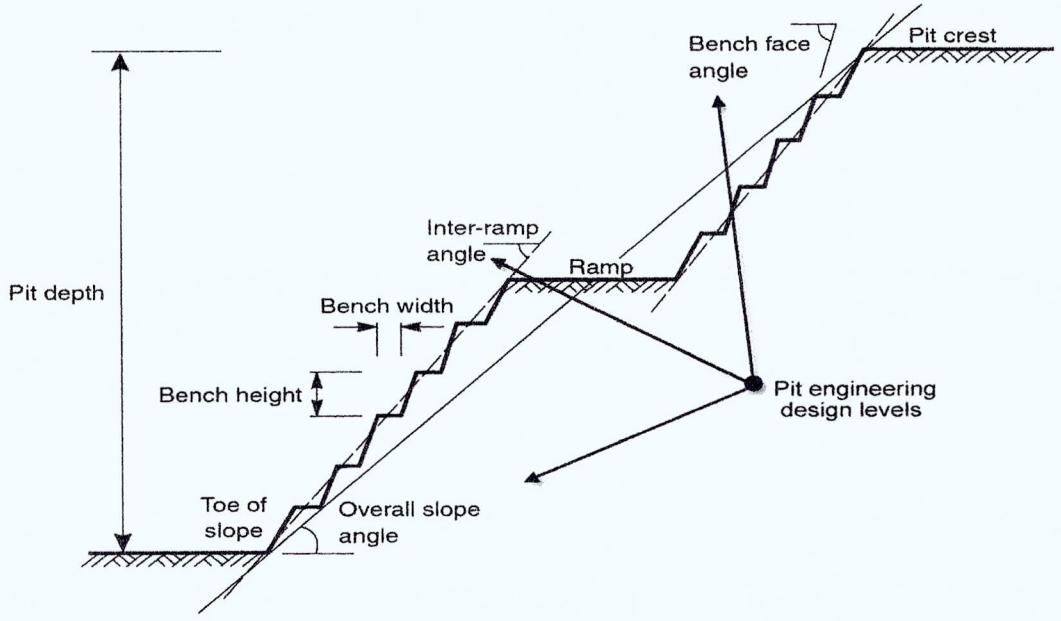
lower safety factors may be used if the engineer is confident of the accuracy of the input data and if good construction control may be relied upon.

REMOVAL OF MATERIALS

If relocation or realignment of a proposed facility is not practical in the area, complete or partial removal of the unstable materials will be considered. Removal of potentially unstable materials can range from simple stripping of near surface materials a few meters thick. The extracted area during slope stabilization will temporarily stock to the designated stockpile on the area, however due to possible environmental effect of the stockpile because of rain, wind and etc. The BCT plans to apply for a separate clearance from the PMRB and MGB, if this extracted materials can be use in other government projects but in prior for the PMRBs or MGBs approval.

REDUCTION OF DRIVING FORCES

Since the forces tending to cause movements downslope are essentially gravitational, a simple approach to increasing stability is to reduce the mass of soil involved in the slope. Techniques for this include flattened slopes, benched slopes, reduced excavation depths, surface and subsurface drainage, and lightweight fill.



BENCHING

a **bench** or **benchland** is a long, relatively narrow strip of relatively level or gently inclined land that is bounded by distinctly steeper slopes above and below it. Benches can be of different origins and created by very different geomorphic processes. For the quarry area at Brgy. Decalachao, benching will be conducted and to meet the safe slope of the area, however, factor of safety is considered.

BENCH WIDTH

The effect of increasing bench width on quarry slope with faces at 70°. The reserves sterilized/lost increase progressively to 1000 tonnes for each 10m length of face as the bench width increases from 5.5m to 10.5m.

FACE HEIGHT

The effect of reducing face height by introducing a bench on a single 20m face is illustrated in figure 3. The reserves sterilized/lost by splitting a 20m face at 70° into 2 x 10m faces with one 7m bench amounts to 3000 tonnes for every 10m length of face. It should be noted that the above calculations relating to face angle, bench width and face height are based on relatively short (10m) lengths of quarry slope and simple geometry; they will need to be increased many times to take into account actual quarry dimensions. The outcome is that very large quantities of material are involved which are likely to have a significant impact on quarry viability. Consequently, it is financially important to a quarry operator to have faces as steep and as high as possible and to have benches as narrow as possible; this results in steep slope angles which maximize reserves.

FACE MAINTENANCE

A requirement that face maintenance must be able to be carried out throughout the life of a quarry would have profound implications for quarry design and costs. It is suggested that the only safe and practical method of maintaining a face is by mechanical plant. On a final benched quarry slope plant access to each bench must, therefore, be possible and, since the building of ramps or pads on the bench below an unstable face is unlikely to be accomplished safely, that plant must be able to reach the crest of the face. This means that the bench width needed to allow safe plant access and the relationship between face height and plant reach

must be considered. In this scenario, the maximum reach of excavators will, therefore, determine the maximum theoretical face height.

VEGETATIVE AND BIOTECHNICAL STABILIZATION

This method is also consider after the bench method apply in the area.

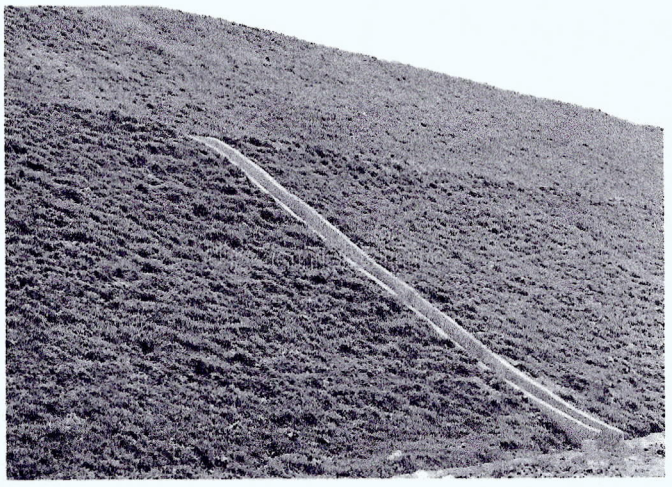
Slope stabilization provided directly by vegetation and by biotechnical slope protection (the use of vegetation combined with structural slope- stabilization elements) is reviewed briefly. The basic concepts of vegetative stabilization are not new, but recent research and development now enable more effective use of this technique than in the past. Additional information about bio- stabilization was provided by Gray (1970), Gray and Leiser (1982), Greenway (1987), and Wu (1994a, 1994b).

Vegetation contributes to stability of slopes through (a) root reinforcement and *(b)* rainfall interception and evapotranspiration, which reduce pore pressures. Case studies have shown that slope failures can be attributed to the loss of reinforcement provided by tree roots (Wu et al. 1979; Riestenberg and Sovonick-Dunford 1983; Riestenberg 1987). In spite of the fact that Greenway (1987), in his ex- tensive summary of the effects of vegetation on slope stability, included reports that vegetation tends to reduce slope stability, most researchers believe that vegetation is by far a positive aspect in the protection of slopes. Wu (1 994b) quantified this protection in terms of root reinforcement and reduction of soil moisture and pore pressures.

Stabilization of slopes by the combined use of vegetation and manufactured structural elements working together in an integrated manner is known as biotechnical slope stabilization. This relatively new concept is generally cost-effective as compared with the use of structures alone; it has increased the environmental compatibility of such treatments and allows the use of indigenous nat- ural materials. Although vegetative treatments alone are usually much less expensive than earth- retaining structures or other constructed slope protection systems, their effectiveness in arresting slope movement or preventing soil loss under ex- treme conditions may be much lower than that of the structures (Gray and Leiser 1982).

Grasses and woody plants are used most often in biotechnical stabilization. They have a true reinforcing function and should not be considered merely cosmetic adjuncts to the structure. They may be planted on a slope above a low retaining wall, or the interstices of the structure may be planted with vegetation whose roots bind together the soil within and behind the structure. The stability of all types of retaining structures with open gridwork or tiered facings benefits from such vegetation.

The BCT will introduce grasses on the area after the benching process to help in the stability of the bench slopes.



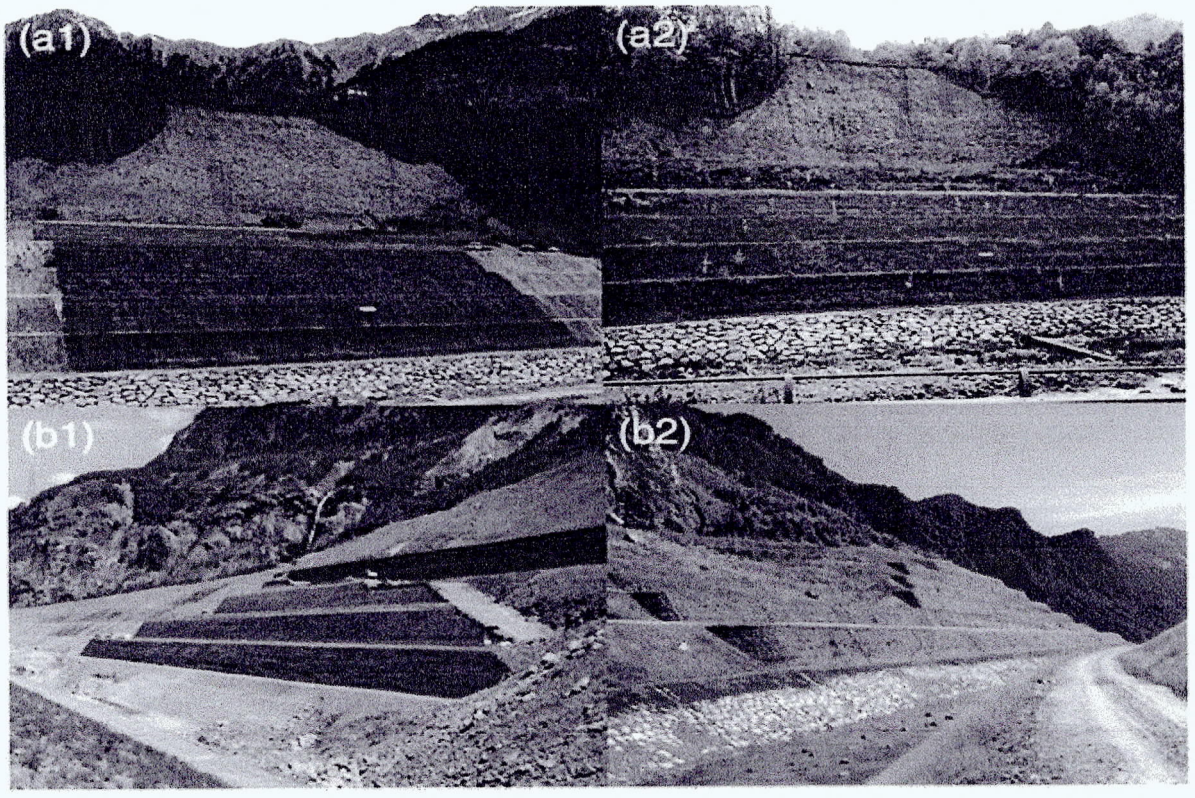
4. REHABILITATION TIMESCALE

Time frames for rehabilitation of the Site will be driven largely by the rate of extraction and will occur progressively over the Site in conjunction with the completed stages. It is anticipated, that rehabilitation of each worked-out stage will be completed within Six to twelve months of the stage being finished (i.e. within a year of filling concluding).

Rehabilitation Stage	**Area**	**Date of Completion (Indicative Only)**
Sitio Lmud Quarry	4.99 hectares	January-August 2023

5. PROPOSED FINAL LANDFORM

The volume and infill rate of clean fill will guide the final land form of the rehabilitated Site. The minimum finished floor level for the Site, following operational rehabilitation and clean fill activities, is expected to be at least 5.0 - 10.0 meters (this includes a minimum topsoil of 200 mm) .This would result in an irregular contoured depth of 1.0 - 4.0 meters below natural ground level.



6. ENVIRONMENTAL MANAGEMENT

SITE MANAGEMENT

The overall management of Site rehabilitation will be the responsibility of the BCT TRADING AND CONSTRUCTION or by delegated authority. Responsibilities include:

- Managing daily quarry operations – extraction and manufacturing of aggregates to supply orders
- Ensuring constant compliance with the Conditions of all Resource Consents pertaining to the Site.
- Communicating resource consent requirements to staff, contractors and all other relevant parties.
- Overseeing implementation of the Site Rehabilitation Plan and other management plans.
- Billboard will be posted also on the entrance of the area to notify the public that the area is under rehabilitation.

PREPARED BY:

MRS. BELLA C. TIOTANGCO

BCT Trading & Construction Inc.

Proprietor