



Oyu Tolgoi LLC

**Health, Safety, Environment, Security, and Communities
Management System Procedures**

Biological rehabilitation procedure

Biological Rehabilitation Procedure		
Effective date: 2015.09.01	Document number: OT-10-E14-PRC-0010-E	Version: 1.1

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1 PURPOSE

The LDC&RMP and associated procedures are designed to support OT achieve its commitment of NPI for priority biodiversity and>NNL for natural habitats in Southern Gobi. This Biological Rehabilitation Procedure aligns with this commitment and aims to:

- Ensure rehabilitation returns the maximum amount of disturbed land to pre-mining conditions
- Ensure rehabilitation uses native plant species to the Southern Gobi and restores vegetation communities if impacted by the Project
- Ensure that monitoring procedures are in place to track progress towards meeting biological rehabilitation completion criteria and implement adaptive management processes if required
- Ensure stakeholder engagement and involvement of local community in necessary steps of biological rehabilitation.

The procedure will fulfil these aims through the provision of a standard and guidelines that are applicable to biological rehabilitation in technically rehabilitated areas.

2 SCOPE

This procedure applies to all land that are owned, leased, managed, or indirectly impacted by OT through all phases of the project life cycle such as project planning, construction, operation, and closure.

3 ROLES AND RESPONSIBILITIES

Role	Responsibilities
OT General Manager HSESC and Manager Environment & Biodiversity	<ul style="list-style-type: none"> • Develop and communicate on a regular basis, to relevant department managers, targets related to technical and biological rehabilitation requirements. • Overseeing and planning for short term (annual) and midterm (up to 3 years) rehabilitation. Review and approval of finalized plan and modification. • Overall responsibility for the implementation of biological rehabilitation, including ensuring the integration with general land usage planning and adequate resourcing to allow implementation. • Provide support to ensure that all OT departments,

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	<p>contractors and visitors adhere and comply to this procedure.</p>
OT Environment Flora team	<ul style="list-style-type: none"> • Undertake pre-disturbance assessment for vegetation community (OT-10-E14-PRC-0009-D) and develop recommendations to ensure the mitigation hierarchy is followed • Maintain the Vegetation Clearance Record (VCR). • Develop annual and mid-term (3 year) biological rehabilitation planning based on the VCR data and any requirements of the local rehabilitation Act. • Ensure annual planning is aligned with Environmental Management Plan (EMP) and estimate the relevant cost for approval of department manager. • In co-operation with the land team ensure that technically rehabilitated areas meet the necessary criteria for biological rehabilitation. • Manage the Native Plant Propagation Center (NPPC) and all NPPC activities including seed collection, cultivation of seedlings and tree saplings, shrubs and certain priority plant species; as well as relevant research and experimental work. • Ensure rehabilitation follows the most appropriate technique (i.e., drill seeding, hydro seeding, or hand cultivating) and involvement of contractors is well managed in accordance with chosen technique and further rehabilitation activities. Ensure contractors meet completion criteria. • Undertake annual post-rehabilitation monitoring and adaptively manage biological rehabilitation plans based on the results.
OT Environment Land team	<ul style="list-style-type: none"> • Ensure the land is technically rehabilitated and restored in line with the OT Rehabilitation procedure: OT-10-E14-PRC-0002-E, OT Topsoil Handling procedure OT-10E14-PRC-0001-E, Rio Tinto Land Use Stewardship Standard, National Standards, and DEIA requirements for the Oyu Tolgoi Project. • Ensure sufficient cooperation is held with flora

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	team for successful implementation of above mentioned procedures.
OT Environment Compliance team	<ul style="list-style-type: none"> • The Compliance team circulates Technical rehabilitation acts issued by Local administration. • The Compliance team coordinates arrangements of State inspections for relinquishment of biologically rehabilitated land. • Identify a timeframe that assigned by local Rehabilitation Acts, if there is any and monitor relevant performance for meeting deadline.
OT Social Performance team	<ul style="list-style-type: none"> • Cooperate in necessary stages of biological rehabilitation for assurance of adequate stakeholder engagement

4 PROCEDURE

#	Bio-Rehabilitation Stages	Detailed guideline	Verification and Reporting
4.1 BIOLOGICAL REHABILITATION PLANNING			
4.1.1	Pre-disturbance assessment	<p>Biological rehabilitation requirements are defined by disturbance activities and initial state of the environment; therefore bio-rehabilitation planning is based on the data collected during the pre-disturbance assessment. The flora research team collect initial baseline data of land, in particular, soil and vegetation data under internal procedures, such as, OT Land Disturbance Permit Procedure (OT-10-E14-PRC-0003-E) and Priority Plant Protection Procedure (OT-10-E14-PRC-0007-E) for rehabilitation of the Oyu Tolgoi Project impacted areas. The key information contained in the pre-disturbance documentation is compiled into the OT Vegetation Clearance Record (VCR) and includes for example:</p> <ul style="list-style-type: none"> • Area disturbed 	<ul style="list-style-type: none"> • OT VCR is consistently maintained and restored for data base • The form of Pre-disturbance assessment for vegetation community (OT-10-E14-FRM-0009-D) is filled with reference of Priority Plant Protection Procedure (OT-10-E14-PRC-0007-E) • Topsoil registration record is consistently

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		<ul style="list-style-type: none"> • Plant community including dominant and priority species impacted and number or area of plants disturbed; • Date to be returned to local Government; • Key requirements of local government or communities etc. <p>Pre-disturbance assessment also includes soil assessment for examining soil characterization and providing with top soil handling recommendations including:</p> <ul style="list-style-type: none"> • Depth of topsoil stripping • Where to place stockpile • Stockpile requirement <p>This will go in line with Top Soil Handling Procedure (OT-10-E14-PRC 0001-E).</p> <p>In occasional cases, pre-disturbance assessment may reveal areas that its natural condition is absolute gravelly hill, thus not possible for biological rehabilitation.</p>	<p>maintained through soil assessment and restored for OT database</p> <ul style="list-style-type: none"> • Biological rehabilitation plans
4.1.2	Timing	<p>The short/annual and midterm (up to 3 years) biological rehabilitation plans are generated in line with the VCR findings and LDC&RMP.</p> <p>The planning shall aim to undertake biological rehabilitation within 6-12 months after technical rehabilitation where the soil remains favourable for vegetation growth. This planning will be closely linked to research and propagation activities at NPPC to ensure the correct species and quantities are available for biological rehabilitation to be undertaken</p> <p>All planning shall consider a timeframe that assigned through local rehabilitation Acts, if there is any. All practicable actions must be carried out to commence and complete biological rehabilitation within assigned time frame. Post-rehabilitation care will be viewed through relevant monitoring programme.</p>	<ul style="list-style-type: none"> • Once the biological rehabilitation plan is clear, the plan should be reflected to the EMP of that year, calculate budget for completion, and receive Department Manager approval.

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4.2 BIOLOGICAL REHABILITATION PREPARATION

4.2.1	Site inspection	<p>Conduct preliminary site inspection to check soil condition compaction, depth of top soil and topography analysis. When necessary, flora officer takes a soil sample from the technical rehabilitated area. This inspection is carried out at the same time as the LDP closure inspection.</p> <p>There could be cases that biological rehabilitation is not required: a. Based on findings of pre-disturbance assessment there may be a case that technically rehabilitated area doesn't necessary require biological rehabilitation (refer to 4.1.1). b. Sites will be allowed to regerate naturally, if land disturbance operation doesn't impact topsoil and any further layers of soil; as well as plant root system. In such case, this should be noted on the local Act or technical rehabilitation acceptance order.</p>	<ul style="list-style-type: none"> A form for Land assessment for rehabilitation is filled during site inspection. Soil sampling process must comply with the OT Soil Sampling Procedure
4.2.2.	Seed collection and preparation	<p>Based on the OT VCR, seed rate will be estimated and seed mix will be specified. The proportional composition of affected vegetation species shall be key factor to determine seed rate and seed mix. The seeds should be collected by NPPC staff and/or purchased through procurement team from other sources in line with the biological rehabilitation plans. In any case of seed collection, only native plant seeds shall be used for biological rehabilitation. Local provenance shall be referenced in accordance with MNS 2429:2009 / Seeds of shrubs and trees. Sampling. Following the MNS, seeds must be certified by seed passport for its origin and seed passport must demonstrate the local provenance of all seeds that are used for biological rehabilitation.</p> <p>Where applicable, seed purchases must be granted with a Certificate of seed quality (following MNS 5995:2009 / Seed of trees and shrubs. The rules for issue and forms of documentation on quality) International best practice guidelines e.g</p>	<p>In any case, the seed collection and storage must comply with the SWP for Seed collection, storage, planting and seedling transplantation OT-0244-00-SWPO-0009. As per MNS 2429:2009 / Seeds of trees and shrubs. Sampling, below forms must be filled and maintained consistently for further recording:</p> <ul style="list-style-type: none"> -seed passport -seed address -act for seed sampling

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		<i>Seed Testing, Principles and Practices</i> (Elias et al, 2012) shall be used when MNS guidelines face limitation.	
4.2.3	Cutting preparation	Based on the OT VCR and the biological rehabilitation plans woody plant branches of the appropriate species must be prepared and cultivated. Cutting is prohibited during green season, thus has to be done from January to no later than early February.	Detailed steps of preparation, storing and planting of cuttings are followed by drafted SWP for cutting preparation and cultivating. The form of Cutting preparation of woody plant is filled in accordance
4.2.4	Priority plant nursing	Based on the OT VCR and the biological rehabilitation plans priority plant species must be cultivated in the NPPC for planting out at the appropriate time. The NPPC will provide collection and preparation of seeds, propagation, relocation, and rehabilitation of priority plants.	The related document is: Priority Plant Protection Procedure (OT-10-E14- PRC-0007-E)
4.2.5	Other NPPC activities	Other actions that must be undertaken at the NPPC and are important for biological rehabilitation include: <ul style="list-style-type: none"> • making plastic pots • cutting preparation • seed cleaning and sorting • soil preparation for cultivation • constant care for the cultivated seedlings and tree saplings 	<ul style="list-style-type: none"> • Daily work record of Native Plant Propagation center (EN-OT-10-E14-FRM-00013-D) • Hydroseeder checklist

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		<ul style="list-style-type: none"> • ensuring a sufficient supply of soil additives and necessary consumables • Maintenance of machinery such as drill seeder, hydroseeder, light vehicle etc. • Undertake research into propagation and translocation of priority plant species 	
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4.3 BIOLOGICAL REHABILITATION OPERATION

The operation of biological rehabilitation involves two stages: 1. Initial seeding during the first year and 2. Hand cultivation into the pre-seeded soil during the following year. As stated in OT biological rehabilitation completion criteria, the completion of each rehabilitation operation stages shall be indicated through soil testing and visual inspection demonstrating no limitation to apparent and future growth; as well as visual appearance of vegetation that likely to become similar to undisturbed area.

4.3.1	Initial seeding (“Year 1 bio-rehabilitation”)	<p>Initial seeding of Year 1 - biological Rehabilitation should ideally take place within a year of the completion of technical rehabilitation whilst the soil condition remains free of the occurrence of erosion, compaction and crust. Additional technical rehabilitation may be required if soil conditions have deteriorated.</p> <p>Initial seeding can be undertaken using either a drill seeder or a hydroseeder. The preferred method is recommended based on the baseline and control site vegetation survey and topography of the land. First 2 year of establishment need to be followed by watering with the frequency of 2-3 times a year.</p> <p><i>Drill seeding:</i> Drill seeding is an agricultural process to complete with a tractor and a specialized seeding attachment called a drill. The drill utilizes a mechanical mechanism to open a furrow, place the seed in the soil at a certain depth, and then cover the seed with wheels or some sort of packing mechanism. The depth of the seed can be regulated, as well as the rate of</p>	Registration form for Bio-Rehabilitation progress (EN-OT-10-E14-FRM-00014-D)
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		<p>application. Drill seeding is the most common form of biological rehabilitation areas for OT.</p> <p><i>Hydroseeding:</i> Hydroseeding (or hydraulic mulch seeding, hydro-mulching, hydraseeding) is a planting process that uses slurry of seed and mulch (Hydroseeder Operation and Maintenance Procedure). At OT, a Kenworth T800 Hydroseeder Truck RT-119 is used and it is mainly utilized to revegetate the topsoil stockpile, rehabilitate borrow pits and other areas which have a slope that the drill seeder could not be operated.</p>	
4.3.2	Hand cultivation ("Year 2 bio-rehabilitation")	<p>Hand cultivation is used for priority and woody plant species.</p> <p>If the preliminary vegetation survey and control site study register woody and/or priority plants, 2-3 year old saplings will be manually transferred into the respective area from the NPPC. During the first 2 years of establishment transplanted individuals need to be watered 2-3 times a year. From third year on watering will be kept at minimum.</p>	Registration form for Bio-Rehabilitation progress (EN-OT-10-E14-FRM-00014-D)
4.3.3	Alternative Rehabilitation Techniques	<p>The OT flora team is constantly researching potential new techniques and technologies that are suitable for rehabilitation in the Gobi desert. Those techniques need to be trialed first, in small plots and, if successful, can be used in future rehabilitation operation.</p>	

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4.4 POST REHABILITATION CARE

Overall post-rehabilitation monitoring is carried out for duration of 5 years as field trial. If the annual monitoring result suggests negativity or areas for improvement, a review of potential reasons for under performance will be undertaken and rehabilitation work will be adaptively managed and additional rehabilitation will be included into the rehabilitation planning process. The results of rehabilitation monitoring and achievement of completion criteria will feed into the projects net positive impact forecast.

4.4.1	Vegetation monitoring	Vegetation monitoring is begun the year after bio-rehabilitation has been undertaken and continues for at least 5 years on an annual basis. Biological Rehabilitation monitoring results will be cross checked with the monitoring of a control site and with biological completion criteria. The control site is selected within 50 m radius. Monitoring methodology and timing must be identical for both rehabilitation area and control site. The activity is bound by OT Vegetation Monitoring Procedure (OT-0244-SWPO-0008) which was referenced from the Monitoring Manual for Grassland, Shrubland and Savanna Ecosystems.	The following field survey forms are used as part of the SWP for Vegetation Monitoring (OT-0244-SWPO-0008): <ul style="list-style-type: none"> • Plot Metadata Form for Monitoring • Basal Gap Intercept with Height Data Form • Line Point Intercept Data Form • Belt Transect Data Form • Plant Species Richness Data Form • Plant Production Data Form • Woody plant morphology study OT-10-E14-FRM-0012-D
4.4.2	Soil monitoring	Post-rehabilitation soil monitoring is conducted once per year to compare the soil physical and chemical properties with the control site and will continue for at least 5 years. Monitoring results must be compiled and restored for further improvement. Plot Metadata Form for Monitoring also used for soil monitoring as it includes three key parameters to assess soil erosion: <ul style="list-style-type: none"> • Pedoderm Class • Soil Redistribution Class • Resource Retention Class 	<ul style="list-style-type: none"> • Soil sampling must comply with the OT Soil Sampling Procedure • Soil Stability test form • Plot Metadata Form for Monitoring

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4.4.3	Insect monitoring	Ants and beetles have been identified in many ecosystems as valuable bio-indicators for monitoring the process of mining rehabilitation. Insect monitoring work is planned in the future to monitor rehabilitated land.	
4.4.4	Relinquishment of rehabilitated area	<p>Relinquishment process will be approached if positive, self-sustaining result is demonstrated as per growth of rehabilitated plant, soil stability and ecosystem functioning. Major benchmark to assess rehabilitation success is stated in reference.</p> <p>Relinquishment involves two stages:</p> <p><i>Presentation of the rehabilitation work to local community</i></p> <p>One of the commitments of OT is to work collaboratively with the local community. For that, rehabilitation work will be periodically presented to the local community and herders.</p> <p><i>Relinquishment of biologically rehabilitated land</i> The Compliance team will coordinate relinquishment related arrangements including liaising with State inspections agencies and other government authorities.</p> <p>Meeting minutes and Acts shall be signed off and recorded.</p>	<ul style="list-style-type: none"> • OT Biological rehabilitation completion criteria, • Guideline for mining rehabilitation (resolution N138 of Ministry of Environment and Green Development, Date: 2015.03.30)

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5 DEFINITIONS

- **Pre-disturbance vegetation survey:** The flora team inspects the vegetation community and priority plants prior to land disturbance, once the LDP has been requested to ensure the mitigation hierarchy is applied in to the land disturbance process.
- **Priority Plants:** Species of Conservation Importance that are:
 - Listed on the National Red List as CR or EN;
 - Listed in the Red Book as Rare or Very Rare and are genuinely rare following an OT data review;
 - Listed as Rare/Very Rare under legislation and are genuinely rare following an OT
- **Gravelly hill:** an area that is covered with no vegetation and the soil is bare rock. These areas occur frequently in Gobi.
- **Biological rehabilitation:** Rehabilitation of disturbed land with native plant species to achieve a return of a condition that is closest to pre-disturbance condition.
- **Control site:** An area that is undisturbed and unaffected by an activity. Therefore it can serve as a benchmark to assess the state of an area that has been disturbed or affected by an activity. Also known as reference site/area.
- **Woody plant species:** A woody plant is a plant that produces wood as its structural tissue. Woody plants are usually either trees, shrubs and lianas. The woody plant species that are common in the Gobi are: tree species: *Haloxylon ammodendron*, *Ulmus pumila*, and big shrub species: *Tamarix ramosissima*, *Salix ledebouriana*, *Amygdalus pedunculata*; shrub species: *Eurota ceratoides*, *Reamuria soongorica*, *Salsola passerine*, *Salsola laricifolia* etc.,
- **Native Plant Propagation Center (NPPC):** NPPC located at Khanbogd soum to perform the cultivation of seedlings, seed collection, taking care of the propagation of plants that are used for biological rehabilitation.

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6 REFERENCES AND RELATED DOCUMENTS

Legal documents:

1. Guideline for mining rehabilitation (resolution N138 of Ministry of Environment and Green Development, Date: 2015.03.30)
2. MNS 2429:2009, below forms must be filled and maintained consistently for further recording:
3. MNS 5915:2008. Environment. Classification of land destroyed due to mining activities
4. The Minister of Environment, Green Development and Tourism of Mongolia's approved guideline A-138 of March 30th 2015 for Technical and Biological Reclamation of land that is impacted by mining activities.
5. Ministry of Nature, Environment and Tourism of Mongolia, Eco-Sfera LLC, S.E.C LLC and etc., *Mine Land Reclamation Guide*. Ulaanbaatar, Mongolia, 2010
6. Pre-disturbance Vegetation survey and fill out records.
7. OT Annual Rehabilitation Record

Procedures:

1. OT Biological rehabilitation completion criteria,
2. Land Disturbance Permit procedure (OT-10-E14-PRC-0003-E)
3. OT Topsoil handling procedure (OT-10-E14-PRC-0001-E)
4. OT Soil sampling procedure
5. SWP for Vegetation monitoring (OT-0244-SWPO-0008)
6. Priority Plant Protection Procedure (OT-10-E14-PRC-0007-E)
7. SWP for Seed collection, storage, planting and seedling transplantation (OT-0244-00-SWPO-0009)
8. Drafted SWP for "Cutting preparation and cultivating"
9. Drafted procedure for "Hydroseeder operation and maintenance"

Forms and Records:

1. OT Vegetation Clearance Record
2. Topsoil Registration Record
3. Daily work record of Native Plant Propagation center (EN-10-E14-FRM-00013-D)
4. Pre-disturbance assessment for vegetation community (OT-10-E14-FRM-0009-D)
5. Land assessment for rehabilitation
6. Seed passport

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7. Seed address
8. Act for seed sampling
9. Hydroseeder checklist form
10. Registration of Bio-Rehabilitation progress (EN-10-E14-FRM-0014-D)
11. Plot Metadata Form for Monitoring
12. Basal Gap Intercept with Height Data Form
13. Line Point Intercept Data Form
14. Belt Transect Data Form
15. Plant Species Richness Data Form
16. Plant Production Data Form
17. Woody plant morphology study (OT-10-E14-FRM-0012-D)
18. Soil Stability test

7 DOCUMENT CONTROL

File Name	Biological Rehabilitation procedure
Description	To provide guidance on steps for the biological rehabilitation of the lands that are owned, leased, managed or indirectly impacted by Oyu Tolgoi LLC through all phases of the project life cycle that needs to be doing a biological rehabilitation.
Original Author(s)	Altantsetseg Balt, Uuganbayar Buyantogtokh
Creation Date	25 June, 2015
Approved By	Dennis Hosack
Approval Date	13 July, 2015
Change Number	Record ##

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Moderate	2016.02.29	Dennis Hosack	2 yearly	2018.02.28

Version	Revision Date	Author(s)	Approved By	Revision Notes
1.0	2015.07.13	Altantsetseg Balt and Uuganbayar Buyantogtokh	Dennis Hosack	Approved
1.1	2016.02.29	Altantsetseg Balt, Anudari Ganbaatar	Dennis Hosack	Updated