

SECTION B: BASELINE ASSESSMENT

CHAPTER B7a: BIODIVERSITY

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7 BIODIVERSITY

7.1 INTRODUCTION

7.1.1 Scope

This chapter of the ESIA describes the legislative and policy framework for biodiversity conservation in Mongolia, the flora and fauna of the Oyu Tolgoi Project Area of Influence (“Aol”), and the protected and designated areas in or near the Oyu Tolgoi Aol. In addition, this chapter also evaluates the criteria for the designation of Critical Habitat in accordance with the International Finance Corporation’s (IFC) 2006 version of Performance Standard 6 (PS6) and the European Bank for Reconstruction and Development’s Performance Requirement 6 (PR6). For the purposes of this chapter, the Oyu Tolgoi Aol includes the Khanbogd and Manlai *soums* of the Omnogovi *aimag*. The conclusions are aligned with those of the Rapid Biodiversity Assessment (RBA) team, provided in the Annexes of this Chapter and *Chapter C6: Biodiversity and Ecosystems Services Impact Assessment*; see Box 1. Some methods and results remain somewhat divergent from those of the RBA, for which see the relevant Annexes.

7.1.2 Goals and Objectives

The goal of this chapter is to provide description of the biodiversity features of the Oyu Tolgoi Aol such that key biodiversity features requiring special consideration can be identified for the purposes of later impact assessment and the identification and design of mitigations that will protect these key biodiversity features. Also, the chapter is designed to facilitate evaluation of Project compliance with the applicable provisions of Lender requirements on biodiversity, i.e., the IFC’s 2006 version of PS6 and the EBRD’s PR6 (see Section 7.2.5), particularly in regards to the designation of Critical Habitat.

7.1.3 Biodiversity Regulation and Protection in Mongolia

International Standards

The 2006 version of IFC Performance Standard 6 (“PS 6”) addresses Biodiversity and Sustainable Natural Resource Management issues (*Chapter A2*, Section 2.8.2). The requirements set out in PS 6 include an assessment of the significance of project impacts on all levels of biodiversity as an integral part of the social and environmental assessment process, with a focus on major threats to biodiversity including habitat destruction and invasive alien species.

EBRD Performance Requirement 6 (“PR 6”) addresses biodiversity and has as its objective: the avoidance, minimisation and mitigation of impacts on biodiversity and the offsetting of significant residual impacts, where appropriate, with the aim of achieving no net loss or net gain of biodiversity (*Chapter A2*, Section 2.8.3).

International Conventions & Treaties

Mongolia is a signatory to several multilateral environmental agreements and protocols related to the protection of biodiversity. These are summarised below:

- *The Convention on the Conservation of Migratory Species of Wild Animals (‘CMS’)*: This Convention aims to conserve terrestrial, marine and avian migratory species throughout their range. Under the framework of the CMS, a number of agreements and memoranda of understanding (‘MoUs’) have been entered into, focussing on specific endangered species. Mongolia has ratified the CMS and is signatory to the MoU concerning the Conservation of Migratory Birds of Prey in Africa and Eurasia (in force 1 November 2008) with the objective of achieving the favourable conservation status of migratory birds of prey with reference to their range, population dynamics and habitat;
- *Convention on Wetlands of International Importance especially as Waterfowl Habitat (Ramsar Convention 1971 Ratified 1998)*: the Convention on Wetlands provides a framework for national action and international co-operation for the conservation of wetlands of international importance and the sustainable use of all wetlands;

- *Convention on International Trade in Endangered Species (March 1973)*: this Convention aims to ensure that international trade in specimens of wild animals and plants does not threaten their survival;
- *Bern Convention*: The Bern Convention on the Conservation of European Wildlife and Natural Habitats 1979, also known as the Bern Convention (or Berne Convention), came into force on June 1, 1982;
- *International Convention to Combat Desertification (June 1994)*: the objective of this Convention is to combat desertification and mitigate the effects of drought in countries experiencing serious drought and/or desertification through effective action at all levels and supported by international cooperation; and
- *Convention on Biological Diversity (June 1992)*: the Convention on Biological Diversity focuses on promoting sustainable development and establishes three main goals: the conservation of biological diversity, the sustainable use of its components, and the fair and equitable sharing of the benefits from the use of genetic resources.

Mongolian Laws for the Protection of Flora and Forests

The following laws and regulations govern the protection of flora in Mongolia.

Law on Natural Plants, 1995

The purpose of this law is to regulate the proper use, protection and restoration of natural plants other than forests. The law requires the implementation of measures for plant protection from fire, disease, harmful predators and humans. Citizens, corporations and other land users are also required to implement such measures at their own expense on the land they occupy. The use of chemicals for plant protection measures is prohibited, except where specifically permitted by central government. The possession of land containing 'very rare plants' by citizens, corporations and others for any purpose is prohibited, except for the activities of plant protection. Very rare plants are defined in the Natural Plants legislation, which includes plants in danger of extinction, those with restricted distribution, or no natural reserves or no natural restorative capacity. These categories are not based on IUCN assessment criteria.

There is a corresponding law on *Natural Plant Use Fees* which sets fees for the use of very rare, rare and abundant plants. Fees are payable to the *soum* and district upon the issuance of a licence.

Law on Fire Protection for Forests and Grassland, 1996

The purpose of this law is to set out procedures and responsibilities in connection with fire prevention and fire-fighting in forest and grassland areas. Business entities have the following responsibilities under this legislation:

- To protect themselves and their environs from fire and to fight fires;
- If a fire occurs, to take action to extinguish the fire using its own personnel and vehicles and report the fire to the governor of the *soum* and district; and
- Comply with regulations on the use, storage and transportation of flammable substances.

Law on Forestry, 2007

The purpose of this law is to address the protection, possession, sustainable use, restoration and reproduction of forests in Mongolia. Among other things, this legislation prohibits the cutting and utilisation of cedar, spruce and elm without permission from the Central Government Authority.

Mongolian Laws for the Protection of Fauna

Mongolian legislation on fauna consists of the *Constitution of Mongolia (1992)*, the *Environmental Protection Law (1995)*, *Law on Fauna (2000)* and other legislative acts issued in compliance with these instruments. The hunting and trapping of fauna is regulated by the *Law on Hunting (2000)*. Under Mongolian law, if an international treaty to which Mongolia is a party is inconsistent with these laws, the provisions of the international treaty shall prevail. Accordingly, the provisions of international treaties need to be considered so far as they relate to the Oyu Tolgoi Project. A summary of the key wildlife laws is provided below.

Law on Fauna, 5 May 2000

The purpose of this Law is to regulate the protection and breeding of terrestrial and aquatic fauna. This law includes provisions addressing limits on fauna use; the recording of rare and endangered species listed in the IUCN Red List of Threatened Species¹; the protection of natural habitats and migration routes; and the establishment of game reserves and regulations for their use.

The Law on Fauna defines "Extremely rare animals" as wildlife species that have a restricted capacity to recover; a limited distribution; no usable reserves, and are in danger of extinction. "Rare animals" are fauna which have a limited capacity to recover, limited distribution, have a small population, and are potentially in danger of extinction. These categorizations are not based on IUCN assessment criteria.

Law on Hunting, 5 May 2000

The purpose of this law is to regulate the hunting and trapping of game animals and the proper use of hunting reserves. Hunting management refers to activities to develop the proper use, conservation and breeding of a territory's animal reserve by gaining a better understanding of their distribution and numbers. Hunting management reports and evaluations form the basis for conservation, breeding and the proper use of game animal reserves. Hunting management is carried out by a Certified Professional Organisation authorised by the State Administrative Central Organisation in charge of environment affairs. The law on hunting sets out hunting and trapping payments and fees; hunting and trapping limits and methods; authorised hunting seasons; establishes liability for infringements and rewards for information provided by citizens.

Aimag and Capital City Citizens' Representative Assemblies have the rights to define and implement measures and budgets for the protection of extremely rare and rare animals within their territory. Such rights include the coordination and implementation of legislation and resolutions related to the protection of fauna including the implementation of environmental programmes.

Soum and District Citizens' Representative Assemblies and Governors also have the right to define and implement measures and budgets for the protection of extremely rare and rare animals within their territory.

Extremely rare animals are protected through the implementation of Mongolia's Environmental Impact Assessment laws and the prohibition on hunting and trapping, except for scientific purposes and under licence from central government. A variety of additional measures are available for the protection of fauna in Mongolia:

- Listing extremely rare and rare fauna in the international and Mongolian "Red Books"¹;
- Protecting the territory of fauna and ensuring that their migration routes are clear;
- Establishing game reserves and regulating their use;
- Reintroducing fauna to its indigenous habitat;
- Protecting fauna from threats by industrial and economic activities;
- Taking biotechnical measures; and
- Assisting fauna that are threatened by disease, natural disaster or other dangers.

Companies occupying land under contract are responsible for implementing measures to protect fauna from industrial activities, natural disaster and other dangers and for taking 'biotechnical measures' for nature conservation.

Mongolian Legal Framework for Protected Areas

Mongolian legislation on Protected Areas is well established and includes clear definitions on permitted activities within the Protected Areas and their buffer zones. The following laws and regulations govern protected areas in Mongolia.

¹ The Mongolia Red Book (1997) was not based on IUCN assessment criteria. Subsequent Mongolian Red Lists based on IUCN criteria were published in 2006 for fish, reptiles and amphibians, and mammals. The Mongolian Red Lists for birds and medicinal plants are nearing completion.

Law on Special Protected Areas (1995)

Entered into force on 1 April 1995, this Law regulates the designation, management and use of land falling within Special Protected Areas. Special Protected Areas fall into the following four categories: 'strictly protected areas'; 'national parks', 'nature reserves' and 'historic monuments'. All of these Protected Areas are the responsibility of the national Ministry of Nature and Environment; these categories are described in more detail below:

- **Strictly Protected Areas (SPAs)** – Applied to ecologically-important, pristine wilderness areas with particular importance for science and human civilization, including:
 - Pristine Zones: research only;
 - Protected Zones: research and conservation measures;
 - Limited Use Zones: tourism, traditional religious activities, and some plant gathering permitted. Hunting, logging and construction are prohibited; and
 - Buffer Zones (dealt with under separate legislation).
- **National Parks** – Applied to wilderness areas with historical, cultural, or environmental education value, divided into:
 - Core Areas: research and conservation activities;
 - Ecotourism Zone: tourism, fishing, and activities listed above are allowed; and
 - Limited Use Zone: above activities, in addition to grazing, and limited construction allowed with park permission.
- **Nature Reserves** – Four types:
 - Ecosystem - protecting natural areas;
 - Biological - conserving rare species;
 - Paleontological - conserving fossil areas; and
 - Geological - geographical importance.
- **Historical Monuments:**
 - Natural features within the landscape; and
 - Buildings and other manmade structures.

The *Law on Special Protected Areas (1995)* placed limitations on the types of activities which can be undertaken within the different zones of a Strictly Protected Area (SPA). These limitations are described below². In addition, Article 5.3 of the Law provides for State border related activities to be approved through the applicable border protection agency where Strictly Protected Areas overlap a border zone, as it does for the Gashuun Sukhait border crossing and the section of road to the border through the protected area. The border related activities associated with the Project's export of concentrate and import of goods are controlled and approved through Article 5.3 rather than through the land use zone restrictions discussed below.

- **Pristine Zone**

Activities within the 'pristine zone' of an SPA are limited to protection measures required to maintain the integrity of the SPA. This may include research and observation works but restricted to those which will not disturb the habitat. The Oyu Tolgoi road will not pass through this zone.

- **Protected Zone**

Only limited activities and measures required to restore habitat damaged by natural disasters or other occurrences which may have damaged the environment. The Oyu Tolgoi Project will not pass through this zone.

² Law of Mongolia on Special Protected Areas November 15, 1994, Chapter One, General Provisions.

▪ **Limited Use Zone**

Restricted to activities within the pristine and protected zones (as discussed above), restoration of soil and plant cover, forestry maintenance and recovery, activities regulating the census of animals, their number, age, gender and herd composition according to approved schedules and methodologies; utilisation of hot and cold mineral water as well as other medical minerals; organisation of nature-based tours and tourism under specific itinerary and directions according to established procedures; development of any established accommodation dwellings designed for tourists or other permitted persons for temporary stay, observation or studies; taking photos and audio or video records and their use for writing and producing; worship of mountains and hills, holding other traditional and customary ceremonies (intangible cultural heritage), harvesting and use by local residents natural secondary resources, medicinal or food plants. Other economic activities are not permitted. The Oyu Tolgoi Project (i.e. the Oyu Tolgoi to Gashuun Sukhait Road) will pass through this zone for 13 km.

▪ **Buffer Zone**

Law on Buffer Zones (1997)

Entered into force 23 October 1997 – this law addresses the regulation of Buffer Zones which are established around Strictly Protected Areas and National Parks and may also be established around Nature Reserves and National Monuments. The *Law on Buffer Zones (1997)* defines Buffer Zones as;

‘those areas established to minimise, eliminate and prevent actual and potential adverse impacts to Strictly Protected Areas and National Parks, to increase public participation, to secure their livelihood and to establish requirements for the proper use of natural resources’³.

Whilst economic activity is not prevented in the Buffer Zone of a Mongolian protected area, permitted activities are limited and organisations and economic entities which conduct commercial logging, hunting, establishment of hunters’ camps, exploration and mining of minerals, establishment of water reservoirs, construct floodwalls or dams shall, pursuant to law, be subject to a Detailed Environmental Impact Assessment.

The upgraded and realigned Oyu Tolgoi to Gashuun Sukhait road will pass through the Buffer Zone of the Small Gobi Strictly Protected Area (“SGSPA”) for 32 km and as such is subject to the provisions of the *Law on Buffer Zones (1997)*. The process followed by Oyu Tolgoi to obtain the necessary approvals for the alignment of the Oyu Tolgoi to Gashuun Sukhait Road through the SGSPA is briefly described below.

Permitting of the Oyu Tolgoi to Gashuun Sukhait Road within the limited use zone and buffer zones of the SGSPA

The Oyu Tolgoi to Gashuun Sukhait (“Oyu Tolgoi to Gashuun Sukhait”) road was approved by the national authorities after the preparation and review of two Environmental Impact Assessments:

<p>Oyu Tolgoi Project EIA Volume I: Transport and Infrastructure Corridor⁴ from Oyu Tolgoi to Gashuun Sukhait</p>	<p>EIA of the original road and power line proposal from Gashuun Sukhait (GS) to Oyu Tolgoi via the western, or current coal, route.</p> <p>Provides approval for access through the South Gobi Strictly Protected Area (SGSPA) and the buffer zone.</p> <p>Approval was provided by the Ministry for Nature, Environment and Tourism and endorsed by the Protected Area Authority and Border Protection Authority</p>	<p>Submitted April 2004</p>	<p>Approved May 2004</p>
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³ Law of Mongolia on Buffer Zones, October 23, 1997, Chapter One, General Provisions.

⁴ Infrastructure Corridor refers to the zone of land that contains both the road and the power transmission line between the Mongolian-Chinese border and Oyu Tolgoi.

Supplementary EIA Volume I: for Route Changes to the Oyu Tolgoi to Gashuun Sukhait Transport Corridor	Assessment of the revised Eastern route to GS and includes an assessment of existing environmental damage caused to the western route from coal traffic. Approval was provided by the Ministry for Nature, Environment and Tourism and endorsed by the Protected Area Authority and Border Protection Authority	Submitted December 2006	Approved March 2007
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An Agreement between Oyu Tolgoi and the Ministry of Road, Transportation, Construction and Urban Development was signed by both parties on 12th November 2010. This agreement approves the Feasibility Study for the road including the road sections that traverse the SGSPA Buffer Zone and Limited Use Zones, and lays down the future requirements for the contractor tendering process⁵. The agreement does not include any specific conditions related to environment, health and safety. Once the contractor is appointed, Oyu Tolgoi can apply to the Governor of Omnogovi *aimag* to release a Reference Letter regarding the land ownership for Oyu Tolgoi to Gashuun Sukhait state road construction.

7.2 METHODOLOGY

The baseline information presented in this chapter includes information collected by the Oyu Tolgoi Project's Detailed Environmental Impact Assessments (DEIAs) submitted to the national authorities, field studies carried out by Oyu Tolgoi personnel and consultants, literature review, field surveys and consultation with experts undertaken in 2011 as part of the Rapid Biodiversity Assessment ("RBA", performed by Fauna & Flora International, The Biodiversity Consultancy, and Mongolian specialists), and reviews of the available literature. Specific methodologies for the DEIA field studies and the RBA are summarised below. An overview of the Rapid Biodiversity Assessment program and how it relates to development of the ESIA biodiversity baseline and impact assessment chapters is presented in Box 1.

An important input to this baseline is the "Oyu Tolgoi Project Critical Habitat Assessment: IFC Performance Standard 6/EBRD Performance Requirement 6" ("Technical Report") prepared by The Biodiversity Consultancy and Fauna & Flora International ("TBC/FFI"). In addition, field survey reports undertaken as part of the RBA program by collaborating national experts have been included as source documents.

⁵ Agreement between Oyu Tolgoi and Ministry of Road, Transportation, Construction and Urban Development, 12th November 2010.

Box 1: The Rapid Biodiversity Assessment (RBA): an overview

Oyu Tolgoi contracted Fauna & Flora International to deliver products that would achieve compliance with the IFC PS6 and EBRD PR6 biodiversity performance standards in accordance with the IFC PS6 Guidance Document for Oyu Tolgoi (IFC 2009). This was achieved using the specialist experience of The Biodiversity Consultancy and a large, experienced team of local and international experts from the Wildlife Conservation Society, the Wildlife Science and Conservation Centre in the Ornithology Laboratory of the Institute of Biology (Mongolian Academy of Sciences), WWF Mongolia, National University and elsewhere.

As part of the RBA work, FFI commissioned a number of field studies to contribute to the biodiversity knowledge underpinning the compliance documents. Time constraints meant that broad surveys of birds, vegetation, large mammals etc were discounted as being impractical, and instead rather more focused studies were conducted by top specialists. The possibility of aerial surveys of large mammals was pursued but it was not possible to conduct a safety audit of available aircraft in the time available. Thus the topics chosen for detailed field study were:

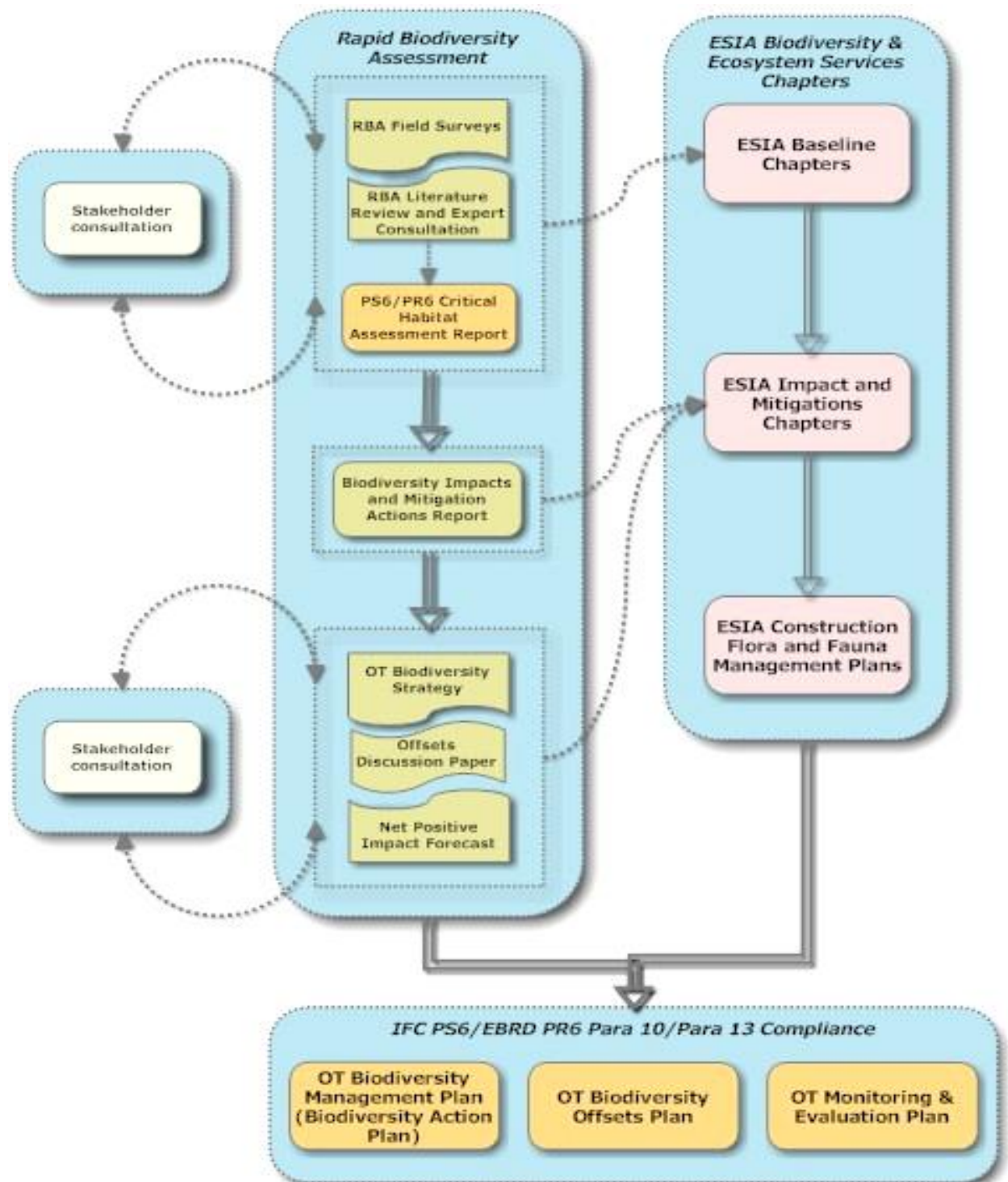
- small mammals (of which certain threatened species were conceivably present in the Aol);
- saxaul (*Haloxylon ammodendron*) forest and elm tree (*Ulmus pumila*) dynamics;
- medicinal plants distribution and use;
- rangeland quality; and
- Houbara bustards (*Chlamydotis undulata*) along the transmission line route.

Reports on the above were integrated into the main outputs of the RBA which were completed between July and September 2011. These outputs were:

- Oyu Tolgoi Biodiversity Strategy' (Annex A, *Chapter C6: Biodiversity and Ecosystems Services Impact Assessment*);
- 'PS6 / PR6 Critical Habitat Report for the Oyu Tolgoi Project (Annex C)';
- 'Biodiversity Impacts and Mitigation Actions for the Oyu Tolgoi project (Annex B, *Chapter C6: Biodiversity and Ecosystems Services Impact Assessment*)';
- 'Biodiversity offsets strategy for the Oyu Tolgoi project (Annex C, *Chapter C6: Biodiversity and Ecosystems Services Impact Assessment*)'; and
- 'Net Positive Impact forecast for the Oyu Tolgoi project' (Annex D, *Chapter C6: Biodiversity and Ecosystems Services Impact Assessment*).

Box 1 (cont): The Rapid Biodiversity Assessment (RBA): an overview

The outputs of the RBA work listed above have been produced so as to inform and be appended within the Oyu Tolgoi project ESIA reports as follows:



As the above diagram indicates, this baseline assessment of biodiversity of the Oyu Tolgoi Project Aol incorporates the results of RBA fieldwork as well as the RBA’s Critical Habitat Assessment of the project Aol. Other outputs of the RBA program will be incorporated in the biodiversity impact assessment chapter of the Oyu Tolgoi project ESIA.

7.2.1 Flora and Vegetation

Data on flora and vegetation in the Oyu Tolgoi Project areas has been sourced from published botanical literature, original EIAs for the various project components and flora and vegetation field reports relating to some specific project infrastructure components (e.g. the Gunii Hooloi water supply borefield and the preferred Oyu Tolgoi to Gashuun Sukhait road route). In addition, a field survey of saxaul and elm populations in Khanbogd *Soum* (Schmidt et al. 2011), undertaken as part of the RBA program, was also incorporated into this baseline chapter. Where possible, sampling methodologies of the various field studies have been described here under the applicable sub-section. Historical sampling data has been supplemented through Oyu Tolgoi's ongoing internal environmental monitoring programme which includes vegetation monitoring of 36 survey plots within the Mine Licence Area. The principal sources of data are listed below:

- The Law on Natural Plants, 1995;
- J. Sanjid, Mongolian Institute of Biology, Vegetation Cover of Oyu Tolgoi and Their Features, July 2003;
- Oyu Tolgoi Project Environmental Impact Assessment, Volume I Report of Oyu Tolgoi to Gashuun Sukhait Road and Infrastructure Corridor, Environmental Protection Plan and Environmental Monitoring Plan, Eco-Trade LLC, 2004;
- Oyu Tolgoi Project, Supplementary Environmental Impact Assessment Report for the Vertical Shafter #2 in Oyu Tolgoi Hugo North Deposit, Eco Trade LLC, Ulaanbaatar 2005;
- Oyu Tolgoi Project Groundwater Resource Use from the Gunii Hooloi and Galbyn Gobi Regional Aquifers, Eco-Trade LLC, 2005;
- Oyu Tolgoi Project Environmental Impact Assessment Volume III Mine and Processing, Eco-Trade LLC, UB 2006;
- Environmental and Social Impact Assessment: UHG Phase II, Energy Resources LLC, ERM and Sustainability, 2009;
- Oyu Tolgoi Project Social, Economic and Environmental Subset, Centre for Policy Research, Population Training and Research Centre, 2009;
- Oyu Tolgoi Annual Environmental Report for 2009;
- von Wehrden, H, K. Wesche & G. Miede. 2009. Plant communities of the southern Mongolian Gobi. *Phytocoenologia* 39(3): 331-376;
- Amendment to the DEIA Report 2005 on the extraction of Gunii Hooloi groundwater resource for Oyu Tolgoi Project. JEMR Consulting LLC, 2010;
- Environmental Impact Assessment Report for the Permanent Airport, February 2011; and
- Schmidt, S., Baasandamba, E., Khaulenbek, A., & Bug, D. Saxaul and Elm Assessment, Khanbogd *Soum*, for Oyu Tolgoi Critical Habitat Analysis IFC (International Finance Corporation) – Performance Standard 6. New Zealand Nature Institute – Initiative for People Centered Conservation, August 2011.

Mine Licence Area

Vegetation within the Mine Licence Area was surveyed by Eco Trade (2006) using 10 m x 10 m (100 m²) plots located so as to capture different ecological conditions and vegetation communities. Smaller, 1m² plots were nested within the 100m² plots, and were used to record a variety of vegetation parameters (species composition, abundance, density and conservation status) in order to aid classification of the vegetation units. Plant samples taken during the survey were compared with the key references on Mongolian flora together with the Mongolian Red Book (1997) List of Plants and Mongolian Law on Natural Plants (1995) in order to identify an rare, very rare or otherwise conservation significant taxa.

A targeted rare plant survey of the Mine Licence Area was conducted in August 2005 (Eco Trade, 2006). This survey identified the exact location of observed Rare and Very Rare plants and the proposed protection measures for identified plant populations (see *Table 6.3* of Chapter 6 of the Mine and Processing EIA).

Vegetation mapping across the Mine Licence Area was completed using the results of field surveys described above, line surveys and interpretation of high definition satellite imagery. Vegetation units were described based on the dominant species observed and the resulting vegetation map is provided in *Figure 7.6*. The vegetation communities identified within the Mine Licence Area are summarised in Section 7.3.5 below.

It is noted that the Oyu Tolgoi Mine Licence Area has been subjected to substantial mineral exploration activities, including surface sampling, drilling, and associated construction of roads and camps, prior to the completion of vegetation surveys. Localised disturbance of vegetation has occurred where mineral exploration activity is concentrated and as such, the establishment of a representative baseline of vegetation condition is limited for the Licence Area.

Borefield and Pipeline Area

A vegetation survey of the Gunii Hooloi area was completed by botanist J.Sanjid in March, 2004 (Eco Trade, 2009). The vegetation survey was undertaken using survey plots of 25 x 25 m and 100 x100 m however the number of each plot surveyed within the study area was not reported. Within survey plots the cover and abundance of plant species was recorded. Vegetation units within the study area were identified and mapped based on the dominant plant species present as well as the landform on which the vegetation occurred. The rooting depth of dominant plant species was also recorded in an attempt to infer the groundwater dependency of the various vegetation units.

A second vegetation survey of the Gunii Hooloi area was performed in 2008, the results of which are presented in JEMR (2010). The JEMR (2010) survey mapped vegetation units encountered within the study area based on dominant plant species and broad landform types. The results of the vegetation mapping are presented in Section 7.3.3 below.

Road and Transmission Line (Infrastructure Corridor)

A flora and vegetation field survey of the (then) proposed Oyu Tolgoi to Gashuun Sukhait road route was conducted in May 2006 (Eco Trade 2006). Vegetation cover, biomass and species composition were recorded in 10 x 10 m plots located near the sites of proposed borrow pits or where different vegetation communities were encountered. The number and location of field survey plots was not recorded.

A second flora and vegetation field survey of the infrastructure corridor was conducted in October 2010 (Eco Trade 2010). Field survey data was collected on species distribution and abundance, and the location of rare, endangered, endemic and relict plants from 6 10 x 10m plots along the infrastructure corridor. Vegetation plots were positioned within the various vegetation units and landforms observed within the Project area.

Eco Trade (2010) mapped the broad vegetation units encountered within the road and transmission line infrastructure corridor. As with the borefield and pipeline area, the vegetation units were described based on the dominant plant species of the vegetation and broad landform on which the vegetation was observed.

Airport Area

A flora and vegetation survey of the proposed new, permanent airport location was undertaken in 2010 (OSMT 2011). The plant species composition, dominant species, soil surface, and vegetation condition were described within 25 x 25m survey plots positioned within the study area however the number of survey plots used during the vegetation survey was not recorded. OSMT (2011) mapped the vegetation of the permanent airport study area. Vegetation units were defined on the basis of the dominant plant species and broad landform type on which the vegetation occurred.

7.2.2 Fauna

Baseline fauna data for the Project AoI has been obtained from a number of sources including the original EIAs for the various Project components. Additional data on the presence of fauna species within the Project AoI was sourced from Oyu Tolgoi's fauna monitoring programme initiated in August 2010. A review of published technical studies on specific conservation significant species of the South Gobi was also undertaken. Specific species included the houbara bustard (*Chlamydotis undulates*), saker falcon (*Falco cherrug*) and Asiatic wild ass (*Equus hemionus*) (referred to 'khulan' in Mongolia). The RBA program included a small mammal survey of the Khanbogd *soum*, the results of which have also been incorporated in this baseline chapter.

A list of the principal secondary reference sources is provided below:

- Oyu Tolgoi Project Environmental Impact Assessment, Volume I Report of Oyu Tolgoi to Gashuun Sukhait Road and Infrastructure Corridor, Environmental Protection Plan and Environmental Monitoring Plan, Eco-Trade LLC, 2004;
- Oyu Tolgoi Project Environmental Impact Assessment Volume II, Groundwater Resource Use from the Gunii Hooloi and Galbyn Gobi Regional Aquifers, Eco-Trade LLC, 2005;
- Clark, E. L., Munkhbat, J., Dulamtseren, S., Baillie, J. E. M., Batsaikhan, N., King, S. R. B., Samiya, R. and Stubbe, M. (compilers and editors) (2006). Summary Conservation Action Plans for Mongolian Mammals. Regional Red List Series Vol. 2. Zoological Society of London, London;
- Kaczensky P., D.P. Sheehy, C. Walzer, D.E. Johnson, D. Lhkagvasuren and C.M. Sheehy. 2006. Room to Roam? The Threat to Khulan (Wild Ass) from Human Intrusion. Mongolia Discussion Papers, East Asia and Pacific Environment and Social Development Department. Washington, D.C.: World Bank (September 2006);
- Oyu Tolgoi Project Environmental Impact Assessment Volume III Mine and Processing, Eco-Trade LLC, UB 2006;
- Environmental Impact Assessment Report for Oyu Tolgoi Project Domestic Airport Relocation, Eco Trade LLC. 2007;
- Environmental and Social Impact Assessment: UHG Phase II, Energy Resources LLC, ERM and Sustainability, 2009;
- Oyu Tolgoi Project Social, Economic and Environmental Subset, Centre for Policy Research, Population Training and Research Centre, 2009;
- Oyu Tolgoi Annual Environmental Report for 2009;
- Draft Terms of Reference dated 6th July 2010 - Development of Fauna Monitoring and Conservation Programs for the Small Gobi Strictly Protected Areas (SPA) & Adjoining Territories;
- Oyu Tolgoi Project DEIA Vol II GH Water Supply Amendment, 2010. Amendment to the DEIA Report 2005 on the extraction of Gunii Hooloi groundwater resource for Oyu Tolgoi Project. JEMR Consulting LLC, 2010;
- Walton. T. 2010. Southern Gobi Regional Environmental Assessment. Mongolia Discussion Papers, East Asia and Pacific Sustainable Development Department. Washington, D.C.: World Bank;
- Batbayar, N., Batsukh, B. Stacey, J. & A. Bräunlich. Key endangered species in Galba Gobi: status and provisional impact assessments of regional development scenarios. Ulaanbaatar: The World Bank and BirdLife International. February 2011;
- Environmental Impact Assessment Report for the Permanent Airport, February 2011;
- Batsaikhan, N., Battulga, S., Darmaa, D. 2011. Small Mammals Diversity in Oyu Tolgoi area and Small Gobi "A" and "B" SPA [First Survey Report]. Ulaanbaatar;
- Kaczensky P., D.P., Sheehy, C. Walzer, D.E. Johnson, D. Lhkagvasuren and C.M. Sheehy. 2006. Room to Roam? The Threat to Khulan (Wild Ass) from Human Intrusion. Mongolia Discussion Papers, East Asia and Pacific Environment and Social Development Department. Washington, D.C.: World Bank;
- Kaczensky, P., Kuehn, R., Lhagvasuren, B., Pietsch. S., Yang, W. & Walzer, C. 2011. Connectivity of the Asiatic wild ass population in the Mongolian Gobi. Biological Conservation 144:920-929;
- Uuganbadrakh.O, Battulga.S, Ganbat.B, 2011. Final report of second survey. Small Mammals Diversity in Oyu Tolgoi area and Small Gobi "A" and "B" SPA. Ulaanbaatar; and
- <http://www.zuil.mn>.

Mine Licence Area

Initial baseline studies of the terrestrial vertebrate fauna of the Oyu Tolgoi Mine Licence Area were conducted in 2002 and repeated in 2003 (Eco-Trade, 2006). Baseline surveys were undertaken over a radius of between 10 and 15 km from the centre of the Mine Licence Area and therefore included the entirety of the Mine Licence Area as well as a significant area beyond the Mine Licence Area.

Eco-Trade (2006) do not record the methodologies used to survey fauna within the Mine Licence Area. It is assumed that timed searches, transects and other quantitative methods were not employed rather incidental sightings of fauna were recorded during day-time random meander traverses throughout the study area. This type of survey is biased towards medium and large mammals, birds and reptiles active during the day and is likely to significantly under-represent fauna groups such as nocturnal reptiles and small mammals (including bats) and aquatic fauna. To maximise the likelihood of observing fauna (of all taxonomic groups), where possible, surveys were undertaken at times when forage was plentiful, springs contained (unfrozen) water and visibility was good. The variety of fauna species within the study area was determined through direct observations of animals as well as through identification of tracks, burrows, skeletons, and other evidence. Patterns of faunal distribution were noted in relation to vegetation, topography and substrate in the study area.

Fauna surveys were supplemented by interviews with local herders and exploration geologists (working on remote drilling locations) to gain a broader appreciation of the presence and number of fauna in the area. This anecdotal evidence was used to complement the field observations and provide information on the movement patterns of key large mammals.

Borefield and Pipeline Area

A number of fauna surveys have been carried out within the Gunii Hooloi area (reported in the Eco-Trade EIAs) and have been supplemented with more recent data captured in 2008 (J. Puntsagdulam, 2008) and provided in the Oyu Tolgoi Project DEIA Vol II GH Water Supply Amendment, 2010. The methodologies employed for the survey not been detailed within any of the current reports (JEMR, 2010.) however they are believed to be the same or similar to those employed within Mine Licence Area and other infrastructure areas.

Road and Transmission Line (Infrastructure Corridor)

Fauna surveys were completed along the Oyu Tolgoi to Gashuun Sukhait road route in 2003 (Eco-Trade, 2004), prior to the coal road development. The methodology used in these studies are not presented within the survey reports; however based on discussions with Oyu Tolgoi staff, it is understood that the methodology was the same or similar to that employed for the Mine Licence Area. The study area included the whole transport corridor (including the high-voltage power line corridor) covering a significantly larger area than the road corridor itself (e.g. sections of the Galbyn Gobi and SGSPA) so as to maximise the likelihood of observing migratory and nomadic megafauna utilising the area. As with the Mine Licence Area surveys, direct observations of fauna were supplemented with observations of tracks, burrows, skeletons and anecdotal information from herders.

Airport Area

To date there have been no fauna surveys undertaken within the proposed permanent airport footprint. The fauna assemblage of the airport study area has therefore been inferred based on consideration of the habitat types documented to occur within and surrounding the permanent airport footprint. These habitat types are widespread and do not support any unique faunal assemblages.

2011 Small Mammal Surveys

In 2011, as part of the Rapid Biodiversity Assessment, two small mammal surveys were carried out by Mongolian mammal specialists (Batsaikhan *et al.*, 2011; Uuganbadrakh *et al.*, 2011) in the Oyu Tolgoi Aol. The small mammal survey was undertaken within the Khanbogd *soum* of the Omnogovi *Aimag* and included the eastern portion of the South Gobi Special Protected Area A and the western portion of South Gobi Special Protected Area B. The study used a combination of baited pitfall traps and 'Sherman'-type box traps to sample the small mammal fauna at 9 locations. At an additional three locations, small mammals were surveyed using 5 km long line transects which intersected the Oyu Tolgoi to Gashuun Sukhait road and were orientated perpendicular to the road corridor.

7.2.3 Data Limitations

The biological data available for the Project AoI are subject to a number of limitations that are generally inherent to ESIA baselines including:

- Temporal limitations; and
- Spatial limitations:
 - Incomplete spatial coverage of sampling points and transects relative to extent of habitats and ranges of species and movement patterns of nomadic and migratory fauna, extensive scale of the Project footprint and the widely dispersed mosaic of habitat types;
- Taxonomic limitations:
 - Poor collecting, the absence of local museums, limited access to international literature, poor in-country knowledge of some groups such as invertebrate fauna and *Phrynocephalus* lizards, create uncertainty regarding species determinations in the Oyu Tolgoi ESIA and related surveys;
- Observational limitations:
 - Data points for most species are few given the relative paucity of researchers in the region as well as the significant spatio-temporal variability of the distribution and abundance of species in relation to local weather patterns, among other factors; and
 - The distribution and abundance of most plant species are poorly documented, making assessments of the conservation status of these species tentative at best.

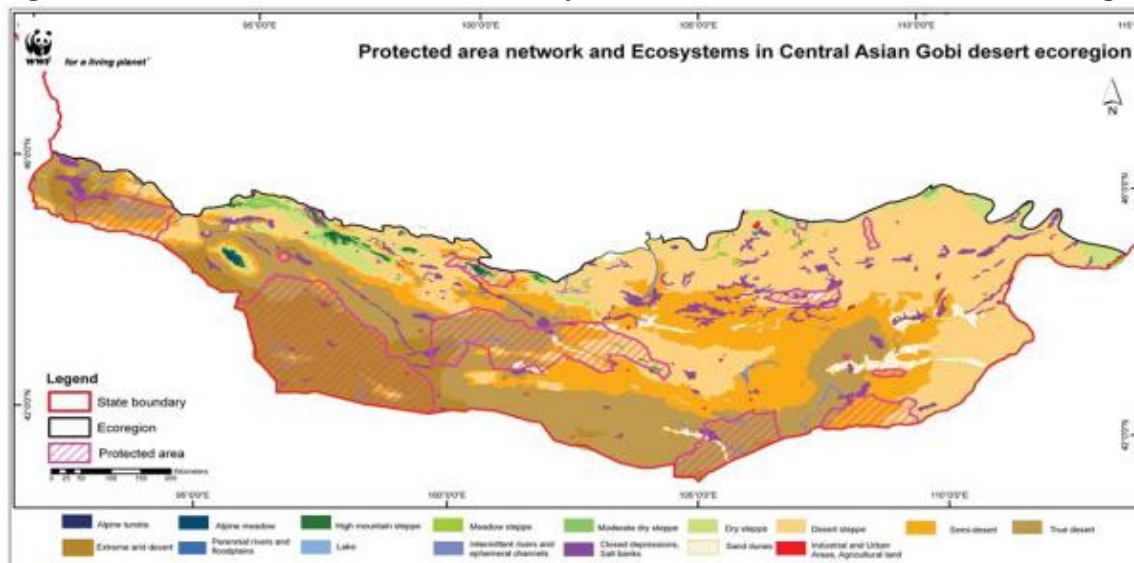
These limitations urge the application of a precautionary approach in the interpretation of the information and the decision making process regarding mitigations. Although there has been limited baseline surveying, and some priority species may remain undetected, the Critical Habitat analysis performed by the RBA was based on maps of predicted distribution which have been developed or are under development for most taxa. National and international expert opinion was also solicited to ascertain inclusion of all plausible priority species. The monitoring and evaluation protocols to be developed in 2012 will also address the need for improved baseline data.

7.3 RESULTS - VEGETATION AND FLORA

7.3.1 Phytogeographic and Ecoregional Setting

In terms of WWF Terrestrial Ecoregions (Olson *et al.*, 2001), the Oyu Tolgoi Licence Area straddles the transition between the Eastern Gobi Desert Steppe (to the NW) and the Alashan Plateau Semi-Desert ecoregions (see Figure 21 of Annex C). According to Chimed-Ochir *et al.*(2010) the Oyu Tolgoi AoI lies in the Eastern Gobi Desert subregion of the Central Asian Gobi Desert ecoregion which covers over half a million square kilometres in southern Mongolia (**Figure 7.1**).

Figure 7.1: Protected area network and Ecosystems in Central Asian Gobi desert ecoregion



Source: Chimed-Ochir et al. (2010)

7.3.2 South Gobi Plant Associations

The vegetation of the Oyu Tolgoi Aol is largely comprised of diverse association of low-statured drought- and cold-tolerant shrubs, perennial grasses and forbs, and annual plants. The plant associations largely reflect patterns of geology, geomorphology, and drainage, which affect soil structure, depth, chemistry, and moisture availability. Trees are absent over much of the landscape, but are locally abundant in areas where substrate conditions allow for greater soil moisture or where shallow groundwater can be tapped. Vegetation cover is generally low and cryptobiotic crusts (composed primarily of cyanobacteria and lichens) are important in maintaining soil organic matter and preventing erosion. The vegetation supports populations of both wild and domestic large herbivores as will be discussed in the fauna section of this Chapter and in *Chapter B7b: Ecosystem Services*.

The flora and vegetation of the South Gobi has been well studied by German botanists and geocologists in recent decades, in particular W. Hilbig, H. von Wehrden, K. Wesche, and their associates. In addition, Mongolian specialists such as J. Sanjid and Oyu Tolgoi biologists have made major contributions through ongoing surveys and monitoring of the Oyu Tolgoi Aol since 2004.

Hilbig & Tungalag (2006) report on a field study of vegetation associations in the South Gobi, which included a route through the Oyu Tolgoi Aol. They identified the associations detailed in Annex A.

Von Wehrden *et al.* (2009) provide the latest synthesis of the plant associations of the southern Mongolian Gobi, based on field studies (1996 through 2005) of more than 1,400 10x10-m plots focused on the protected areas of the region, including the western (“A”) and eastern (“B”) units of the Small Gobi Strict Protected Area (SGSPA). They characterize the flora as “generally poor” (i.e., relative low numbers of species) and with endemics being “few in number.” The greatest diversity in the South Gobi is found in the mountainous areas. These authors identify 28 associations/communities and 18 sub-associations/sub-communities or variants, of which 11 are restricted to mountain areas characterized by higher precipitation than the plains and valleys. The plant associations of the areas outside of the montane areas are listed in Annex A.

None of the plant associations identified by von Wehrden *et al.* (2009) were noted to be of special conservation interest, however the threat to saxaul vegetation posed by unsustainability harvesting for firewood (due to the increased availability of trucks to transport the wood) was identified. H. von Wehrden (cited in the TBC/FFI Technical Report on Critical Habitat), provides the following additional comments regarding the conservation significance of vegetation and habitats within and surrounding the Project Aol:

- “Associations of elm trees within river beds in an arid landscape, such as regularly seen in the unit of analysis, are now largely confined to this area. Their distribution to the west has always

been limited (reaching only to around Gobi Gurvansaikhan), and the distribution to the east and south has now been much reduced by anthropogenic pressures (see Wesche et al. 2011). As such, the unit of analysis represents an extremely important area globally for this habitat type.”

- “Water bodies are an extremely rare feature in the arid south of Mongolia, yet the unit of analysis contains (i) several large and important ephemeral lakes and pools, and (ii) a particularly high abundance of springs (such as those on the Undai River). Little is known of the ephemeral lakes/pools, but they appear confined to particular depressions where surface aquifers are close to the ground surface and where nearby hills encourage drainage into the depressions. This situation mostly occurs in Small Gobi B, but also in Small Gobi A (and less frequently in Galbyn Gobi where there is limited relief). These 'aquifer oases' form in regular locations, but not every year (perhaps every 2-4 years at a guess). Even so, they have distinctly different vegetation communities around them. When they do form, they have been seen to host thousands of migrating waterbirds (shorebirds, cranes, etc.) These oases are thus a very important feature of the unit of analysis and largely unique in a Mongolian context.”
- “...some saxaul forests in the unit of analysis represent extreme and very unusual examples of the habitat type, with exceptionally high (>2 m) and broad trees.”
- “The unit of analysis contains a number of granite outcrops. The unusual edaphic conditions that these provide, in such an arid area, mean that the vegetation on these outcrops is quite distinct. Such outcrops are not widespread in southern Mongolia, and the unit of analysis thus comprises an important area for these habitat assemblages.”

The plant associations identified by the Eco-Trade EIAs and discussed below for the Gunii Hooloi Borefield/Pipeline Area, the Mine Licence Area, and the Infrastructure Corridor are generally consistent with vegetation units identified regionally by Hilbig & Tungalag (2006) and von Wehrden et al. (2009).

Based on the species reported by the various DEIA studies, their subsequent amendments and Oyu Tolgoi monitoring, a list of 211 plant species recorded in the Oyu Tolgoi Aol is presented in Annex B, updated to reflect the current taxonomy followed by the Missouri Botanical Garden Tropicos database, the *Flora of China*, the Virtual Guide to the Flora of Mongolia, and the International Plant Name Index. The flora of the Project Aol is largely typical of semi-arid and arid desert and desert steppe ecosystems with most species rich plant families including Amaranthaceae (including the chenopods), Asteraceae, and Fabaceae.

7.3.3 Gunii Hooloi Borefield and Pipeline Area

The studies of the Gunii Hooloi borefield and pipeline area have resulted in three distinct vegetation classifications. While the names and arrangements of the classifications vary, the species identified are similar.

The surveys by J. Sanjid conducted in 2004 and reported in the *Oyu Tolgoi Project Groundwater Resource Use from the Gunii Hooloi and Galbyn Gobi Region Aquifer* study (Eco-Trade, 2005) identified the following plant communities:

- **Mountain community:** This vegetation unit was found to occupy the low mountains in the east and north of the Gunii Hooloi with elevations between 904-1012 m a.s.l. compared to the valley which is at an average elevation of 877 m a.s.l. The desert mountain vegetation unit included low shrubs such as *Anabasis brevifolia*, *Ajania achilloides*, *Caragana leucophloea*, and *Amygdalus pedunculata* (Figure 7.2). The average vegetation cover was estimated to be 14% with 1.5-2 plants per 1x1m square survey plot.
- **Low mountains, hills and hillocks community:** The hills and low mountains in the western, central and southeastern portions of the Gunii Hooloi are between 30 and 50 m higher than the valley floor and include Ar Tsavchir, Khunkher Zag and Taliin Bor Ovoo. Vegetation present within these habitats was typically low (10 – 20 cm) and sparse with vegetation cover estimated at 15%. The dominant plants on the exposed hills were *Anabasis brevifolia* (Figure 7.3), *Salsola passerina* and *Artemisia xerophytica* and *Sympegma regelii* and *Krascheninnikovia ceratoides* were also recorded as dominant species in some areas.
- **Terrace and plateau community:** Terrace and plateau areas are located on surfaces 30-50 m higher than the surrounding areas. These vegetation types are located at: Ikh and Baga springs,

near Khanbogd; Ukhaa Zag; Bayan Zag; Khongor Shand; Ulaan Ovoo and; Khil Usnii Ovoo. The terraces and plateaux typically support sparse (~10% cover) semi-desert steppe vegetation dominated by *Anabasis brevifolia* with a lower representation of *Cleistogenes songorica*, *Oxytropis aciphylla* and *Stipa gobica*⁶.

- **Semi-desert steppe community:** This vegetation type covered approximately 60% of the Gunii Hooloi area and was represented in the eastern valley of Bultger Khongor Ovoo in the central Gunii Hooloi and in the eastern Baytiin Khudag, Amtgain Toirom, and its surrounding flat desert areas. The semi-desert steppe vegetation was dominated by *Artemisia arenaria*⁷ and *Anabasis brevifolia*. Other common species included *Brachanthemum mongolicum*, *Potania mongolica*, *Salsola passerina*, *Nitraria sibirica*, *Allium mongolicum*, and *Salsola collina*. The semi-desert steppe vegetation included many salt tolerant species and reached just 10-20 cm in height. The sparse vegetation cover (approximately 10% of the ground surface) showed an average density of 190 plants in a 25x25m square plot area.
- **Ravine and dry river bed community:** There are many ravines and wadis with temporary water flow with the largest being Ukhaa Zagiin River, Bayan Zagiin River, Ikh and Baga Spring and Bulag Bayan. These desert riparian environments contained *Iris bungei*, *Achnatherum splendens*, *Stipa glareosa*⁸, *Allium mongolicum*, *Allium polyrhizum* and *Carex duriuscula*. A few elm trees (*Ulmus pumila*) occurred within the wadis at Gunii Hooloi. Plant communities with *Salsola passerina*, *Anabasis brevifolia*, *Reaumuria soongarica* and *Nitraria sibirica* were recorded further back from the ravines. Plant cover was typically sparse (approximately 12% of the ground surface) with between 1.1-1.8 plants in a 1x1m square survey plot.
- **Sand dunes:** Several sand dune systems have been recorded in the central and north-eastern section of the Gunii Hooloi borefield area. The main dunes exist in the Khemgiin, Gunii, Ulaan Ergiin and Khunkher Zagiin dunes and sand dune vegetation communities occupied approximately 20% of the study area. *Agriophyllum squarrosum* and *Thymus* sp. were the dominant species on sand dune soils with occasional *Cleistogenes songorica*. Tamarisk and woody plants occur rarely within the largest sand dunes.

Figure 7.2: *Amygdalus pedunculata*, Oyu Tolgoi Aol, May 2011



⁶ Currently recognised as *Stipa tianschanica* var. *gobica* (Roshev.) P.C. Kuo & Y.H. Sun.

⁷ Currently recognised as *Arenaria tscherneviana* Besser.

⁸ Currently recognised as *Stipa caucasica* subsp. *glareosa* (P.Smirn.) Tzvelev.

Figure 7.3: *Anabasis brevifolia*, a typical sub-shrub of the Oyu Tolgoi Aol



Subsequently, the *Detailed Environmental Impact Assessment Report on the Gunii Hooloi Borefield and Pipeline for Water Supply of the Oyu Tolgoi Project* (Eco-trade, 2009) reported the following geomorphological units and plant associations:

- **Desert steppe peneplain (Vegetation of the plain valley between low knolls and hills)** – Dominants include *Anabasis brevifolia*, *Reaumuria soongarica*, *Salsola passerina* and *Nitraria sibirica*. The major plant associations are:
 - *Salsola passerina* – *Nitraria sibirica*; and
 - *Anabasis brevifolia* – *Salsola passerina*.
- **Desert peneplain** – Dominants include *Sympegma regelii*, *Anabasis brevifolia*, *Salsola passerina*, *Reaumuria soongarica*, *Potaninia mongolica*, and *Zygophyllum xanthoxylon*. The major plant associations are:
 - *Reaumuria soongarica* sub-association;
 - *Stipa* – *Anabasis brevifolia* association; and
 - *Potaninia mongolica* – *Nitraria sibirica* association.
- **Low hills** – Dominant species include *Amygdalus pedunculata*, *A. mongolica*, *Zygophyllum xanthoxylon*, *Anabasis brevifolia*, *Salsola laricifolia*, *S. passerina*, *S. arbuscula*, *Reaumuria soongarica*, *Sympegma regelii*, *Ptilagrostis pelliottii* and *Ephedra przewalskii*.
- **Ephemeral river beds and saline marshes** – Halophytic and hygrophytic plants are dominant and include *Achnatherum splendens*, *Kalidium foliatum*, *K.gracile*, *Reaumuria soongarica* and *Nitraria sibirica* dominate here. Siberian elm (*Ulmus pumila*) grows along dry river beds and ravines.
- **Vegetation of the depression and valley with depositional sands (Saxaul groves)** – *Haloxylon ammodendron*, *Nitraria sibirica* and *Zygophyllum xanthoxylon* are dominant in this unit.

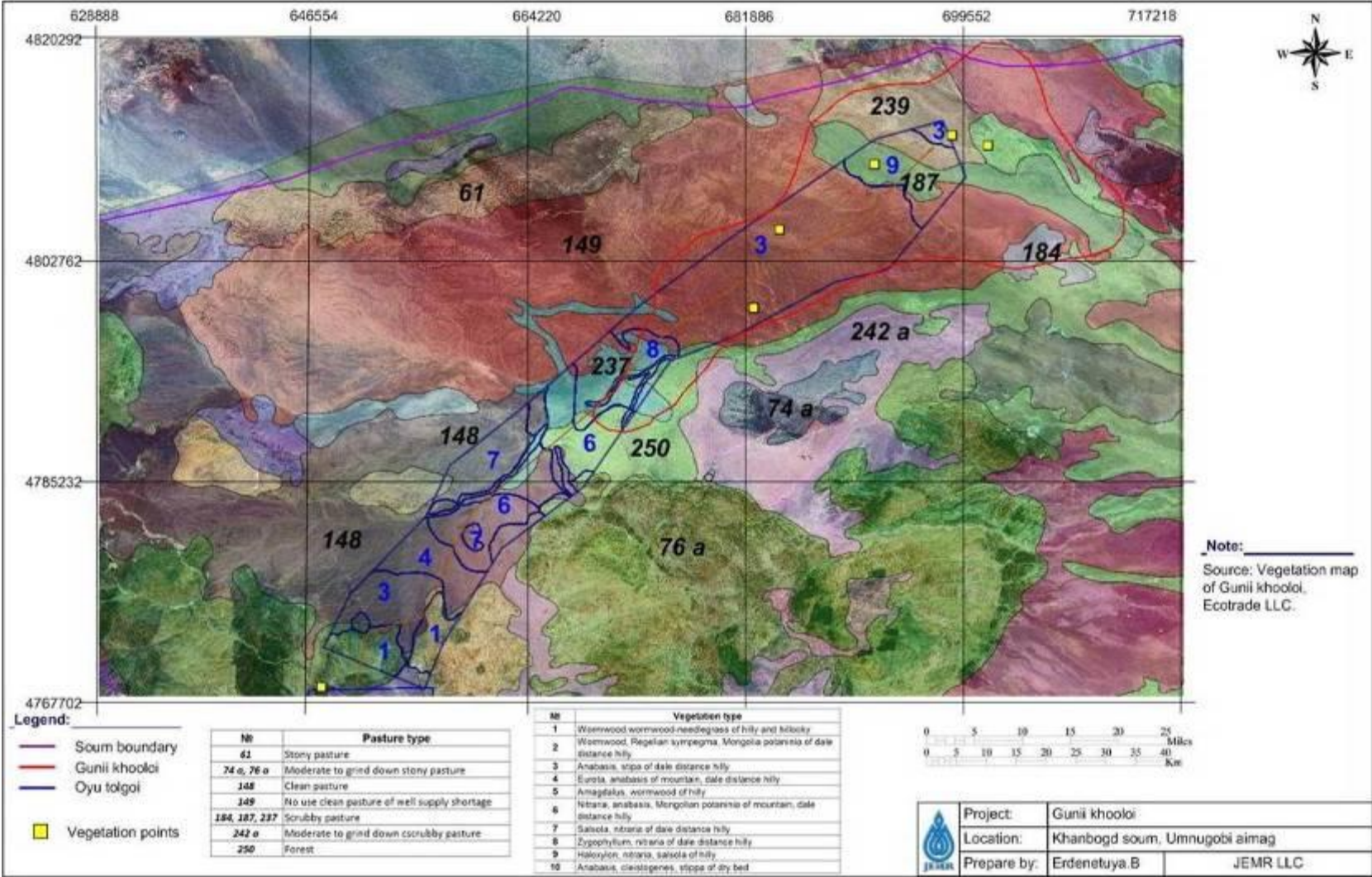
Finally, the Amendment to the Gunii Hooloi DEIA (JEMR, 2010) identified the following plant communities (Figure 7.4):

1. *Salsola passerina* – *Anabasis brevifolia* – low hills
2. *Salsola passerina* – *Sympegma regelii* – *Potaninia mongolica* – valley between low hills
3. *Anabasis brevifolia* – *Stipa gobica* – flat areas between hills

-
4. *Eurotia ceratoides*⁹ – *Anabasis brevifolia* – low mountains and flats between hills
 5. *Amygdalus pedunculata* – *Salsola laricifolia* – low hills
 6. *Nitraria sibirica* – *Anabasis brevifolia* – *Potaninia mongolica* – low hills and flats between hills
 7. *Reaumuria soongorica* – *Nitraria sibirica* – valley between low hills
 8. *Zygophyllum xanthoxylon* – *Nitraria sibirica* - *Reaumuria soongorica* – *Salsola passerina* – low hills
 9. *Haloxylon ammondendron* – *Nitraria sibirica* – *Reaumuria soongorica* – sandy valley
 10. *Anabasis brevifolia* – *Cleistogenes songorica* – *Stipa gobica* – dry river bed

⁹ Currently recognised as *Krascheninnikovia ceratoides* (L.) Gueldenst.

Figure 7.4: Vegetation units of the Gunii Hooloi Borefield and Pipeline Area (JEMR, 2010)



7.3.4 Permanent Airport Area

According to OSMT (2011), the proposed permanent airport area has sparse vegetation with communities of a type intermediate between desert and desert steppe, with more dense vegetation along the gullied areas and less dense vegetation in the gravel hills. Two broad vegetation units were described from within the permanent airport study area by OSMT (2011); Steppe Valley vegetation and Dry River Bed Meadow vegetation. These vegetation units are described in further detail below.

- **Steppe Valley vegetation:** This vegetation unit was dominated by the shrub *Anabasis brevifolia* and grass species *Stipa glareosa* with other plant species such as *Salsola passerina*, *Convolvulus ammanii*, *Dontostemon senilis* and *Arnebia guttata* also recorded on hilly areas. In shallow depressions species such as *Salsola laricifolia*, *Convolvulus fruticosus*, *Sympegma regelii*, *Oxytropus aciphylla*, *Ajania achilleoides*, *Reaumaria soongarica*, *Stipa glareosa*, *Cleistogenes soongarica*, *Dontostemon senilis*, *Astragalus* sp. and *Arnebia guttata* were also recorded. Vegetation cover was low (approximately 5-10%) across the Steppe Valley vegetation unit with a stony gravel mantle covering the soil surface. Vegetation was typically more sparse on the low hillocks (1-5% cover) compared to shallow depression/hollow areas (7-10%).
- **Dry River Bed Meadow vegetation:** This vegetation unit was located within ephemeral drainage areas within the permanent airport study area and was dominated by *Nitraria* sp. and *Achnatherum* sp. Other species recorded include *Salsola passerina*, *Convolvulus ammanii*, *Lappula intermedia*, *Arnebia guttata*, *Anabasis brevifolia*, *Sympegma regelii*, *Pxytropus aciphylla*, *Ajania achilleoides*, *Reaumuria soongarica*, *Stipa glareosa*, *Cleistogenes soongarica*, *Dontostemon senilis* and *Astragalus* sp. Vegetation cover was typically sparse (5-10%) and litter was abundant.

7.3.5 Mine Licence Area

Detailed surveys and vegetation monitoring have been performed in the Mine Licence Area (Eco-Trade, 2006; Oyu Tolgoi vegetation monitoring reports), where the vegetation generally consists of sparse (<5% surface cover), and low (>0.5m) drought-tolerant perennial shrubs. Annual grasses and other herbaceous species emerge following seasonal rainfall events. Eco-Trade (2006) described four broad vegetation units based on the landforms within the Mine Licence Area:

- The **Terrace community** occupied 80% of the Oyu Tolgoi Mine Licence Area and was dominated by the typical desert steppe plants *Salsola passerina*, *Reaumuria soongarica*, *Anabasis brevifolia* and *Sympegma regelii*. One small area of variation in the terrace community was observed where the semi desert plants *Stipa glareosa* and *Allium polyrhizum* were the dominant species. The terrace community within and surrounding the Project area was found to contain a greater diversity of species when compared to the terrace communities of other desert steppe areas including Altai Gobi and Dzungarian Gobi.
- The **Hills community** occurred on the rocky elevated and shallow soiled areas. Such habitats were found to occur across approximately 5% of the Oyu Tolgoi Mine Licence Area. The hills vegetation community was dominated by *Anabasis brevifolia*, *Sympegma regelii*, *Chesneya macrantha*, *Salsola passerina*, *Reaumuria soongarica* and *Potania mongolica* (Figure 7.5).
- The **Dry watercourse community** accounted for approximately 1% of the Mine Licence Area and was found along the various ephemeral drainage channels that together make up the Undai River. The community was dominated by the low shrubs *Salsola passerina*, *Anabasis brevifolia*, *Reaumuria soongarica* and *Nitraria sibirica* with the occasional Siberian elm (*Ulmus pumila*). The Siberian elm has evolved several strategies which enable it to survive an arid environment such as that of the southern Gobi region. An extensive lateral root system allows the species to access shallow alluvial groundwater and soil moisture within river sediments. The elms are also able to decrease water usage during drought through partial summer dormancy where seasonal leaf growth is restricted. Moreover, the trees have very thick bark of between 5 to 7 cm which helps to retain moisture and insulate against extreme summer and winter temperatures. As one of the few tree species in the south Gobi, Elm trees play a major role in the regional ecosystem. The trees are often the only suitable nesting sites for birds and provide habitat and shelter for many small mammals, reptiles and insect species. The elms also have practical as well as

cultural significance to local herders as indicators of shallow groundwater and they are informally protected from felling for firewood or timber.

- The **Spring community** occurs at the permanent Bor Owoo Spring and includes species such as *Carex duriuscula*, *Puccinellia tenuifolia* and *Glaux maritima* in the damp ground adjacent to the spring area. *Iris lactea*, *Phragmites communis* and *Achnatherum splendens* are located in areas of standing water and saturated soils. *Kalidium gracile*, *Achnatherum splendens* and *Nitraria sibirica* occur on the periphery of the spring while *Kalidium gracile*, *Salsola passerina*, *Reaumuria soongarica* and *Carex duriuscula* occur on the dried evaporate soils where the spring retracts during drier periods.

Figure 7.5: *Potaninia mongolica* association, Oyu Tolgoi Vegetation Monitoring Plot 1, May 2011



Each of the four broad vegetation units described above have been subdivided into a number of plant communities based on the dominant plant species and structural attributes (primarily % cover) of the vegetation (Eco-Trade, 2006). These vegetation communities are described in *Table 7.1* and mapped in *Figure 7.6* below:

Table 7.1: Mine Licence Area Vegetation Communities and Associations (see Figure 7.6)

Community name	Percent cover	Average height (cm)	Number of species per site	Dominant species	Total number of individual plants per site	DEIA survey locations and Oyu Tolgoi monitoring sites
Terrace vegetation community associations						
<i>Salsola passerina</i> + <i>Reaumuria soongarica</i> + <i>Allium polyrhizum</i> (desert community)	18-23	10-14	9-28	<i>Anabasis brevifolia</i> <i>Salsola passerina</i> <i>Sympegma regelii</i> <i>Reaumuria soongarica</i>	20 441 15 65	Site # 4: 4768000 / 654000 Site # 15: 4759818/ 655651 Site # 17 located in the east line of waste dump
<i>Anabasis brevifolia</i> + <i>Sympegma regelii</i> + <i>Allium polyrhizum</i> (desert community)	15-27	8-12	23-27	<i>Sympegma regelii</i> <i>Nitraria sphaerocarpa</i> <i>Potaninia mongolica</i> <i>Reaumuria soongarica</i> <i>Anabasis brevifolia</i> <i>Allium polyrhizum</i>	5 1 1 35 237	Site # 2: 4765500 / 654000 - adjacent to box cut waste: 4759940 / 653100

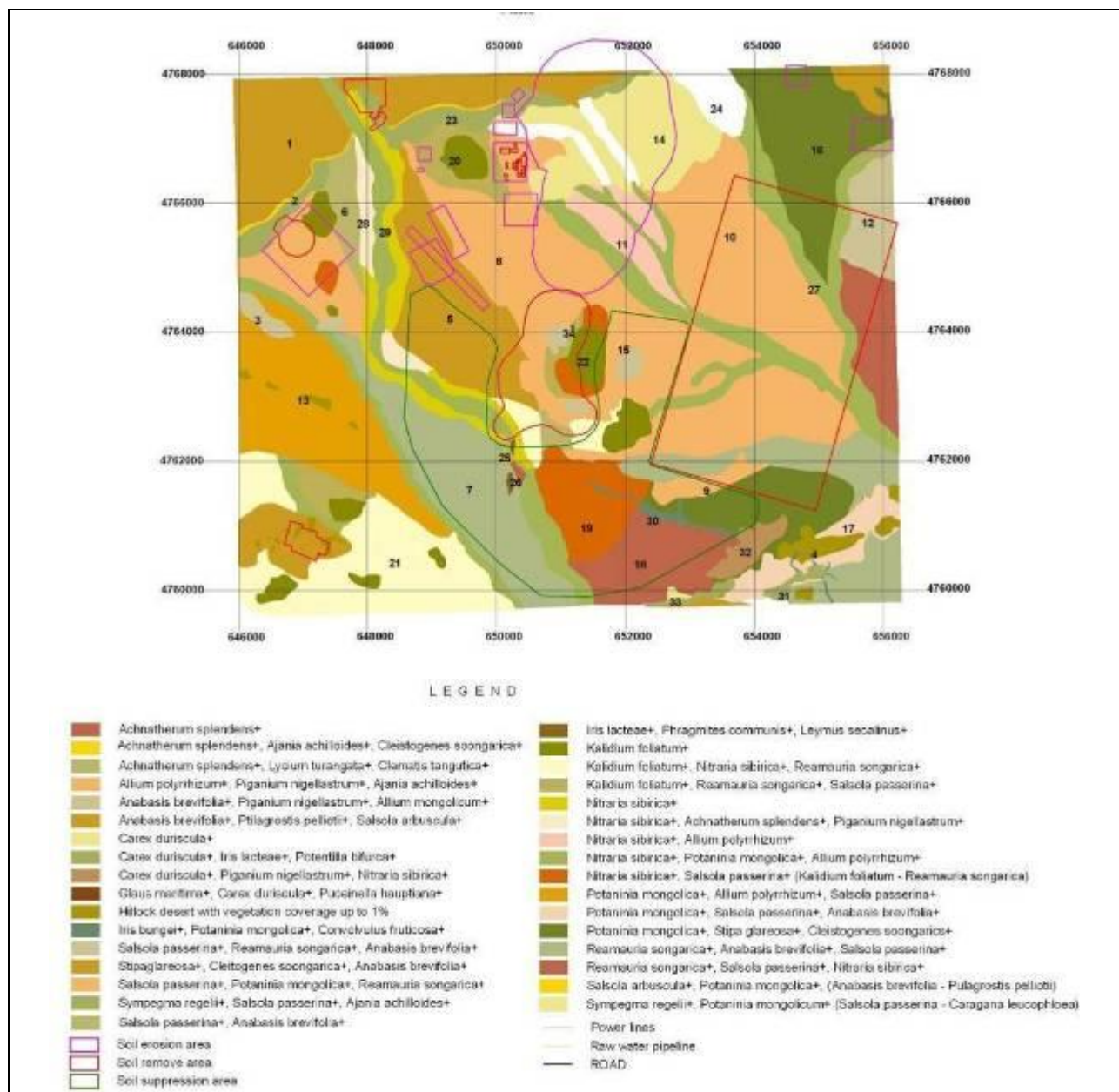
Community name	Percent cover	Average height (cm)	Number of species per site	Dominant species	Total number of individual plants per site	DEIA survey locations and Oyu Tolgoi monitoring sites
				<i>Stipa glareosa</i>	75 14	
<i>Sympegma regelii</i> + <i>Salsola passerina</i> + <i>Potania mongolica</i> (desert community)	25-30	15-18	22-28	<i>Sympegma regelii</i> <i>Anabasis brevifolia</i> <i>Salsola passerina</i> <i>Ajania achilloides</i> <i>Potania mongolica</i>	137 179 49 136 37	In the north side of far north Oyu: 4765477 / 653318
<i>Stipa glareosa</i> + <i>Anabasis brevifolia</i> + <i>Allium polyrhizum</i> (low steppe element)	35-40	10-13	20-29	<i>Anabasis brevifolia</i> <i>Stipa glareosa</i> <i>Ajania achilloides</i> <i>Potania mongolica</i> <i>Allium polyrhizum</i>	32 20 128 15 33	Site # 3: 4765000 / 648000 Site # 5: 4766000 / 649000 West side of Undai R
<i>Anabasis brevifolia</i> + <i>Salsola passerina</i> + <i>Sympegma regelii</i> (desert community)	15-20	15-20	8-12	Not surveyed		Site # 15: 4759818 / 655651
Spring vegetation community associations						
<i>Carex duriuscula</i> + <i>Puccinellia tenuiflora</i> + <i>Glaux maritima</i> (meadow element)	99	5-10	15	Not surveyed		Near Bor Ovoo spring: 4761727 / 650569
<i>Iris lactea</i> + <i>Phragmites communis</i> + <i>Achnatherum splendens</i> (shallow groundwater)	45	15-20	13	<i>Iris lactea</i> <i>Achnatherum splendens</i>	368 196	Immediately east of Central Oyu:
<i>Kalidium gracile</i> + <i>Achnatherum splendens</i> + <i>Nitraria sibirica</i> (Salty shallow groundwater)	35-40	25-30	15	<i>Nitraria sibirica</i> <i>Kalidium gracile</i> <i>Achnatherum splendens</i>	18 340 175	200 m to the east from Bor Ovoo Spring:
<i>Kalidium gracile</i> + <i>Salsola passerina</i> + <i>Reaumuria soongarica</i> (semidesert)	15-20	25	17	<i>Kalidium gracile</i> <i>Salsola passerina</i> <i>Reaumuria soongarica</i> <i>Sympegma regelii</i>	631 125 78 25	South side of Central Oyu:
<i>Carex duriuscula</i> (takyre ¹⁰)	40	15-20	12	Not surveyed		Site # 8: 476000 / 653000
Dry river bed (dry ravine) vegetation community associations						
<i>Salsola passerina</i> + <i>Anabasis brevifolia</i> + <i>Reaumuria soongarica</i> (<i>Nitraria sibirica</i>) (Dry river bed and ravine valley)	35-40	10-15	17-25	<i>Nitraria sibirica</i> <i>Anabasis brevifolia</i> <i>Salsola passerina</i> <i>Reaumuria soongarica</i> <i>Halogeton</i>	21 234 87 56	East valley of Central Oyu Site # 7: 4765000 / 652000 Site # 12: 4767000 / 648000

¹⁰ "Takyre" soils are heavy clay soils in shall depressions where water ponds during seasonal rains, often developing high salt contents.

Community name	Percent cover	Average height (cm)	Number of species per site	Dominant species	Total number of individual plants per site	DEIA survey locations and Oyu Tolgoi monitoring sites
				<i>glomeratus</i>	>20,000	
				<i>Allium polyrhizum</i>	250	
				<i>Bassia dasiphylla</i>	250	
				<i>Halogeton arachnoideus</i>	5000	
				<i>Artemisia scoparia</i>	625	
				<i>Artemisia blepharolepis</i>	250	
					125	
Hills vegetation community associations						
<i>Anabasis brevifolia</i> + <i>Sympegma regelii</i> + <i>Chesneya macrantha</i> (desert community)	37	12-15	23-25	<i>Anabasis brevifolia</i>	126	NE low hills on west side of Undai gol
				<i>Sympegma regelii</i>	17	
				<i>Chesneya macrantha</i>	35	
				<i>Potaninia mongolica</i>	11	
<i>Salsola passerina</i> + <i>Reaumuria soongarica</i> + <i>Sympegma regelii</i> (+ <i>Potaninia mongolica</i>) (desert community)	18-20	10-15	20-30	<i>Salsola passerina</i>	509	Site # 10 / central site of waste rock dump site area: 4761990 / 652603
				<i>Reaumuria soongarica</i>	415	
				<i>Sympegma regelii</i>	59	On the top of Central Oyu
				<i>Anabasis brevifolia</i>	50	
				<i>Potaninia mongolica</i>	81	
				<i>Halogeton glomeratus</i>	>20,000	
				<i>Bassia dasyphylla</i>	>20,000	

Source: Eco-Trade (2006)

Figure 7.6: Plant associations (see Table 7.1) within the Oyu Tolgoi Mine Licence Area



Source: Eco-Trade (2006)

7.3.6 Infrastructure Corridor Area

The Infrastructure Corridor extends between the Mine Licence Area to the north and the international border with China to the south, and includes both the 220kV transmission line route and the Oyu Tolgoi to Gashuun Sukhait Road route. The corridor passes through the subregion known as the Galba (or Galbyn) Gobi, which occupies a broad, low-lying valley. Shrubs such as *Caragana bungei*, *C. leucophloea*, *Salsola passerina*, *Artemisia xerophytica*, *Potaninia mongolica*, *Nitraria sibirica* and grasses such as *Stipa gobica*, *S. glareosa*, *Cleistogenes soongorica* are the dominant species found in the low hills and flat plains of semi-desert and desert regions.

Eco-Trade (2010) found the vegetation of the infrastructure corridor to be closely related to topography with landform features such as hillocks, flat plateaus and depressions each tending to have a separate assemblage of plant species. Hillock and flat plateaus of desert and desert steppe zone were covered by drought tolerance shrubs and other perennial plant species. Within the Project area, dense vegetation was restricted to oases and other extensive water catchment sites. Some extra-zonal plant communities

such as elm forest, saxaul forest and saline meadows were present along large drainage areas or where groundwater lay close to the surface.

A total of 5 broad vegetation units have been described from within the infrastructure corridor (Eco-Trade, 2010). These include; flat plateaus vegetation of desert steppe, flat plateaus vegetation of desert, vegetation of hillocks, dry drainage vegetation (with temporary runoff) and oasis vegetation. Eight vegetation communities, described on the basis of their dominant plant species, occur within these 5 broad units (Eco-Trade, 2010):

- **Desert Steppe Plateaus:** This unit dominates along the road transect from Oyu Tolgoi to Durvuljin ovoo. This unit includes two plant communities both of which were dominated by low shrub species:
 - *Anabasis brevifolia-Reaumuria soongarica-Salsola passerine*; and
 - *Nitraria sibirica-Kalidium gracile*.
- **Desert Plateaus:** This unit occurs on the flat plateaus of the Galba Gobi. The vegetation cover was typically sparse with 20-25 individuals of shrubs counted in a 10 x 10 m survey plots. Plant communities recorded within this unit included:
 - *Sympegma regelii-Anabasis brevifolia-Potaninia mongolica*; and
 - *Zygophyllum xanthoxylon-Convolvulus groschakovii*.

Other plant species recorded within these two plant communities included *Ptilagrostis* sp., *Haloxylon ammodendron*, *Convolvulus fruticosus*, *Allium polyrrhizum*, *Allium mongolicum*, *Cleistogenes songorica*, *Heteropappus altaicus*, *Ajania achilleoides*, and *Stipa glareosa*.

- **Hillocks:** Hillock plant communities of desert and desert steppe were common across much of the study area. The distribution of this unit is dependent on relief and geomorphologic characteristic; however, floristically, this unit is similar to the flat plateaus vegetation of desert and desert steppe vegetation types. The plant communities present within the hillock unit include:
 - *Anabasis brevifolia-Stipa gobica*; and
 - *Caragana leucophloea-Zygophyllum xanthoxylon-Amygdalus pedunculata*.

Vegetation cover of hill tops was very sparse with 3-4 shrubs and perennial plants recorded in 1 m² survey plot. Additional plant species recorded on hillocks within the study area included *Ptilagrostis pelliotii*, *Setaria viridis*, *Reaumuria soongorica*, *Heteropappus altaicus* and *Ajania achilleoides*.

- **Dry drainage vegetation (with temporary run offs):** Ephemeral drainage channels within the infrastructure corridor study area have relatively dense vegetation cover compared to plateau and hillock areas as well as relatively high species diversity. Vegetation cover was estimated to be greater than 50 percent within ephemeral drainage channels. Only one plant community was recorded within this unit:
 - *Nitraria sibirica-Achnatherum splendens*
- **Vegetation of Oasis:** A single major oasis (spring) named Bulan Sukhait was recorded towards the southern end of the infrastructure corridor in the southern part of the Galba Gobi. The oasis was located within a low point of the surrounding steppe habitat of the Galba Gobi where surface water gathers after rainfall events. The presence of relatively dense vegetation exploiting the shallow groundwater of the oasis promotes the collection of humus and development of relatively deep and fertile soil. A single plant community was recorded within the oasis:
 - *Tamarix ramosissima-Salsola passerina-Reaumuria soongarica*

The plant communities mapped within the Infrastructure Corridor by Eco-Trade (2010) are presented in Figure 7.7 below.

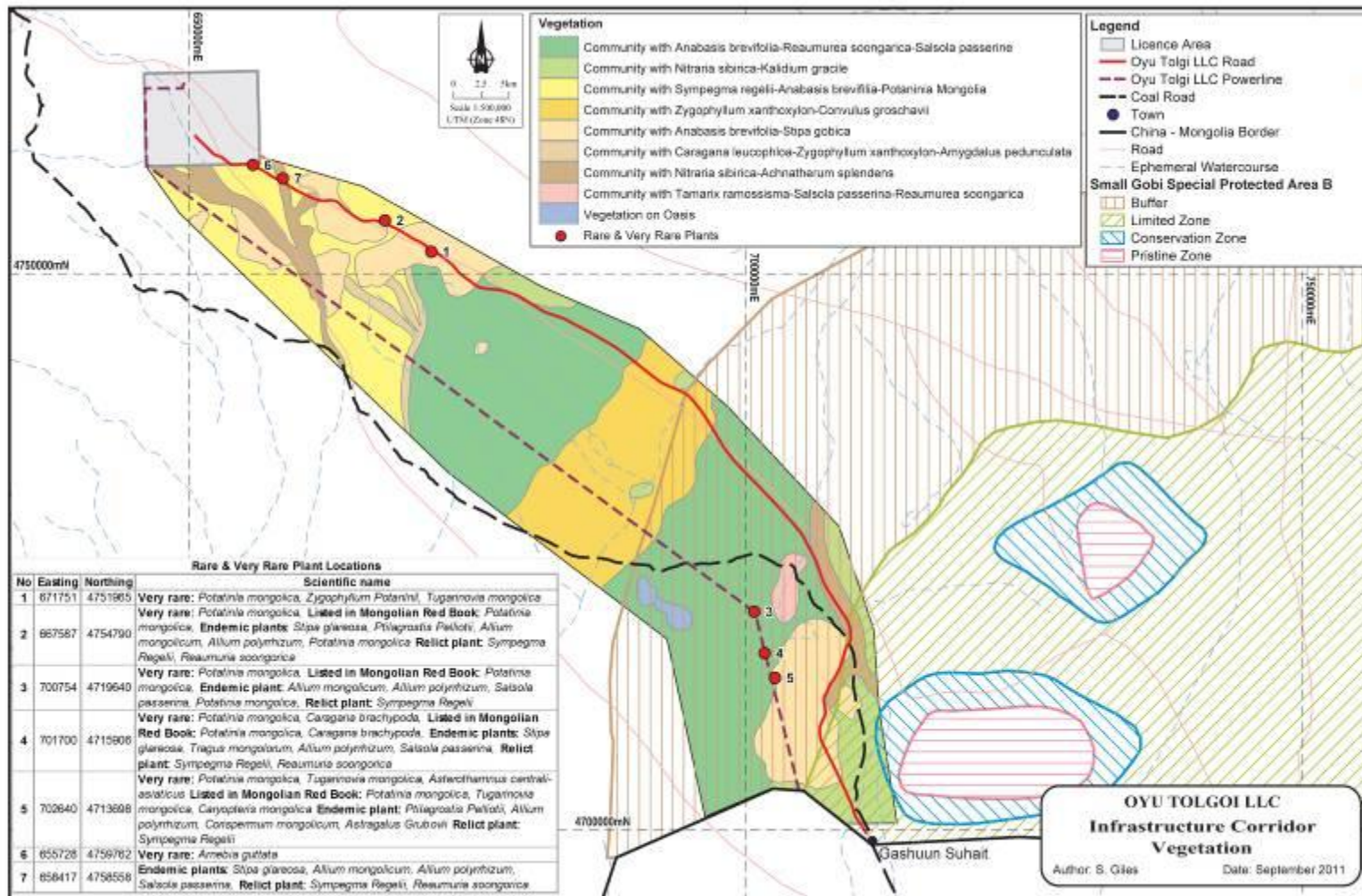
In addition to the communities observed by Eco Trade (2010) within the infrastructure corridor, a large saxaul forest community is known to occur within the southern deltaic region (known as the Daichin) of

the Undai River, to the west of the Transmission Line. This area appears to be frequented by herds of nomadic and migratory large ungulates such as the endangered Asiatic wild ass and the threatened black-tailed gazelle.

East of the existing Tavan Tolgoi Coal Road, a stand of poplar (*Populus euphratica*) occupied the alluvial zone of an ephemeral river. This stand was recognised as one of the easternmost poplar groves in the South Gobi but has apparently died off over the past two years due to the alteration of the flow patterns and the effects of burrowing by the great gerbil (*Rhombomys opimus*).

The use of the existing Talvan Tolgoi “coal road” and the existing Oyu Tolgoi to Gashuun Sukhait road has resulted in localised disturbance to vegetation of the Infrastructure Corridor. Disturbance is primarily due to the creation of multiple parallel tracks adjacent to the formal road (caused by trucks and other vehicles attempting to negotiate poor condition/waterlogged sections of the road) and the deposition of dust generated by traffic on the unimproved surfaces as well as by the settlements around the Javkhant *bagh* centre. In contrast, the area through which Transmission Line will pass is largely undisturbed due to its relative remoteness from the main existing transportation routes.

Figure 7.7: Vegetation Units of the Infrastructure Corridor



7.3.7 Flora and vegetation of conservation interest

Saxaul forest

Saxaul (*Haloxydon ammodendron*) (Figure 7.8) is a shrub or small tree that forms relatively extensive stands typically in dunes, saline-alkaline deserts, and sandy places on riversides from the Caspian region eastwards to China (W Gansu, Nei Mongol, NW Ningxia, N Qinghai, Xinjiang) and Mongolia.

Depending on groundwater availability, Saxaul may have a deep root system, up to 30-40m in depth (see Chapter C6: Biodiversity and Ecosystems Services Impact Assessment Annex C). Such deep roots allow the saxaul trees to exploit shallow groundwater during times of low soil moisture availability. Studies summarised by Quanlin *et al.* (2007) found that saxaul is a facultative phreatophyte; able to access and use groundwater where available at shallow depths, but also able to persist in areas without shallow groundwater where soil moisture is seasonally or sporadically replenished through stream runoff and direct infiltration of rainfall. Other drought tolerance features such as reduced leaves and partial or complete dormancy of up to 5-6 years, allow saxaul to withstand extended periods without rainfall. Quanlin *et al.* (2007) found saxaul to have a rather limited optimal range of soil moisture, where too much water was a limiting factor in experimental conditions. Soil crusts were found to limit water availability, which in part may explain the association of saxaul with sand dunes where permeability is higher.

Saxaul is important to both native and domesticated large herbivores as a perennial forage resource and also plays a significant role as habitat for a range of fauna, in particular birds and small mammals, including the saxaul sparrow (*Passer ammodendri*).

According to Schmidt *et al.* (2011), Khanbogd *soum* contains approximately 6% of the total area of saxaul vegetation in Mongolia. Within the Oyu Tolgoi Aol, saxaul forests are present in the central and northeastern sectors of the Gunii Hooloi area and in the Daichin area (“Daichingiin Zag”) in the southern tributary zone of the Undai River.

Saxaul of the Gunii Hooloi Borefield Area

Saxaul stands have been recorded in the central and eastern part of the Gunii Hooloi valley in the central terrace. The central portion of Gunii Hooloi has stands of young saxauls growing on low sand dunes which have been estimated to be 4-10 year old. These saxauls are growing in comparatively moist areas adjacent to ephemeral streams and where surface flows discharge into low lying, broad depressions. The termination of the Ukhaa River in the Gunii Hooloi valley contains many low saxauls, suggesting a reliance on seasonal soil moisture replenished by surface water flows rather than a reliance on groundwater. Saxaul groves in the eastern part of the Gunii Hooloi borefield (near Amtgain Toirom) are thought to be older and are typically taller than those in the central part of the Gunii Hooloi borefield however these trees are also thought to rely on seasonal availability of soil moisture rather than permanent shallow groundwater.

Saxaul plants represent approximately 8% of the surface cover in the terrace vegetation type and had a surveyed average density of 68 plants per 25 x 25-m plot (Eco Trade 2009, JEMR 2010). A high percentage of the saxaul in this area were immature specimens established on gravel and rocky soils and average height was 80 cm with a canopy diameter of approximately 50 cm.

Saxaul of Daichingiin Zag

Saxaul of the Daichingiin Zag are typically multi-stemmed low trees. This growth form has been attributed to greater soil moisture availability within this habitat type provided by the tributaries of the Undai River (Sanjid J. in Eco Trade 2005). However, the multi-stemmed habit may also result from heavy browsing.

Figure 7.8: Saxaul Forest, Gunii Hooloi Basin, May 2011



Elm groves

The Siberian elm (*Ulmus pumila*, Figure 7.9) is an east-central Asian floristic element that is widespread in north-western China, but which reaches the western limit of its distribution in central Mongolia, southern Russia and western China (Wesche *et al.*, 2011). These trees form elongate groves or woodlands on alluvial soils along seasonal watercourses or on alluvial fan deposits near the base of the granitic Khanbogd Massif.

According to Wesche *et al.* (2011), Siberian elms need reliable groundwater supplies as they hardly reduce transpiration under periods of high radiation and they neither tolerate stagnant water nor high salt content. This observation suggests that well-drained sandy alluvial soils are preferable to clayey depressional areas for elm growth. These authors found the elms in the South Gobi study sites to be usually confined to the lowest sites in the drainage line, where there is shallow groundwater and – at least temporarily – some surface water available. Similarly, Dulamusuren *et al.* (2009) found Siberian elms to have high transpiration rates throughout the summer, which in part may be a cooling mechanism that allows them to persist in strong summer sunlight but where there is adequate water availability. These authors also noted that Siberian elms have rapid root growth. Studies by Sanjid J. in the Oyu Tolgoi Aol indicated that the elms access moisture by extensive lateral root systems at depths from 0.2 to 4.0 m.

Siberian elm provides habitat for many species of birds and nesting sites for numerous raptors, including lesser kestrels (*Falco naumanni*) and saker falcons (*Falco cherrug*), as well as shade for large mammals (Wesche *et al.*, 2011). While Wesche *et al.* (2011) have recently commented on the apparent rarity of recruitment in Mongolian Gobi elm stands, some current regeneration can be observed in elm groves to the east of the existing Oyu Tolgoi to Gashuun Sukhait road (Figure 7.10).

The Project Aol is thought to be a globally important area for Siberian elm (von Wehrden *in litt.*, Annex C) as; (i) the Project Aol is situated at the western edge of the Siberian elm distribution (the species distribution is known to extend westward to around Gobi Gurvansaikhan), and (ii) the distribution of the species to the east and south has been much reduced by anthropogenic pressures (see Wesche *et al.*, 2011).

Figure 7.9: Siberian Elms in Undai valley, May 2011



Figure 7.10: Elm Recruitment in Grove East of Infrastructure Corridor, May 2011



Poplar groves

Poplars (*Populus euphratica*) form small groves in the South Gobi but are far less common than elms, as the poplars are gradually replaced by elms east of 101.5° E (Wesche *et al.*, 2011). Only one poplar grove has been recorded from the Oyu Tolgoi Aol, at Ikh Gun Usnii Hooloi near the Tsagaan Khad settlement along the existing road near the Chinese border north of Gashuun Sukhait. This stand is believed to have succumbed to some combination of effects from changes in surface deposition of sediments, changes in seasonal flow patterns, and root predation by great gerbil colonies (Figure 7.11). This poplar stand was considered to be one of the most easternmost in the Mongolian Gobi (Sanjid J., pers. comm, 2011).

Figure 7.11: Dead poplar grove at Ikh Gun Usnii Hooloi near road to Gashuun Sukhait, May 2011



Tamarisk groves

The tamarisk (*Tamarix ramosissima*¹¹, Figure 7.12) is a widespread desert shrub or tree that often forms raised hummocks where sediments and organic matter accumulate. This species has a deep taproot which, in the Project Aol reaches depths of up to 10 - 12 m (Sanjid J. in Eco-Trade, 2005). In the Oyu Tolgoi Aol, tamarisk occurs in depressional areas where water accumulates and forms seasonal wetlands or pools. It produces berries that are fed upon by many animals. The most important tamarisk habitat within the Oyu Tolgoi Aol is in the playa known as Bulan Sukhait in the Infrastructure Corridor area.

Figure 7.12: Bulan Sukhait tamarisks



Granite outcrop communities

The exposed granitic substrates of the Khanbogd Massif located within the eastern part of the Project Aol are believed to support unique communities of plants due to the occurrence of unusual edaphic conditions (H. von Wehrden cited in TBC & FFI, 2010:88). Granitic outcrops such as the Khanbogd Massif are not common in southern Mongolia and as such, the project Aol is likely to support an important

¹¹ Currently recognised as *T. chinensis* Lour. by Tropicos.org.

area for these unique vegetation communities. While von Wehrden (cited in TBC & FFI 2011) noted the occurrence of these communities, to date there has been no published botanical surveys of vegetation associated with the Khanbogd Massif or other large granite outcrops of southern Mongolia.

***Nitraria* hummocks**

In limited parts of the Gunii Hooloi borefield and pipeline area, areas of sandy hummocks (supporting *Nitraria sibirica* dominated vegetation) are present (see Figure 7.13). Although widely distributed within the Gunii Hooloi area and elsewhere in the South Gobi, the hummocks have an important ecological role; their wide-rooting system traps windblown sand, moisture and nutrients and, therefore, plays a role in stabilising the desert surface. The *Nitraria* plants also produce a significant quantity of fruits (a fleshy drupe) that are consumed by many species of wildlife as well by local communities.

Figure 7.13: *Nitraria sibirica* hummocks in Gunii Hooloi, May 2011



Legally-Designated Rare and Very Rare Species

To date, no IUCN assessment has been performed for the Mongolian flora and as such, it is unknown whether any flora that would meet the IUCN criteria for threatened flora occur within the Project AoI. The Mongolian Law on Natural Plants (1995, updated in 2004 and 2010) establishes three categories of species: abundant, rare, and very rare. However, this categorization was not applied in a manner consistent with the IUCN regional categorization approach.

The rare and very rare species identified by Mongolian legislation are largely of medicinal or other economic or cultural interests. All of the species, with the possible exceptions of *Cynanchum gobicum* (reported as *Vincetoxicum lanceolatum*) and *Limonium gobicum*, are widespread in the greater Gobi region of Mongolia and China or more widely distributed westwards into central Asian countries.

Table 7.2 summarises the information on the rare and very rare species identified in the Oyu Tolgoi AoI.

Table 7.2: Plant species within the Oyu Tolgoi Aol identified as Rare or Very Rare by Mongolian Law

Scientific Name	Mongolian Name	Distribution	Project Areas	Category
<i>Phragmites communis</i>	Egel nishing (khuls)	Cosmopolitan	Licence Area	Rare
<i>Amygdalus mongolica</i>	Mongol builees	China (Gansu, Nei Mongol, Ningxia), Mongolia	Infrastructure Corridor (660893 N 4757410 E)	Rare
<i>Arnebia guttata</i> (Figure 7.14)	Shar bermeg, Tolbot bereemeg	Afghanistan, China, India, Kazakhstan, Kyrgyzstan, Mongolia, Pakistan, Russian Federation, Tajikistan, Turkmenistan, Uzbekistan	Infrastructure Corridor (42059'24,9 N 106051'12,9 E), Licence Area	Very Rare
<i>Artemisia xanthochloa</i>	Shar sharilj	China (Nei Mongol Zizhiqu), Mongolia	Infrastructure Corridor (42037'50,1 N 107032'52,16 E)	Very Rare
<i>Asterothamnus centrali-asiaticus</i>	Tov Aziin lavai	China (Gansu, Nei Mongol, Ningxia, Quinhai, SE Xinjiang), Mongolia	Infrastructure Corridor (653892 N 4760589 E), Licence Area	Very Rare
<i>Brachanthemum gobicum</i>	Gobiin tost	China (Nei Mongol: Bai et al., 2008), Mongolia	Licence Area	Very Rare
<i>Calligonum gobicum</i>	Mongol azar	China (Gansu, Nei Mongol, Xinjiang), Mongolia (Dzungarian Gobi, Transaltai Gobi, Alashan Gobi)	Infrastructure Corridor (42042'35,8 N 107006'19,9 E)	Rare
<i>Caragana brachypoda</i>	Khoirgo khargana, Hoirog hargana	China (Gansu, Nei Mongol, Ningxia, Shaanxi (Dingbian)), Mongolia	Infrastructure Corridor (653892 N 4760589 E), Licence Area	Very Rare
<i>Caragana gobica</i>		Mongolia (East Gobi, Gobi-Altai: Gubanov, 1996). Stony slopes, rocks and outcrops of agglutinated conglomerates (Grubov, 2001)	Gunii Hooloi? (Not documented)	Very rare
<i>Caragana tibetica</i>	Tovd haragana	China (Gansu, W Nei Mongol, Ningxia, Qinghai, N Shaanxi, W Sichuan, Xizang), Mongolia (East Gobi, Gobi-Altai, Alashan Gobi)	Infrastructure Corridor (660893 N 4757410 E)	Very rare
<i>Chesneya macrantha</i> (Listed as <i>Oxytropis grubovii</i>)	Gruboviin ortuuz	China (Nei Mongol Zizhiqu, Xinjiang Uygur), Mongolia	Infrastructure Corridor (42059'24,9 N 106051'12,9 E), Licence Area	Very Rare
<i>Chesniella mongolica</i> (Listed as <i>Chesneya mongolica</i>)	Mongol buurtsgana	China (Nei Mongol), Mongolia (Depression of Great Lakes, Valley of Lakes, East Gobi, Gobi-Altai, Transaltai Gobi, Alashan Gobi: Gubanov, 1996). Alkaline sands, sandy debris tailings of mountains and hills, sandy-pebble bottom of says in desert zone (Grubov, 2001).	Licence Area	Very Rare
<i>Cistanche salsa</i>	Martsnii argamjin tsetseg	Mongolia, China, Kazakhstan, Kyrgyzstan, Tajikistan, Turkmenistan, Uzbekistan	Licence Area	Very Rare

Scientific Name	Mongolian Name	Distribution	Project Areas	Category
<i>Cynanchum gobicum</i> (Listed as <i>Vincetoxicum lanceolatum</i>) ¹²	Yulden yerondgono	Mongolia (East Gobi, Gobi-Altai, Dzungarian Gobi, Transaltai Gobi, Alashan Gobi)	Infrastructure Corridor (659858 N 4751765 E)	Rare
<i>Cynanchum thesioides</i> (Listed as <i>Vincetoxicum sibiricum</i>)	Sibir temeem khukh	China, Democratic Peoples' Republic of Korea, Kazakhstan, Mongolia, Russian Federation	Licence Area	Very Rare
<i>Ephedra equisetina</i>	Shivleehei zeergene	Gansu, Hebei, Nei Mongol, Ningxia, Qinghai, Shanxi, Xinjiang [Afghanistan, Kazakhstan, Kyrgyzstan, Mongolia, Russia, Tajikistan, Turkmenistan, Uzbekistan]	Infrastructure Corridor (654204 N 4760506 E)	Very Rare
<i>Ephedra dahurica</i> (Listed as <i>Ephedra sinica</i>)		China (Gansu, Hebei, Heilongjiang, Jilin, Liaoning, Nei Mongol, Ningxia, Shaanxi, Shanxi). Mongolia	Licence Area	Very rare
<i>Glycyrrhiza uralensis</i>		Afghanistan, China (Gansu, Hebei, Heilongjiang, Liaoning, Nei Mongol, Ningxia, Qinghai, Shaanxi, Shandong, Shanxi, Xinjiang), Kazakhstan, Kyrgyzstan, Mongolia, Pakistan, Russia, Tajikistan.	Licence Area	Very rare
<i>Gueldenstaedtia monophylla</i>	Gants navchit saljir	Mongolia, Russian Federation (Zhu 2004)	Infrastructure Corridor (653424 N 4761061 E), Licence Area	Very Rare
<i>Limonium aureum</i>	Altan bermeg	China, Mongolia, Russian Federation	Licence Area	Very Rare
<i>Limonium gobicum</i> ¹³	Goviin bermeg	East Gobi in subsaline chee-grass stands; Desert Steppe of Dornogobi. Also reported from Nei Mongol, China ¹⁴	Infrastructure Corridor (665439 N, 4755002 E)	Rare
<i>Olgaea leucophylla</i>	Tsagaan navchit khas zul	China (7 provinces), Mongolia	Licence Area	Very Rare
<i>Olgaea lomonosowii</i>	Lomonosovyn Has zul	China (Gansu, Hebei, Jilin, Nei Mongol Zizhiqu, Ningxia, Shanxi), Mongolia.	Infrastructure Corridor (660893 N 4757410 E)	Rare (1997 Red Book)

¹² *Vincetoxicum lanceolatum* was synonymised with *Cynanchum gobicum* by Grubov in 2000. According to Gubanov (1996), *V. lanceolatum* is found in East Gobi, Gobi-Altai, Dzungarian Gobi, Transaltai Gobi, and Alashan Gobi. According to Grubov (2001), it inhabits rocky and shady canyons and creek valleys.

¹³ Believed to be in error by J. Sanjid as this species has not been documented from this subregion of the East Gobi. *Limonium gobicum* is found in the "East Gobi" (Gubanov, 1996) in "subsalsine chee-grass stands" (Grubov, 2001). This species is not listed by the *Flora of China*, but has been reported from Inner Mongolia, China, by an unpublished thesis on the evolutionary biology of six species of *Limonium*. GBIF occurrences are limited to four sheets (MMNH-PL-0000774-777) of specimens from the Dalanjargalan *soum* of the Dornogovi *aimag* collected in May 2010. Chimeddorj *et al.* (2009) list this species is listed an "endangered plant species in Omnogovi *Aimag*" and report it as an element of the Desert Steppe of Dornogobi botanic-geographic region, which includes the *soums* of Mandal-Ovoo, Tsogt-Ovoo, Khankhongor, Tsogttsetsii, Manlai, Khanbogd, and Bayan-Ovoo.

¹⁴ <http://mt.china-papers.com/?p=53476>

Scientific Name	Mongolian Name	Distribution	Project Areas	Category
<i>Orobancha cernua</i> (Listed as <i>Cistanche feddeana</i>)	Feddiin argamjin tsetseg	Afghanistan, China, Kazakhstan, Kyrgyzstan, Mongolia, Nepal, Pakistan, Russian Federation, Tajikistan, Turkmenistan, Uzbekistan	Licence Area	Very Rare
<i>Peganum harmala</i>	Egel omhii ovs		Infrastructure Corridor (42038'42.5 N 107031'24,5 E)	Very Rare
<i>Populus euphratica</i> (Listed as <i>P. diversifolia</i>)	Eldev navchit ulias		Infrastructure Corridor	Very Rare
<i>Potaninia mongolica</i>	Khulan khoirgo, Mongol hulana hoirgo	China (Nei Mongol Zizhiqu), Mongolia (Valley of Lakes, Gobi Altai, East Gobi, Alashan Gobi)	Infrastructure Corridor (665439 N 4755002 E), Licence Area	Very Rare
<i>Sophora alopecuroides</i>			Bulan Sukhait	Rare
<i>Stellaria dichotoma</i>	Aman ajigana	China (Gansu, Hebei, Heilongjiang, Liaoning, Nei Mongol, Ningxia, Qinghai, Shaanxi, Xinjiang), Mongolia, Russia.	Licence Area	Rare (1997 Red Book)
<i>Tugarinovia mongolica</i>	Mongol shardalan	China (Nei Mongol Zizhiqu), Mongolia	Infrastructure Corridor (659272 N 4757928), Licence Area	Very Rare
<i>Zygophyllum potaninii</i>	Argalyn undaa Khulangiin undaa	China (3 Provinces), Kazakhstan, Mongolia	Infrastructure Corridor (660893 N 4757410 E), Licence Area	Very Rare

Sources: Eco-Trade DEIAs and supplements; TROPICOS (www.tropicos.org); Flora of China (http://www.efloras.org/flora_page.aspx?flora_id=2); Virtual Guide to the Flora of Mongolia (<http://greif.uni-greifswald.de/floragreif/>).

Figure 7.14: *Arnebia guttata*, Mine Licence Area, May 2011



7.4 RESULTS - FAUNA

7.4.1 Zoogeographic Setting

The Mongolian fauna includes a combination of Eurasian forest-steppe species in the north and east and Central Asian desert species in the south and west. The central belt of Mongolia is a transitional zone that includes forest-steppe and desert steppe elements. The fauna of the Gobi region is diverse, with many widespread species typical of the Central Asian and Near Eastern deserts. However, faunal endemism in the southern Gobi region of Mongolia is low, as evidenced by the absence of “restricted range” species with global distributions of 50,000 km² or less. The low human population density and high degree of isolation of the southern Gobi region of Mongolia has resulted in the survival of many threatened species that are much rarer in neighbouring countries, making the South Gobi a region of great interest for fauna conservation. The presence of important populations of threatened fauna has led to creation of the Small Gobi Strict Protected Area (“SGSPA”) in two blocks located along the Mongolian-Chinese border to the southwest and southeast of the Oyu Tolgoi Mine Licence Area, as well as the identification of the Galba Gobi Important Bird Area (“IBA”) which is transected by the proposed Infrastructure Corridor.

7.4.2 Invertebrates

There are no published systematic surveys of the South Gobi invertebrate fauna at a regional or sub-regional level and the available literature is scant.

Naganawa & Zagas (2002) studied the branchiopod fauna of temporary ponds in the northern Gobi steppe and noted the poor state of knowledge in the region generally. The Mongolian large branchiopod fauna is comprised of taxa from four zoogeographical groups: species widespread in the Palearctic and partially in the Nearctic, species probably native to Asia, species originating in East Asia, and localised-endemics distributed primarily in the steppe region of central Mongolia. None of the sites studied by these authors were located in the South Gobi region. There is a potential for the presence of branchiopods in the seasonally inundated basins or playas that occur primarily in the southern portion of the Infrastructure Corridor and may hold water for several weeks during the summer (Eco-Trade, 2004:17-18).

Mongolian ants and ant communities of the Gobi have been studied by M. Pfeiffer and associates (2003, 2006), who found the known ant fauna of all of Mongolia to consist of only 68 species. They concluded that the cold winters appear to limit diversification of the ant fauna and that the extensive distribution of two hot desert species in the Gobi indicates an impoverished fauna and may be an example of the dominance-impooverishment rule.

Studies performed for Oyu Tolgoi DEIAs and surveys performed by Oyu Tolgoi Environmental Department suggest the presence of over three hundred species of terrestrial arthropods. While some new country records have been made, none of the species identified to date are known to be locally endemic or of other conservation interest.

7.4.3 Fish

No fish have been identified from either the permanent springs or the ephemeral water bodies in the Oyu Tolgoi Project Area of Influence. While various endemic fish species are known from the Gobi Lakes Valley in western Mongolia, the available literature (e.g., Kottelat, 2006; Ocock *et al.* 2006) does not suggest that the South Gobi desert harbours any fish populations. However, while Kottelat (p. 65) had commented that there is historical information that some springs of the Gobi Lakes Valley and along the Mongolia-China border were inhabited by fishes, he later tracked the old Russian itinerary and found the maps and the places discussed is in China (Qinghai or Tibet), around the sources of the Yellow River), not in Mongolia (Kottelat in litt.) Nevertheless, it would be advisable to do surveys of any permanent springs in the South Gobi but these were not feasible during the RBA study period.

7.4.4 Amphibians

The only amphibian known to occur within the Mongolian Gobi region and the Project Area is the Mongolian toad or “mongol bakh” (*Pseudepidalea raddei*), listed as a species of Least Concern by the IUCN and the Mongolian Red List (Terbish *et al.*, 2006) and which is also found in China, the Democratic People’s Republic of Korea, and the Russian Federation (Kuzmin *et al.*, 2004). In the Project Area, this toad is associated primarily with permanent springs such as Bor Ovoo and springs along edges of the granite massif, where they breed in early spring (*Figure 7.15*).

Figure 7.15: Mongolian toad (*Pseudepidalea raddei*) tadpoles at Khanbogd, May 2011



7.4.5 Squamata (lizards and snakes)

The deserts of southern Mongolia are well populated by several species of widespread lizards and snakes adapted to the harsh seasonality and arid to semiarid conditions. Studies to date in the Oyu Tolgoi Aol have reported eight species of lizards and five species of snakes (for example, see *Figure 7.16* - *Figure 7.18*), listed in Annex B. None of the lizard, or snake species known to occur in the Oyu Tolgoi Aol are listed as globally threatened by IUCN or nationally threatened by the 2006 Mongolian Red List of Reptiles and Amphibians (Terbish *et al.*, 2006). In general, the lizard and snake species of the South Gobi are under little threat by the types of development activities being undertaken in the region.

A record of the Yangihissar or Gobi naked-toed gecko (*Cyrtopodion elongatum*), a species listed as Vulnerable by Terbish *et al.* (2006), in the English version of the 2005 draft amendment to the Gunii Hooloi DEIA report was subsequently re-identified as *Alsophylax pipiens* by the Mongolian language version of the report and this species is not included as part of the fauna of the Oyu Tolgoi Aol.

Figure 7.16: Gobi racerunner (*Eremias przewalskii*), Bor Ovoo Spring, May 2011



Figure 7.17: Toad-headed agama (*Phrynocephalus cf. przewalskii*), Mine Licence Area, May 2011



Figure 7.18: Slender racer (*Coluber spinalis*), Khanbogd Area, May 2011



7.4.6 Birds

At least 137 species of birds have been reported from the Oyu Tolgoi Aol and species are being added regularly by Oyu Tolgoi staff biologists (*Annex B, Table A-3*). Of these, 1 species is categorised as globally Endangered, 6 species are categorised as globally Vulnerable, 1 species is categorised as Near Threatened and a further 2 species are categorised as Least Concern by the IUCN (*Table 7.3*). The Mongolian Red List of Birds remains under review and has not yet been released however draft listings (provided by TBC/FFI in Annex C) are provided in *Table 7.3* below. It is noted that several of these threatened species are believed to occur in insignificantly small numbers in the Out Tolgoi Aol but are included here as a precautionary measure.

Table 7.3: Globally Threatened Species of Birds in the Oyu Tolgoi Aol

Species	Common names	Category (IUCN/MRL)	Global threats	Global population and range
<i>Neophron percnopterus</i>	Egyptian vulture	EN/LC	Declines in Africa likely driven by loss of wild ungulate populations and overgrazing in some areas by livestock. Disturbance, lead poisoning (from gun-shot) and collision with powerlines are currently impacting upon European populations. In India, it appears that the veterinary drug Diclofenac is driving the recent rapid declines. In Morocco at least, it is taken for use in traditional medicine.	Population estimate: 30,000-42,000 mature individuals. Isolated resident populations in the Cape Verde and Canary Islands through Morocco and parts of West Africa. Small resident population persists in Angola and Namibia. Main resident population occurs in Ethiopia and East Africa, Arabia and India. Migratory birds breed in southern Europe from Spain in the west, through the Mediterranean, the Caucasus and central Asia to Pakistan, northern India and Nepal.
<i>Anser cygnoides</i>	Swan goose	VU/NT	In Russia, the main threats are uncontrolled hunting, and drainage and ploughing of breeding and moulting habitats. In China, agricultural development at breeding grounds has resulted in wetland destruction and increased disturbance. Egg collection and hunting are also significant threats in China. Its wetland wintering grounds are under increasing pressure from development and pollution.	Population estimated: 60,000-80,000 mature individuals. Range estimate: 1,620,000 km ² Key breeding grounds lie in the border area between Russia, Mongolia and mainland China. Other important breeding sites include the lower reaches of the Amur river, north-western Sakhalin Island and Lake Khanka, Russia, western Mongolia and China. Key wintering sites lie along the coast of Jiangsu and around the lakes of Poyang Hu and Dongting Hu in the Yangtze basin, China.
<i>Otis tarda</i>	Great bustard	VU/VU	Key threats are increased habitat fragmentation and habitat loss due to agricultural intensification. Mechanisation, chemical fertilisers and pesticides, fire and predation all contribute to high mortality in eggs, chicks and juveniles. Hunting is a major threat in Morocco, Syria, Turkey, Ukraine and China, and collision with overhead power lines is another significant threat.	Population estimate: 45,000 mature individuals. Range estimate: 2,350,000 km ² . Breeds in Morocco (c.150 birds), Portugal (1,435 birds), Spain (23,055-25,000 birds), Austria, Germany, Slovakia, Hungary (1,100-1,300 birds), Bulgaria, Romania (nearly extirpated), Moldova, Turkey (800-3,000 birds), Iran, Russia (8,000 birds), Ukraine, Kazakhstan, Kyrgyzstan, Tajikistan, Uzbekistan, Mongolia (1,000 birds), and China (2,250-3,300 birds).
<i>Chlamydotis undulata</i> (Figure 7.22)	Houbara bustard	VU/VU	The principal threat is from hunting by Middle Eastern falconers, largely but not exclusively on the species' wintering grounds. Habitat loss and degradation compound this problem.	Population estimate: 49,000 - 62,000 mature individuals. Range estimate: 24,200,000 km ² . The <i>macqueenii</i> race extends from Egypt east of the Nile through Israel, Jordan, Lebanon, Saudi Arabia, Yemen, Oman, UAE, Bahrain, Qatar, Kuwait, Syria, Iraq, Iran, Afghanistan, Pakistan, India, Armenia, Turkmenistan, Uzbekistan, Tajikistan, Kyrgyzstan, Kazakhstan, Russian Federation and Mongolia to China, with unconfirmed reports from Azerbaijan and Turkey

Species	Common names	Category (IUCN/MRL)	Global threats	Global population and range
<i>Falco cherrug</i>	Saker falcon	VU/VU	Loss and degradation of steppes and dry grasslands through agricultural intensification, plantation establishment and declines in sheep pastoralism, causing a decline in key prey species; offtake for falconry is also a problem, which has caused local extinctions.	Population estimate: 19,200 - 34,000 mature individuals. Range estimate: 10,300,000 km ² . Breeds in Austria, Hungary, Czech Republic, Slovakia, Serbia & Montenegro, Bulgaria, Romania, Moldova, Belarus, Ukraine, Turkey, Iraq, Armenia, Russian Federation, Uzbekistan, Tajikistan, Kyrgyzstan, Kazakhstan, Mongolia and China,
<i>Larus relictus</i>	Relict gull	VU/EN	Changes in water-level affect breeding success, as do competition for breeding sites and predation by other gulls and mortality from hailstorms and flooding. Human disturbance has caused increased mortality of eggs and chicks in Russia and China, by making them vulnerable to bad weather, predation and desertion. In South Korea, most of the mudflats at the Nakdong estuary have been reclaimed and it is likely that many other coastal wetlands are under similar pressure from development.	Population estimate: 2,500-9,999 mature individuals. Range estimate: 1,380,000 km ² . Breeds at two localities in Kazakhstan, one in Russia and several in Mongolia, whilst the largest colonies are thought to occur in China, at Honjian Nur Lake, Shaanxi and previously at Taolimiao-Alashan Nur on the Ordos Plateau in Inner Mongolia, although this site was recently abandoned. Non-breeding range is poorly understood, but known to winter in South Korea and the coast of eastern China, with evidence that some winter inland on the northern flank of the Qinghai-Tibet plateau, China. Both breeding and wintering ranges are known to fluctuate widely in response to weather conditions
<i>Emberiza aureola</i>	Yellow-breasted bunting	VU/NT	The IUCN listing of this species has been uplisted to Vulnerable because, although it remains abundant locally, anecdotal evidence suggests that overall it has undergone a very rapid population decline owing mainly to trapping on wintering grounds. Breeding declines in Mongolia are attributed to the recent dry conditions and its impact on breeding habitat.	Population estimate: 120,000-1,000,000 individuals. Range estimate: 15,700,000 km ² . This species breeds across the northern Palaearctic from Finland to northern Japan, including northern Mongolia. It mainly winters in Indoburma, but also southern China and northern South Asia. It has been reported. Within the Oyu Tolgoi Aol, this species occurs as a passage migrant, with a few records of this species from the Project area.
<i>Circaetus gallicus</i>	Short-toed snake eagle	LC/EN	This species is not considered to be threatened globally.	Population estimate: 51,000 - 156,000 mature individuals. Range estimate: 13,000,000 km ² . Widespread in portions of Europe, Asia, and Africa.
<i>Aythya nyroca</i>	Ferruginous duck	NT/VU	Given that this species' range may fluctuate considerably from year to year - particularly in Asia - owing to changing water levels, it is very hard to estimate the global population or trends. There have been rapid declines in Europe, but evidence of declines in the larger Asian populations is sparse, and sometimes contradictory, so it is currently listed as Near Threatened by the IUCN. Evidence of rapid declines in Asia would qualify the species for uplisting to Vulnerable.	Population estimate: 160,000 - 257,000 mature individuals. Global range: 3,610,000 km ² . Breeds principally in south-western Asia (east to China and south to Pakistan and India), central and eastern Europe, and north Africa. Wintering range overlaps with the breeding range and extends to the Middle East, north-east and west Africa (mainly Mali and Nigeria) and South-East Asia.

Species	Common names	Category (IUCN/MRL)	Global threats	Global population and range
<i>Podoces hendersoni</i>	Mongolian ground jay	LC/VU	This species is not considered to be threatened globally.	The global population size has not been quantified, but the species has been reported to be very rare in Kazakhstan, uncommon in Mongolia and probably relatively uncommon in China. Also found in Russia.

Sources: BirdLife International Data Zone: www.birdlife.org/datazone and IUCN Red List of Threatened Species. Version 2011.1: www.iucnredlist.org.

Figure 7.19: Eurasian hoopoe in elm, near Mine Licence Area, May 2011



Figure 7.20: Lesser kestrel with toad-headed agama, May 2011



Figure 7.21: Pallas's sandgrouse near Infrastructure Corridor, May 2011



Figure 7.22: Houbara Bustard in the Galba Gobi IBA



Source: B. Nyambayar/WSCC

The 2005 Mine Licence Area DEIA included the rufous-backed bunting (*Emberiza jankowskii*), a globally-endangered species, based on a 1963 report from near the Tsagaan Bulag spring in Khanbogd *Soum*. This same report was also repeated by the Gunii Hooloi DEIA Amendment. However, Mauersberger (1978) considered the Piechocki & Bolod (1972) report from Mongolia to be in error and this species is not considered to occur in Mongolia (BirdLife International, 2001).

Mongolia has few resident bird species, owing to its northerly location and harsh winters. Of almost 200 bird species predicted or known from the unit of analysis used for the Critical Habitat determination (See Section 7.5 below), 174 are considered to be migratory species, with some of these also congregatory. However, despite the occurrence of these migrants within Oyu Tolgoi Aol, there is currently no indication that the Oyu Tolgoi Aol constitutes a major flyway where migratory birds regularly concentrate in numbers exceeding a 1% threshold, although occasional large shorebird concentrations have been noted at ephemeral lakes and pools in the area (H. von Wehrden, cited by TBC/FFI, 2011).

There are no avian species endemic to the South Gobi region, as most of the species are widespread over the interior deserts and steppes of Central Asia. There is only a single Endemic Bird Area identified in Mongolia, the “Mongolian Mountains (secondary area)”, which is defined by the range of the Mongolian accentor (*Prunella koslowi*), a poorly known species which breeds in juniper scrub and grassland on dry mountain slopes (ca. 2,000 masl) in Mongolia (BirdLife International, 2011). This is the only known restricted-range endemic bird in Mongolia (Wildlife Science and Conservation Centre of Mongolia, 2011) and while it is not known from the Oyu Tolgoi Aol, which is at much lower elevations, it is known to occur in the mountains to the west in Bayaan Ovoo *Soum*.

7.4.7 Mammals

The mammalian fauna of the Oyu Tolgoi Aol includes a rich assemblage of small mammals (e.g., jerboas, gerbils, bats, hedgehogs), carnivores (e.g., mustelids, wild cats, foxes, wolves), and large herbivores typical of the South Gobi region. The area hosts globally important populations of large native herbivores which have become decimated or extinct in much of their historical ranges, such as the Asiatic wild ass or khulan (*Equus hemionus*, *Figure 7.23 and Figure 7.24*) and the goitered or black-tailed gazelle (*Gazella subgutturosa*). Rocky areas support Siberian ibex (*Capra sibirica*) and argali sheep (*Ovis ammon*).

The species of greatest conservation interest in the Oyu Tolgoi Aol is the Asiatic wild ass, a species recognised as Endangered by both the IUCN and the *Mongolian Red List of Mammals* (Clark et al., 2006). While globally significant populations of Asiatic wild ass are well documented from the South Gobi region, the habitats utilised by this nomadic species have been locally fragmented to varying extents by the creation of transportation infrastructure (e.g., the Tavan Tolgoi to Gashuun Sukhait “coal road” and the Ulaanbaatar-Beijing railroad) and the fence constructed along the China-Mongolia border (Kaczensky et al., 2006, 2011). P. Kaczensky (in litt. 2011 in TBC & FFI 2011) has estimated a serious barrier effect for Asiatic wild ass at traffic volumes as low as 400 vehicles/day and a complete ecological barrier at 1,000 vehicles/day. A recent traffic census undertaken by Oyu Tolgoi (and reported in *Chapter B11: Transport*) identified approximately 800 vehicles/day on the coal transportation route and 250 vehicles/day on the Oyu Tolgoi to Gashuun Sukhait road [2, the implication being that while traffic volumes on the Oyu Tolgoi to Gashuun Sukhait road are not yet at levels predicted to cause a significant barrier effect for the Asiatic Wild Ass, traffic volumes on the coal transportation route are already approaching levels at which a complete ecological barrier are created. The World Bank’s *South Gobi Regional Environmental Assessment* (Walton, 2010, p. vx and p. 34) states that, according to information provided by the SGSPA Director in 2008, “gazelle and Asiatic wild ass no longer move between the two sections of the Small Gobi Strictly Protected Area because of traffic volume on the road that passes between them to the border crossing”. Nevertheless, herds of Asiatic wild ass can presently be observed both east and west of the road (*Figure 7.23 and Figure 7.24*).

A complete list of the mammal species reported from the Oyu Tolgoi Aol is presented in *Table A-4 of Annex B*. Species recognised as globally or nationally threatened (i.e., categorised as Vulnerable or Endangered by either the IUCN Red List of Threatened Speciestm Version 2011.1 or the 2006 Mongolian Red List of Mammals) are presented in *Table 7.4* below.

Table 7.4: Threatened Species of Mammals in the Oyu Tolgoi Aol

Species	IUCN Category ¹⁵	National Category	Threats	Global population and range
Long-eared jerboa (<i>Euchoreutes naso</i>)	LC	VU	Habitat degradation, possibly through grazing by increasing numbers of livestock (further evidence is required). Human disturbance may also constitute a minor threat. Drying of water sources and droughts also threaten this species, although it remains unclear if these represent natural environmental changes or are driven by anthropogenic activity.	China and Mongolia. In Mongolia, reported from scattered localities in desert habitats of the Trans Altai Gobi Desert and Alashani Gobi Desert. Mongolia represents the northern limit of its global distribution. In China, known from arid regions of Xinjiang, Gansu, Qinghai, Nei Mongol, and Ningxia provinces. Reported by the 2011 RBA surveys from the Daichin Zag saxaul forest along the Bulsh dry river bed in the “stony terrace plain” landform unit to the west of the Gashuun Sukhait-Oyu Tolgoi Transmission Line corridor. These may be the easternmost known populations of the long-eared jerboa.
Snow leopard (<i>Panthera uncia</i>)	EN	EN	In the northern range (Russia, Mongolia, and Altai and Tien Shan ranges of China), threats include poaching for trade in hides or bones, lack of appropriate policy and effective enforcement, lack of institutional capacity and awareness among local people and policy makers, and human population growth or poverty.	Restricted to high mountains of Central Asia, with core areas including the Altai, Tien Shan, Kun Lun, Pamir, Hindu Kush, Karakorum and Himalayan ranges. Global population estimated at 4,080-6,590. Not reported in Oyu Tolgoi Area of Direct Influence, but known to occur in the broader region.
Marbled polecat (<i>Vormela peregusna</i>)	VU	DD	The major threat to this species is the loss of natural steppe and desert habitats. Steppe habitats declining in Europe through conversion to cultivated farmland. Secondary poisoning by rodenticides may also be a threat, as are population declines in key prey species. In China, desertification is the major threat to the species.	Afghanistan, Armenia, Azerbaijan, Bulgaria, China, Georgia, Greece, Iran, Iraq, Israel, Kazakhstan, Lebanon, Macedonia, Mongolia, Montenegro, Pakistan, Romania, Russian Federation, Serbia, Syrian Arab Republic, Turkey, Turkmenistan, Ukraine, Uzbekistan
Asiatic wild ass or Khulan (<i>Equus hemionus</i>)	EN	EN	The Mongolian population is at risk due to illegal hunting and numbers have declined significantly from an estimated population size of 43,165 in 1997. Offtake for the illegal meat trade is estimated at 3,000 individuals per year. If illegal hunting continues in Mongolia, the potential decline of this important population will be 5-10% per year. Recruitment (number of offspring) varies from 3-23%. The potential net loss per year may be 5-10%. In 21 years or 3 generations, the population decline will be greater than 50%.	Native populations remain only in China, India, Iran, Mongolia, and Turkmenistan, having been extirpated over much of its historic range. The largest remaining subspecies population is the Mongolian Khulan which was estimated in 2003 at 18,411 +/- 898 in four areas. Southern Mongolia currently holds the largest population of Asiatic wild ass in the world, representing almost 80% of the global population. There may be as many as 4,800 to 6,000 Khulan in the Kalameili Reserve in China, but this may be a seasonal population that is migrating from Mongolia.

¹⁵ DD= Data Deficient, EN=Endangered, LC=Least Concern, NT=Near Threatened, VU=Vulnerable

Species	IUCN Category ¹⁵	National Category	Threats	Global population and range
			Other threats in Mongolia include habitat degradation/ loss as a result of new human settlements (which restrict access to oases), resource extraction (mining), and possibly increasing numbers of livestock grazing (further evidence is required). Habitat fragmentation and restriction of wide-scale movements due to fencing is a significant problem along the Ulaanbaatar-Beijing railway and the China-Mongolia border, and is also caused by developing roads and railway lines associated with increasing resource extraction.	Recent evidence suggests that the Mongolian population has either expanded or shifted further north and east over the past 20-25 years, but rarely crosses the Ulaanbaatar-Beijing railway line. There are important populations in the Great Gobi Section B Strictly Protected Area, in Dzungarian Gobi, and the Great Gobi Section A Strictly Protected Area in Trans Altai Gobi Desert. The global population of mature Asiatic Wild Ass has declined by 52% population in the last 16 years. Generation length in <i>Equus hemionus</i> is seven years, age at first reproduction for females is 5 years, females produce one live foal every three years, sex-ratio at birth is 50/50, first year survival rate is approximately 50%, second year survival rate is approximately 50%, and only half of the stallions reproduce, yielding an approximately one-third of the population being 'mature individuals'. The current estimated number of mature individuals is 8,358. The estimated global population decline in the future is >50% due to illegal hunting.
Goitered or Black-tailed gazelle (<i>Gazella subgutturosa</i>)	VU	VU	The main threats are illegal hunting (for meat and to a lesser extent for trophies) and habitat loss (due to economic development, conversion to agriculture, increasing numbers of domestic livestock). In Central Asia the species is susceptible to the effects of severe winter weather. On the Arabian Peninsula some are live-caught for private collections. In Mongolia, illegal hunting for meat and sport is the primary threat. Although this species requires very little water, increasing numbers of livestock may compete for use of oases, resulting in pasture degradation (further evidence is required). Increasing resource extraction (mining) is not causing a substantial loss of habitat at present, but associated human disturbance is a threat in some areas.	Afghanistan, Azerbaijan, Bahrain, China, Iran, Iraq, Jordan, Kazakhstan, Kyrgyzstan, Mongolia, Oman, Pakistan, Saudi Arabia, Syrian Arab Republic, Tajikistan, Turkey, Turkmenistan, United Arab Emirates, Uzbekistan, Yemen. Numbers were estimated at 120,000-140,000 in 2001, but populations throughout the range have decreased significantly since then. The population in Mongolia is thought to contain the largest remaining population of the species (estimated at 60,000 in the early 1990s), so holding an estimated 40-50% of the global population. However, this population has been heavily reduced by poaching in the last 2-3 years and this decline is continuing.
Mongolian gazelle (<i>Procapra gutturosa</i>)	LC	EN	Illegal hunting (in addition to the legal harvest) is an increasing threat. The species is harvested for meat and hides. Former tight control in Mongolia has weakened during the last decade and tens of thousands are killed	Population estimates over the last 10 years have ranged from 400,000 to 2,700,000. The species is subject to population fluctuations due to disease and effects of severe winter conditions. Occurs in eastern Mongolia and adjacent areas of

Species	IUCN Category ¹⁵	National Category	Threats	Global population and range
			<p>illegally on top of the official harvest.</p> <p>The Ulaanbaatar-Beijing railway is double-fenced and has effectively cut off the smaller populations from the core population in eastern Mongolia. Outbreaks of disease and severe winters result in sporadic heavy mortality.</p>	<p>Russia and north-eastern China. Smaller populations are still found in central and western Mongolia. There is a translocated population on Homin Tal steppe in Zavkhan Province of west-central Mongolia.</p>
<p>Argali or wild mountain sheep (<i>Ovis ammon</i>)</p>	<p>NT</p>	<p>EN</p>	<p>The main threat facing argali in Mongolia is poaching for subsistence (meat) and increasingly for their horns, which are increasingly being used as substitute horn in traditional Chinese medicine. Also important are the impacts from local, nomadic pastoralists who displace argali, whose livestock feed on the same forage as argali, and whose dogs chase and even kill argali.</p> <p>More minor and localised threats include unsustainable trophy hunting and habitat loss resulting from rapidly increasing resource extraction (i.e., mining). Subsistence poaching by miners general represents a greater threat than actual mining activities, but this may change as the number of mines continues to grow rapidly. These threats remain important due to poor or non-existence law enforcement throughout most of the range of the species in Mongolia. Very little money from trophy hunting currently supports conservation activities in Mongolia.</p>	<p>This species is found currently in northeastern Afghanistan, China, northern India, eastern Kazakhstan, eastern Kyrgyzstan, Mongolia, northern Nepal, extreme northern Pakistan, Russia, eastern Uzbekistan, and eastern Tajikistan.</p> <p>Argali are distributed widely, but patchily across a large portion of Mongolia. Historically, argali occurred in disjunct populations across all, but eastern Mongolia, in areas with rolling hills, mountains, rocky outcrops, canyons, and plateaus. Argali appear to be expanding their distribution in eastern Mongolia, but contracting and becoming even more fragmented in western Mongolia. Large areas formerly occupied in western Mongolia now lack the species. The current distribution includes portions of the Altai, Trans-Alai, Gobi-Altai, Khangai, Khentii, and Khovsgol Mountain ranges, as well as isolated areas in the Gobi Desert. More specifically, isolated populations exist in the mountains of the Mongolian Altai and Gobi Altai Mountains, primarily the western and southern Khangai Mountains, near the source of the Arsain River in the Khovsgol Mountains, and the southernmost Khentii Mountains. Other populations persist patchily in the Dzungarian Gobi Great Gobi, Trans-Altai Gobi, Alashan Gobi, Middle Gobi, and eastern Gobi.</p> <p>Argali continue to decline in western and central Mongolia, while populations in eastern Mongolia appear to be expanding. Argali populations in southern Mongolia appear to be relatively stable. Probably no more than a few thousand Altai argali (<i>O. a. ammon</i>) persist in Mongolia, while several thousand Gobi argali (the putative <i>O. a. darwini</i>) inhabit a growing range in the south and east.</p>

Sources: Clark et al. (2006) and IUCN Red List of Threatened Speciessm. Version 2011.1

Figure 7.23: Asiatic wild ass, SGSPA-B, East of Infrastructure Corridor, May 2011



Figure 7.24: Asiatic wild ass near Daichin Zag, West of Infrastructure Corridor, May 2011



7.4.8 Fauna Dynamics

Although a large number of fauna species have been recorded within the Mine Licence Area, many species have low densities and the larger species have a wide habitat range. This is particularly true for grazing species that move over large distances in search of good pastures and water sources. It is considered that the baseline surveys and additional monitoring provide a good general representation of the current situation although clearly the fauna within the construction areas and along the roads will have been displaced and migration patterns altered due to the fencing of part of the Mine Licence Area. There is anecdotal evidence that gazelles may be attempting to cross into the fenced Mine Licence Area to take advantage of increased availability of forage due to the exclusion of livestock.

In the developed areas of the Mine Licence Area, the increased human activity associated with the Oyu Tolgoi Project has resulted in changes to the fauna community including an increase in species associated with human populations and the loss of species sensitive to human activities. For example the house sparrow (*Passer domesticus*) and common raven (*Corvus corax*) are considered as urban species and their populations in the Oyu Tolgoi area have increased. The numbers of scavenger animals such as black kite (*Milvus migrans*), black vulture (*Aegypius monachus*), long-eared hedgehog (*Hemiechinus auritus*), red fox (*Vulpes vulpes*) and Corsac fox (*Vulpes corsac*) appear to have also increased.

The construction of various ponds for water in the Mine Licence Area, in particular the domestic wastewater lagoon, has attracted many species of shorebirds and waterfowl that would normally simply pass through the area. Numerous new records for the area have been made at these ponds.

7.5 CRITICAL HABITAT DETERMINATION

This section determines the extent of, and qualifying criteria for, Critical Habitat applicable to the Oyu Tolgoi Project. This summary provides the essential technical information and the resulting key conclusions and implications. The full Technical Report (Annex C prepared by The Biodiversity Consultancy and Fauna & Flora International (“TBC/FFI”) and designed for financial and technical advisors, analysts, and project stakeholders, provides details of the requirements of Paragraph 9 of the 2006 version of IFC Performance Standard 6 (PS6), Paragraph 13 of EBRD Performance Requirement 6 (PR6) and the 2009 IFC Oyu Tolgoi Project Guidance Note on Critical Habitat; the custom-built methods developed to respond to this guidance; maps of the spatial units of analysis evaluated; full results for each PS6 Paragraph 9/PR6 Paragraph 13 criterion; the implications of these results for the Project; and the next steps required. This document is complemented by a Biodiversity Impacts and Mitigations report covering all infrastructure components of the Oyu Tolgoi Project as well as an offsets strategy and a Net Positive Impact Forecast (see Box 1). These complementary documents will contain the information to form the basis of compliance against PS6 Paragraph 10/PR6 Paragraph 14, which cover Project impacts and the mitigation options available.

7.5.1 What is Critical Habitat?

Critical Habitat is a concept within the International Finance Corporation Performance Standard 6 and the European Bank for Reconstruction and Development Performance Requirement 6 to facilitate the identification of areas of High Biodiversity Value. The intention of delineating Critical Habitat is to define areas in which development would be of a particularly sensitive nature and require special attention were it to go ahead. This Critical Habitat assessment follows the IFC Oyu Tolgoi Project Guidance Note on Critical Habitat which states that: “*Critical habitats are areas of high biodiversity value that include at least one of the seven criteria specified in para. 9 of PS6*”. These seven criteria are:

1. Critically Endangered and Endangered Species (see *Table 7.5* for more detail)
2. Endemic and Restricted-range Species (see *Table 7.5* for more detail)
3. Migratory and Congregatory Species
4. Unique Assemblages of Species
5. Key Evolutionary Processes
6. Key Ecosystem Services
7. Biodiversity of Significant Social, Economic or Cultural Importance to Local Communities

Critical Habitat is triggered if the requirements of any one of these seven Criteria are met. Quantitative thresholds have been set for Criteria 1-3 (species); qualitative thresholds exist for Criteria 4-7 (habitats, functions, processes and ecosystem services) but depend on quantitative assessment, and expert and participatory judgement. Key issues arising from the Critical Habitat concept include:

- The regional context of the Project site must be studied to provide the ecological context for the Project site: what is the relationship between the Project site and the surrounding environment?
- Critical Habitat is delimited using a recognised spatial unit of analysis. The boundary of the unit of analysis is defined by a sensible ecological (e.g. watershed) or management (e.g. protected area) unit within which the Project site is found. Critical habitat does not consist of small polygons delineated in and around the project site.
- Tiers of Critical Habitat: Grades of significance of Critical Habitat are now recognised and have been defined in terms of difficulty in assuring compliance with critical habitat requirements. Most important amongst these grades are the two Tiers of Critical Habitat defined for Criteria 1-3 of Paragraph 9. Tier 2 Critical Habitat is more likely to be offsettable, although both Tier 1 and Tier 2 habitat are bound by identical critical habitat requirements.

- Quantitative thresholds are proposed as guidance for the species Criteria 1-3 within the 2006 version of PS6 Paragraph 9 which define whether Critical Habitat is triggered and for which Tier. Qualitative thresholds remain for Criteria 4-7. For Criteria 1-2, these thresholds are summarised in *Table 7.5*.

Table 7.5: Quantitative thresholds to define Critical Habitat and Tiers 1 and 2 for Critically Endangered/Endangered and endemic/restricted-range species (Criteria 1 and 2 of 2006 version of PS6 Paragraph 9), from TBC (2010)

Criteria	Tier 1	Tier 2
1. Critically Endangered/Endangered	<p>a) Habitat required to sustain ≥ 10 percent of the global population of an IUCN Red-listed CR or EN species/subspecies where there are known, regular occurrences of the species/sub-species and where that habitat could be considered a discrete management unit for that species/subspecies.</p> <p>b) Habitat with known, regular occurrences of CR or EN species/ subspecies where that habitat is one of 10 or fewer discrete management sites globally for that species/subspecies.</p>	<p>c) Habitat that supports the regular occurrence of a single individual of an IUCN Red-listed CR species/subspecies and/or habitat containing regionally-important concentrations of an IUCN Red-listed EN species/subspecies where that habitat could be considered a discrete management unit for that species/subspecies.</p> <p>d) Habitat of significant importance to CR or EN species/subspecies that are wide-ranging and/or whose population distribution is not well understood and where the loss of such a habitat could potentially impact the long-term survivability of the species/subspecies.</p> <p>e) Habitat required to sustain ≥ 10 percent of the national (or regional) population of a nationally-listed (or regionally-listed) CR or EN (or equivalent) species/subspecies (i.e., habitat is one of 10 or fewer in-country or regional locations) and where that habitat could be considered a discrete management unit.</p>
2. Endemic/restricted-range	<p>a) Habitat known to sustain ≥ 95 percent of the global population of an endemic or restricted-range species/subspecies where that habitat could be considered a discrete management unit for that species/subspecies (e.g., a single-site endemic).</p>	<p>b) Habitat known to sustain ≥ 1 percent but < 95 percent of the global population of an endemic or restricted-range species/subspecies where that habitat could be considered a discrete management unit for that species/ subspecies, where data are available.</p> <p>c) Habitat known to sustain an endemic or restricted-range species/ subspecies where that habitat is restricted to 2 to 100 discrete management sites globally, where data are available.</p>

7.5.2 Methodology of Critical Habitat determination

There are three steps used to identify Critical Habitat. Detailed descriptions are given in the methods section of the technical report (see Annex C).

- **Step 1:** Define scope of assessment, the Project Area of Influence, and the spatial units of analysis.
- **Step 2:** Collect and verify available information on biodiversity and ecosystem services using biological and social fieldwork, literature review, expert consultation and analysis.
- **Step 3:** Screen and select biodiversity components (species, habitats, ecosystem processes and services) possibly qualifying under Paragraph 9 criteria; conduct detailed assessments to identify which components qualify as Critical Habitat using stated quantitative thresholds (Criteria 1-3), or deriving appropriate thresholds from peer reviewed literature (Criteria 4-7).

7.5.3 Results of Critical Habitat determination

- **Spatial Scope and Units of Analysis.** Following the Oyu Tolgoi Project Guidance Note on Critical Habitat, two different units of analysis were identified, related to the ecology and/or impacts applicable to particular biodiversity features. First, the area comprising Khanbogd, Manlai and Bayan-Ovoo *soums*, and Small Gobi Strictly Protected Area sectors A and B was identified as the spatial unit of analysis for large mammals, owing to the nomadic movements of some species of ungulate¹⁶ and to potential secondary impacts across this whole area, notably including increased hunting owing to in-migrants and increased wealth (and consequent availability of vehicles and firearms). This unit of analysis covers 51,415 km². Second, a smaller area comprising Khanbogd and Manlai *soums* was identified as the spatial unit of analysis for all other species, unique assemblages of species, key evolutionary processes, key ecosystem services and biodiversity of significant social, economic or cultural importance to local communities. This unit of analysis incorporates not only Khanbogd *soum*, across which there will be primary impacts from the mine and associated infrastructure, but also Manlai *soum*, into which the Gunii Hooloi aquifer appears to extend (and thus into which significant secondary impacts may potentially occur from mine-related water extraction¹⁷). This unit of analysis covers 27,375 km².
- **Criterion 1: Critically Endangered and Endangered species: Triggered.** No Critically Endangered species are known or predicted to occur in the units of analysis. Eighteen candidate plants listed as 'very rare' in national law, three candidate globally Endangered animal species, and four additional candidate nationally Endangered animal species are known or predicted to occur in the respective applicable units of analysis. Of these candidate species, one (Asiatic Wild Ass *Equus hemionus*) qualifies for Tier 1 Critical Habitat under Criterion 1, and a further three (the plant *Chesneya/Chesniella mongolica*, Argali *Ovis ammon* and Short-toed Snake-eagle *Circaetus gallicus*) qualify for Tier 2 Critical Habitat under Criterion 1. A species summary is given in Table 7.6.
- **Criterion 2: Restricted-range and endemic species: Not Triggered.** One candidate restricted-range species (Mongolian Accentor *Prunella koslowi*) is believed to occur in the applicable (smaller) unit of analysis but does not qualify for Critical Habitat under Criterion 2.
- **Criterion 3: Migratory and congregatory species: Triggered.** 174 candidate migratory bird species, one candidate migratory ungulate species, one candidate migratory hamster species and two candidate migratory bat species are known or predicted to occur in the respective applicable units of analysis. The two bat species, and two others, also form nesting and/or roosting colonies, and so could be considered to be candidate congregatory species. One of the candidate species, Goitered Gazelle *Gazella subgutturosa*, exceeds the 1% threshold and so qualifies for Tier 2 Critical Habitat under Criterion 3.

¹⁶ Particularly Asiatic Wild Ass, which persists in all but the most northern parts of this unit of analysis and which comprises a primary reason for establishing the two parts of the Small Gobi Special Protected Area.

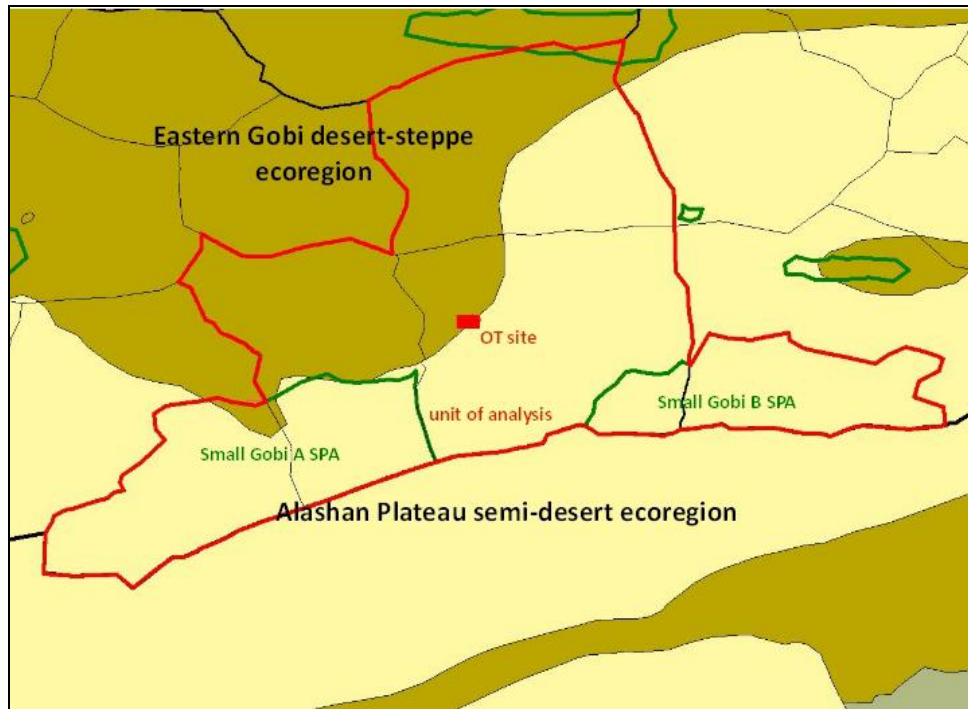
¹⁷ Although these potential impacts have a low likelihood, the consequences if they did occur could be very significant for all biodiversity in the impact area.

- **Criterion 4: Unique assemblages of species: Triggered.** The fauna and flora assemblages of the applicable (smaller) unit of analysis are broadly similar in species composition to nearby areas. Although some landscape-level features were considered important (notably large ungulate communities, riverine Elm trees along seasonal watercourses, ephemeral lakes/ponds, and exceptionally high quality Saxaul forests), these are at a scale larger than 'unique assemblages' are usually considered. While elm/saxaul are not considered to trigger Critical Habitat under Criteria 1-4, tall saxaul is part of the 'biomass fuel' triggering Criterion 7 and both riverine elm and tall saxaul habitats have been taken on board by Oyu Tolgoi as 'priority biodiversity features' based on stakeholder interest in these habitats. They are thus considered under mitigation and offset actions, and Oyu Tolgoi aims to achieve Net Positive Impact for these features as detailed in the NPI forecast. On the contrary, granite outcrops do occur at this scale in this unit of analysis and have distinct floral communities owing to the aridity of the surrounding region. Consequently, in the sense of Criterion 4 this unit of analysis can be considered as Critical Habitat for these particular granite outcrop floral communities.
- **Criterion 5: Key evolutionary processes: Not Triggered.** The applicable (smaller) unit of analysis does not appear to have been the subject of the significant evolutionary processes required to meet this criterion. Rather, it is representative of the two broad ecoregions (the Eastern Gobi desert steppe and the Alashan Plateau semi-desert) within which it is embedded. This unit of analysis thus does not qualify as Critical Habitat under Criterion 5.
- **Criterion 6: Key ecosystem services: Triggered.** Water regulation triggers Critical Habitat under this category. This criterion largely refers to regulating and supporting ecosystem services (Millennium Ecosystem Assessment, 2005). Regulating services are benefits obtained from the regulation of ecosystem processes such as flood control; one regulating service triggered Critical Habitat. Supporting services are those such as soil formation that form the base of support for ecosystems to function; no supporting services were assessed to be of sufficient importance to qualify for Critical Habitat. This study assessed all applicable ecosystem services, including air quality regulation, climate regulation, water regulation, erosion regulation, water purification and waste treatment, disease regulation, pest regulation and natural hazard regulation. The spatial unit of analysis for this criterion was the smaller unit comprising Khanbogd and Manlai *soums*.
- **Criterion 7: Biodiversity of social, economic or cultural significance for local communities: Triggered.** Biodiversity supporting provision of three ecosystem services triggered Critical Habitat under this category, namely: livestock; biomass fuel; and freshwater. No cultural services were assessed as qualifying for Critical Habitat. Note that this criterion largely refers to provisioning and cultural ecosystem services: provisioning services are goods or products obtained from ecosystems, such as food, freshwater, timber, fibre and other goods (Millennium Ecosystem Assessment 2005). Cultural services are non-material benefits obtained from an ecosystem, such as spiritual enrichment, intellectual development, religious experience and recreation (Millennium Ecosystem Assessment, 2005). The spatial unit of analysis for this criterion was the smaller unit comprising Khanbogd and Manlai *soums*.

Figure 7.25: (after Figure 2a and 2b of TBC & FFI 2011) Spatial Unit of Analysis for large mammals (a), and for all other species (b), unique assemblages of species, key evolutionary processes, key ecosystem services and biodiversity of significant social, economic or cultural importance to local communities.

The limits of these spatial units of analysis as used in the Critical Habitat assessment of Paragraph 9 are shown in red.

(a)



(b)

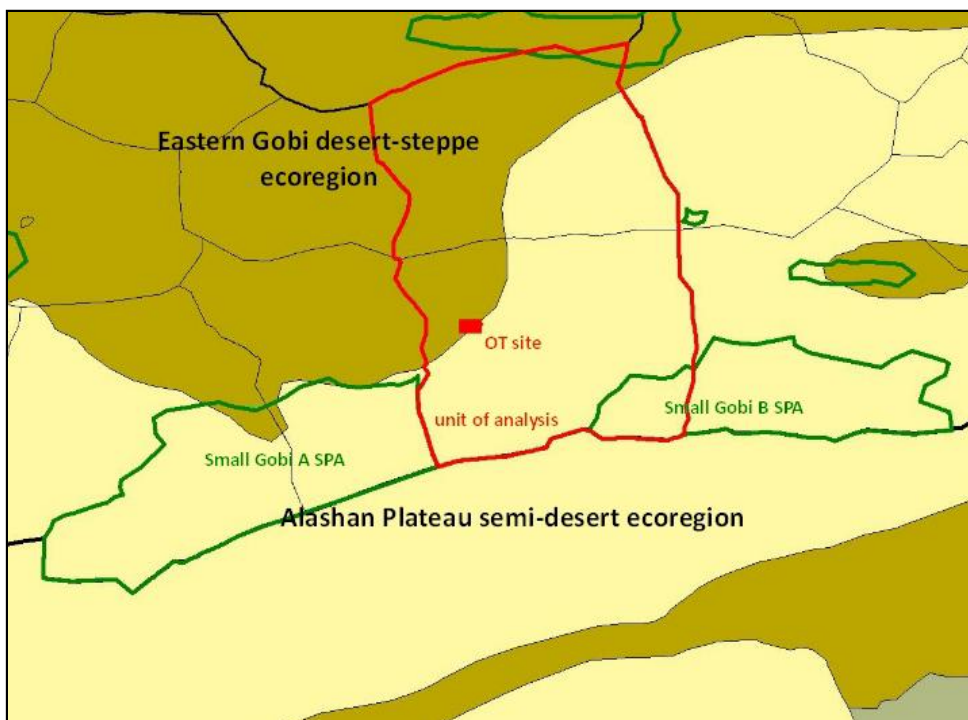


Table 7.6: Criteria 1, 2 and 3 candidate species and their assessment against Paragraph 9 (Critical Habitat trigger species are highlighted in bold)

Note: four species triggered Criterion 1 on endangered species. No species triggered Criterion 2 on restricted-range and endemic species. One species triggered Criterion 3 on migratory and congregatory species. Overall, one species triggered Tier 1 Critical Habitat and four species triggered Tier 2 Critical Habitat.

No.	Species	Common name ¹⁸	CRITERION 1 CR and EN species	CRITERION 2 Restricted- range and Endemic species	CRITERION 3 Migratory and congregatory species	Tier 1 Critical Habitat	Tier 2 Critical Habitat	Rationale (Significance of unit of analysis to critical habitat trigger species)
PLANTS								
1	<i>Cistanche deserticola</i>	Desert Cistanche	Potentially nationally EN	-	-	-	-	Does not meet Criterion 1 thresholds
2	<i>Iljinia regelii</i>	Regelian Iljinia	Potentially nationally EN	-	-	-	-	Does not meet Criterion 1 thresholds
3	<i>Chesneya Chesniella mongolica</i>	Mongolian Chesney	Potentially nationally EN	-	-	-	Yes	Criterion 1. 'nationally-important concentrations of a nationally Red Listed EN species' (>10% of the national population in the unit of analysis)
4	<i>Limonium aureum</i>	Golden Limonium	Potentially nationally EN	-	-	-	-	Does not meet Criterion 1 thresholds
5	<i>Arnebia guttata</i>	Yellow Arnebia	Potentially nationally EN	-	-	-	-	Does not meet Criterion 1 thresholds
6	<i>Asterothamnus centrali-asiaticus</i>	Central Asian Asterthemny	Potentially nationally EN	-	-	-	-	Does not meet Criterion 1 thresholds
7	<i>Gymnocarpus przewalskii</i>	Przewalski's Gymnocarpus	Potentially nationally EN	-	-	-	-	Does not meet Criterion 1 thresholds
8	<i>Oxytropis grubovii</i> ¹⁹	Grubov's Oxytrope	Potentially nationally EN	-	-	-	-	Does not meet Criterion 1 thresholds
9	<i>Brachanthemum gobicum</i>	Gobi Brachanthemia	Potentially nationally EN	-	-	-	-	Does not meet Criterion 1 thresholds
10	<i>Incarvillea potaninii</i>	Potanin's Incarvillea	Potentially	-	-	-	-	Does not meet Criterion 1 thresholds

¹⁸ Most common names for plants are taken from the Mongolian Law on Natural Plants and are rarely used elsewhere (most of these species are only regularly referred to by their scientific names).

¹⁹ Also referred to in other publications as *Chesneya macrantha* or *Chesneya grubovii*

No.	Species	Common name ¹⁸	CRITERION 1 CR and EN species	CRITERION 2 Restricted- range and Endemic species	CRITERION 3 Migratory and congregatory species	Tier 1 Critical Habitat	Tier 2 Critical Habitat	Rationale (Significance of unit of analysis to critical habitat trigger species)
			nationally EN					
11	<i>Caragana gobica</i>	Gobi Pea Shrub	Potentially nationally EN	-	-	-	-	Does not meet Criterion 1 thresholds
12	<i>Caragana brachypoda</i>	Brachypodous Pea Shrub	Potentially nationally EN	-	-	-	-	Does not meet Criterion 1 thresholds
13	<i>Olgaea leucophylla</i>	White-leaved Olgaea	Potentially nationally EN	-	-	-	-	Does not meet Criterion 1 thresholds
14	<i>Potaninia mongolica</i>	Mongolian Potaninia	Potentially nationally EN	-	-	-	-	Does not meet Criterion 1 thresholds
15	<i>Zygophyllum potaninii</i>	Potanin's Zygophyllia	Potentially nationally EN	-	-	-	-	Does not meet Criterion 1 thresholds
16	<i>Jurinea mongolica</i>	Mongolian Jurinea	Potentially nationally EN	-	-	-	-	Does not meet Criterion 1 thresholds
17	<i>Tugarinovia mongolica</i>	Mongolian Tugarinovy	Potentially nationally EN	-	-	-	-	Does not meet Criterion 1 thresholds
18	<i>Artemisia xanthochroa</i>	Yellow Wormwood	Potentially nationally EN	-	-	-	-	Does not meet Criterion 1 thresholds
MAMMALS								
19	<i>Panthera uncia</i>	Snow Leopard	EN	-	-	-	-	Does not meet Criterion 1 thresholds
20	<i>Equus hemionus</i>	Asiatic Wild Ass or 'Khulan'	EN	-	-	Yes	-	Criterion 1. 'globally-important concentrations of an IUCN Red Listed EN species' (>10% of the global population in the unit of analysis)
21	<i>Ovis ammon</i>	Argali	EN (nationally)	-	-	-	Yes	Criterion 1. 'nationally-important concentrations of a nationally Red Listed EN species' (>10% of the national population in the unit of analysis)
22	<i>Gazella subgutturosa</i>	Goitered Gazelle	-	-	migratory	-	Yes	Criterion 3. 'globally-important concentrations of a migratory species' (>1% of the global population in the unit of analysis)

No.	Species	Common name ¹⁸	CRITERION 1 CR and EN species	CRITERION 2 Restricted- range and Endemic species	CRITERION 3 Migratory and congregatory species	Tier 1 Critical Habitat	Tier 2 Critical Habitat	Rationale (Significance of unit of analysis to critical habitat trigger species)
23	<i>Procapra gutturosa</i>	Mongolian Gazelle	EN (nationally)	-	-	-	-	Does not meet Criterion 1 thresholds
BIRDS								
24	<i>Circaetus gallicus</i>	Short-toed Snake-eagle	EN (nationally)	-	migratory	-	Yes	Criterion 1. 'nationally-important concentrations of a nationally Red Listed EN species' (>10% of the national population in the unit of analysis); Does not meet Criterion 3 thresholds
25	<i>Neophron percnopterus</i>	Egyptian Vulture	EN	-	-	-	-	Does not meet Criterion 1 thresholds
26	<i>Larus relictus</i>	Relict Gull	EN (nationally)	-	migratory	-	-	Does not meet Criterion 1 or Criterion 3 thresholds
27	<i>Prunella koslowi</i>	Mongolian Accentor	-	restricted-range	migratory	-	-	Does not meet Criterion 2 or 3 thresholds
OTHER MIGRATORY/CONGREGATORY SPECIES								
	Three migratory mammals, two congregatory mammals (bats), 171 migratory birds		-	-	migratory	-	-	Do not meet Criterion 3 thresholds
Total number of candidate species assessed against each criterion, and total number of species triggering each Tier.			25	1	180	1	4	Tier 1 Critical Habitat triggered by one species. Tier 2 Critical Habitat triggered by four species.

7.5.4 Conclusions and implications of the Critical Habitat determination

Following the criteria of Paragraph 9 within the 2006 version of the International Finance Corporation's Performance Standard 6 (Biodiversity Conservation and Sustainable Natural Resource Management), the IFC Oyu Tolgoi Project Guidance Note on Critical Habitat, and Paragraph 13 within the European Bank for Reconstruction and Development's Performance Requirement 6, this report finds that the entirety of both units of analysis defined for Oyu Tolgoi are Critical Habitat.

The larger unit of analysis (identified as the spatial unit of analysis for large mammals) – comprising Khanbogd, Manlai and Bayan-Ovoo *soums* and Small Gobi SPA sectors A and B (51,415 km²) – qualifies as Critical Habitat under criteria 1 and 3 of the 2006 version of PS6 Paragraph 9. The boundary of this Critical Habitat is therefore the boundary of this unit of analysis, encompassing Khanbogd, Bayan-Ovoo and Manlai *soums* and both A and B sectors of Small Gobi Strictly Protected Area, a total area of c. 51,000 km². This unit of analysis triggers Critical Habitat under two PS6 Paragraph 9 criteria: Criterion 1 - its significance for globally and nationally Endangered species (two species) and Criterion 3 - its significance for migratory and congregatory species (one species). Therefore this unit of analysis does not qualify for Critical Habitat under Criterion 2 - restricted range and endemic species, and was not considered to be an appropriate scale for assessing Criterion 4 - unique assemblages; Criterion 5 – evolutionary processes; Criterion 6 - ecosystem services; and Criterion 7 – biodiversity of social, economic or cultural importance.

Within this larger unit of analysis there are several grades of Critical Habitat. The most sensitive in terms of irreplaceability and vulnerability are defined as IFC Tier 1. The range of Asiatic Wild Ass *Equus hemionus* in this unit of analysis is currently defined as Tier 1, and covers the majority of the unit of analysis. This is due to this unit of analysis representing more than 10% of the population of this globally Endangered species. All other habitats within the unit of analysis are currently classified as Tier 2 due to other applicable criteria (see Methods Annex C).

The smaller unit of analysis (identified as the spatial unit of analysis for all species other than large mammals, and for unique assemblages, evolutionary processes, and ecosystem services) – comprising Khanbogd and Manlai *soums* (27,375 km²) – qualifies as Critical Habitat under criteria 1, 4, 6 and 7 of the 2006 version of PS6 Paragraph 9. The boundary of this Critical Habitat is therefore the boundary of this unit of analysis, encompassing Khanbogd and Manlai *soums*, a total area of 27,375 km². This unit of analysis triggers Critical Habitat under four PS6 Paragraph 9 criteria: Criterion 1 - its significance for globally and nationally Endangered species (two species); Criterion 4 – its significance for unique assemblages of species (one assemblage); Criterion 6 – its significance for key ecosystem services (one ecosystem service); and Criterion 7 – its significance for biodiversity of social, economic or cultural importance to local communities (three ecosystem services). Therefore this unit of analysis does not qualify for Critical Habitat under Criterion 2 - restricted range and endemic species; Criterion 3 – migratory and congregatory species; and Criterion 5 – evolutionary processes. The entirety of this smaller unit of analysis is Tier 2 Critical Habitat.

These results mean that development within the Oyu Tolgoi units of analysis will be subject to the requirements of Paragraph 10 of the 2006 version of the IFC Performance Standard 6/Paragraph 14 of EBRD Performance Requirement 6 and also the interpretation of PS6 Paragraph 10 as set out in the Oyu Tolgoi Project Guidance Note (IFC 2009). These requirements and their implications for the Project can be summarised with reference to the Project Guidance Note as:

IFC Requirement 1: *“In areas of critical habitat, the client will not implement any project activities unless... There are **no measurable adverse impacts** on the ability of the critical habitat to support the established **population** of species described in paragraph 9 or the **functions** of the critical habitat described in paragraph 9”*

Project Implications of Requirement 1: The terms highlighted in bold in the IFC requirements have very specific definitions in the Oyu Tolgoi Project Guidance Note (IFC 2009), see Section 6.2 (TBC & FFI 2011) for further details. Requirement 1 means that there should be no measurable adverse impacts on Paragraph 9-qualifying biodiversity values over the long term at the broader regional scale. It is accepted that there may be some measurable negative impacts at the Project site scale (particularly in the short term), although these should be avoided, minimised and mitigated as far as possible, following the mitigation hierarchy. Particular attention will be given to managing long-term indirect impacts (especially

habitat fragmentation, the spread of invasive species and induced access) (IFC 2009). Monitoring and evaluation of all Project impacts on Critical Habitat is required.

IFC Requirement 2: *“In areas of critical habitat, the client will not implement any project activities unless... There is no **reduction** in the **population** of any recognised critically endangered or endangered species”*

Project Implications of Requirement 2: The impact of potential losses at the project site on species populations should be considered at the global level (or at the national/regional level, where appropriate). A combination of on-site and offset mitigation measures will be used to further the conservation of Critically Endangered and Endangered species qualifying for Paragraph 9. Monitoring and evaluation of all Project impacts on these species is required.

IFC Requirement 3: *“In areas of critical habitat, the client will not implement any project activities unless... Any **lesser impacts** are mitigated in accordance with paragraph 8”*

Project Implications of Requirement 3: Residual impacts on Critical Habitat (e.g. those that are impossible or not cost effective in terms of benefits to biodiversity to mitigate through avoidance, minimisation or rehabilitation) should be mitigated through the implementation of biodiversity offsets (IFC 2009). Tier 1 Critical Habitat is generally not considered to be ‘offsetable’, although there are some situations (for example due to the degree of impact, the client’s capacity and the quality of their biodiversity programme) in which such offsets would be acceptable; this needs to be determined on a case-by-case basis with input from appropriate experts and stakeholders. Some Critical Habitat as per Criteria 4 through 7 (which do not distinguish between Tier 1 and Tier 2) may also be “*very difficult, or impossible, to offset*” (IFC 2009).

Two further important points are made in the Oyu Tolgoi Project Guidance Note (IFC 2009) that apply to all three requirements. First, a biodiversity monitoring programme is essential to ensure that Requirements 1-3 are being met. A set of biodiversity indicators should be developed that specify thresholds for acceptable and unacceptable levels of loss at the site scale for both species and habitats, and these indicators will be incorporated into the broader Social and Environmental Management System. Second, all three requirements allow for the use of biodiversity offsets to compensate for residual impacts on Critical Habitat biodiversity values, while acknowledging that offsets are not appropriate in all cases (some biodiversity values are not offsetable).

The IFC and EBRD requirements do not substantially differ from the requirements set out within the Rio Tinto Biodiversity Strategy with the aim of a Net Positive Impact on biodiversity (Rio Tinto 2004; Rio Tinto 2008). The similarity between IFC PS6 and EBRD PR6 policies with the Rio Tinto Biodiversity Strategy for Net Positive Impact will facilitate the implementation of such requirements using the tools and systems which have been developed internally within Rio Tinto since 2004.

7.6 PRIORITY BIODIVERSITY FEATURES OF THE OYU TOLGOI PROJECT

Priority biodiversity features for the Oyu Tolgoi Project comprise all biodiversity features for which the Oyu Tolgoi project Area of Influence qualifies as Critical Habitat under Paragraph 9 of the 2006 version of the IFC PS6/Paragraph 13 of EBRD PR6 as well as all biodiversity features which are considered significant under Rio Tinto Biodiversity Action Plan guidelines. The Oyu Tolgoi Project Area of Influence is considered here to be the sum of the areas of influence for each of the infrastructure components, which is the whole of Khanbogd *soum* as impacted by the secondary impact of illegal hunting. However the Critical Habitat Assessment and the Oyu Tolgoi Project Guidance Note on Critical Habitat note that some impacts may extend beyond this area, notably the secondary impact of illegal hunting, but also the possible impacts on habitat and water availability over the deep Gunii Hooloi, Galbyn Gobi and Durulj Mount Southern aquifers. For the purpose of planning mitigation actions, a practical Area of Influence is needed, and is defined as Khanbogd *soum*. It is recognised that the secondary impact of illegal hunting may extend further, and it is recommended that offset and additional conservation actions are adequate to address this possible additional area of impact. The impacts on the aquifers are inadequately known and it is recommended that these are subject to further monitoring and research.

The rapid biodiversity assessment team’s Critical Habitat Assessment (TBC/FFI 2011; Annex C) found that the applicable units of analysis are:

- Tier 1 Critical Habitat for Asiatic Wild Ass; and

- Tier 2 Critical Habitat for Mongolian Chesney, Argali, Goitered Gazelle, Short-toed Snake-eagle, granite outcrop floral communities, and four ecosystem services (water regulation, livestock [pasture], biomass fuel and freshwater).

A summary of the biodiversity values identified as qualifying for Critical Habitat is given in *Table 7.7*.

Table 7.7: Critical Habitat qualifying biodiversity features

Criterion	Qualifying value	Biodiversity type	Critical Habitat category
1. Critically Endangered or Endangered species	Asiatic Wild Ass	mammal	Tier 1 (globally important concentrations of a globally Endangered species: >10% of the global population in the unit of analysis)
	Mongolian Chesney	plant	Tier 2 (nationally important concentrations of a potentially nationally Endangered species: >10% of the national population in the unit of analysis)
	Argali	mammal	Tier 2 (nationally important concentrations of a nationally Endangered species: >10% of the national population in the unit of analysis)
	Short-toed Snake-eagle	bird	Tier 2 (nationally important concentrations of a nationally Endangered species: >10% of the national population in the unit of analysis)
2. Endemic or restricted-range species	Not triggered		
3. Migratory or congregatory species	Goitered Gazelle	mammal	Tier 2 (nationally important concentrations of a migratory species: >1% of the global population in the unit of analysis)
4. Unique assemblages of species	Granite outcrop floral communities	species assemblage	N/a
5. Key evolutionary processes	Not triggered		
6. Key ecosystem services	Water regulation	ecosystem service	N/a
7. Biodiversity of social, economic or cultural importance to local communities	Livestock (pasture)	ecosystem service	N/a
	Biomass fuel	ecosystem service	N/a
	Freshwater	ecosystem service	N/a

Ecosystem services are considered to be a component of biodiversity but impacts and mitigation actions on ecosystem services are discussed separately in *Chapter B7b: Ecosystem Services* because these need socio-economic, rather than biodiversity, assessment.

All biodiversity features which qualify for Critical Habitat are considered to be significant under Rio Tinto Biodiversity Action Plan guidelines. In addition, Rio Tinto considers other key stakeholder biodiversity features (which may be primarily of local rather than global concern) within Biodiversity Action Plans. Within the Oyu Tolgoi Project Area of Influence, these are considered to comprise:

- All globally and nationally threatened species;

- All globally restricted-range species (i.e. terrestrial and freshwater fauna with ranges of < 50,000 km²; expert advice is needed to identify restricted-range flora);
- All habitats of conservation value; following the Critical Habitat report (TBC and FFI 2011), these are identified at an ecosystem level; and
- Key habitats (finer-scale than ecosystems) advocated by stakeholders as documented in the Critical Habitat Assessment (TBC and FFI 2011) which include riverine elm trees and saxaul groves.

The full list of priority biodiversity features is presented in *Table 7.8*. Additional plants listed as Very Rare in the national Law on Natural Plants may occur in the Oyu Tolgoi Project sphere of influence (18 such species were identified as known or likely from the area by TBC/FFI 2011), but are considered to be sufficiently represented here by Mongolian Chesney.

Table 7.8: Priority biodiversity features within Oyu Tolgoi Critical Habitat Assessment Units of Analysis

Taxonomic group	Biodiversity feature	Scientific name	Critical Habitat	IUCN Red List status	National Red List status	Status in unit of analysis
Mammal (ungulate)	Asiatic Wild Ass	<i>Equus hemionus</i>	Tier 1	EN	EN	Nomadic 'resident'
Mammal (ungulate)	Argali	<i>Ovis ammon</i>	Tier 2	NT	EN	Localised resident
Mammal (ungulate)	Goitered Gazelle	<i>Gazella subgutturosa</i>	Tier 2	VU	VU	Migratory 'resident'
Mammal (ungulate)	Mongolian Gazelle	<i>Procapra gutturosa</i>	-	LC	EN	Rare visitor from the east
Mammal (rodent)	Long-eared Jerboa	<i>Euchoreutes naso</i>	-	LC	VU	Likely very rare in far south Undai
Mammal	Snow leopard	<i>Panthera uncia</i>		EN	EN	occurs in a CH UoA - very rare "resident" is mapped as occurring in the AoI (IUCN)
Bird	Swan Goose	<i>Anser cygnoides</i>	-	VU	NT	Likely a regular migrant over the area
Bird	Ferruginous Duck	<i>Aythya nyroca</i>	-	NT	VU	Likely a regular migrant over the area
Bird	Short-toed Snake-eagle	<i>Circaetus gallicus</i>	Tier 2	LC	EN	Breeds
Bird	Saker Falcon	<i>Falco cherrug</i>	-	VU	VU	Breeds
Bird	Egyptian Vulture	<i>Neophron percnopterus</i>	-	EN	LC	Probably breeds
Bird	Great Bustard	<i>Otis tarda</i>	-	VU	VU	Regular migrant (stops over in the area)
Bird	Houbara Bustard	<i>Chlamydotis undulata</i>	-	VU	VU	Breeds
Bird	Mongolian Ground-jay	<i>Podoces hendersoni</i>	-	LC	VU	Breeds
Bird	Relict Gull	<i>Larus relictus</i>				occurs in a CH UoA and the ESIA AoI as a (probably uncommon) migrant
Bird	Pallas' Sandgrouse	<i>Syrrhaptes paradoxus</i>				occurs in a CH UoA and the ESIA AoI as a resident; recently added based on

Taxonomic group	Biodiversity feature	Scientific name	Critical Habitat	IUCN Red List status	National Red List status	Status in unit of analysis
						stakeholder concern about impacts of collisions with powerlines
Bird	Mongolian Accentor	<i>Prunella koslowi</i>				occurs in a CH UoA but not the ESIA AoI
Bird	Yellow-breasted Bunting	<i>Emberiza aureola</i>				occurs in a CH UoA and the ESIA AoI as a (probably uncommon) migrant
Species Assemblage	Granite Outcrop Floral Communities	n/a	Tier 2	n/a	n/a	Khanbogd and other massifs
Habitat	Riverine Elm Trees	n/a	-	n/a	n/a	Mostly in Undai riverbed
Habitat	Ephemeral Lakes and Pools	n/a	-	n/a	n/a	Scattered near to hills in south
Habitat	Tall Saxaul Forest	n/a	-	n/a	n/a	Mostly in borefield and depressions
Habitat	Eastern Gobi desert-steppe	n/a	-	n/a	n/a	Major habitat type in the region - widespread
Habitat	Alashan Plateau semi-desert	n/a	-	n/a	n/a	Major habitat type in the region - widespread
Plants	18 very rare plants such as Mongolian Chesney	n/a	-	n/a	n/a	Patchily distributed throughout – assumed here to represent all 18 “very rare” plants known or predicted from the AoI

EN = Endangered; VU = Vulnerable; NT = Near Threatened; LC = Least Concern

Note: Not all priority features are predicted to be impacted by the Project. As outlined in the RBA Appendix 3, there are "biodiversity priority features which are believed to occur in Khanbogd soum but not to be impacted by the Oyu Tolgoi project: Snow Leopard, Long-eared Jerboa, Mongolian Accentor, Granite Outcrops Floral Communities and Ephemeral Lakes and Pools."

7.7 INVASIVE SPECIES

The Oyu Tolgoi AoI does not appear to have been significantly affected by invasive species, either native or exotic. The studies on Gobi rangelands do not identify rangeland weeds as an issue in the region. As of 2004, there were no national inventories of invasive species for Mongolia (Ministry of Nature, Environment, and Tourism, 2004).

The available data do not indicate that any invasive plant species are important elements of the vegetation and flora of the South Gobi region. Among the few invasive species, *Amaranthus retroflexus*, *Fagopyrum esculentum*, and *Triticum aestivum* are noted as the most prevalent (Sanjid. J. *in litt.*).

The only invasive fauna reported are house mice and rats, associated with dwellings and other structures. Domesticated livestock species are closely managed by herders and have not gone feral in the region.

7.8 LEGALLY PROTECTED AND INTERNATIONALLY RECOGNISED AREAS

7.8.1 Protected Areas in Mongolia

One of the first nature reserves in the world was the Bogd Khan Mountain, close to Ulaanbaatar, which was established as a protected area in 1778. Since then, the Mongolian Protected Area system has

expanded to include 69 areas (as of January 2010) that are legally protected under the Mongolian Law on Special Protected Areas and cover more than 14% of the territory, as well as a network of local protected areas that cover about 10% of the country (Chimed-Ochir *et al.*, 2010). The national-level protected areas are divided into four categories of protection. Strictly Protected Areas represent the strongest level of protection, followed by National Parks; Nature Reserves are established for the purpose of ecological, biological, paleontological and geological conservation, and Natural Monuments are classified as natural and/or historical/cultural (Chimed-Ochir *et al.*, 2010).

Large areas of the South Gobi have designated status as Protected Areas; the largest of these is the Great Gobi SPA which, similar to the SGSPA, is also divided into two areas termed A and B. Great Gobi Biosphere Reserve represents the Central Asian deserts and supports rare desert and mountain steppe vegetation. It provides habitat to many endangered species such as the Snow leopard (*Uncia uncia*), ibex (*Capra sibirica*), Argali sheep (*Ovis ammon*), Saiga antelope (*Saiga tatarica mongolica*), Gobi bear (*Ursus arctos gobiensis*) and wild Bactrian camel (*Camelus ferus bactrianus*). Great Gobi Strictly Protected Area was already established in 1976 and was included in the World Network of Biosphere Reserves in 1990 as one of the largest biosphere reserves in the world (5.3 million ha).

Recent studies have noted the weakness of implementation and enforcement within Protected Areas in Mongolia and the correspondingly poor perception of the effectiveness of Protected Areas. Pilot projects are now starting to be implemented to provide models of the effective governance and management of Protected Areas throughout Mongolia²⁰. Similarly, there is an ongoing UNDP programme to enhance governance and management effectiveness²¹.

7.8.2 Protected Areas in the Omnogovi Aimag

Within Omnogovi *aimag*, State Special Protected Areas comprise 3,490,894 ha (21.1% of the total area). This consists of:

- 1 Strictly Protected Area (the SGSPA);
- 1 National Park; and
- 1 Nature Reserve.

Table 7.9 summarises the protected areas within Omnogovi *aimag*. Figure 7.26 illustrates the regionally protected areas within Omnogovi *aimag*. The *aimag* also includes a number of Protected Areas which have local protection status but are not listed at the national level. Descriptions of the SGPA and the Important Bird Areas are provided below.

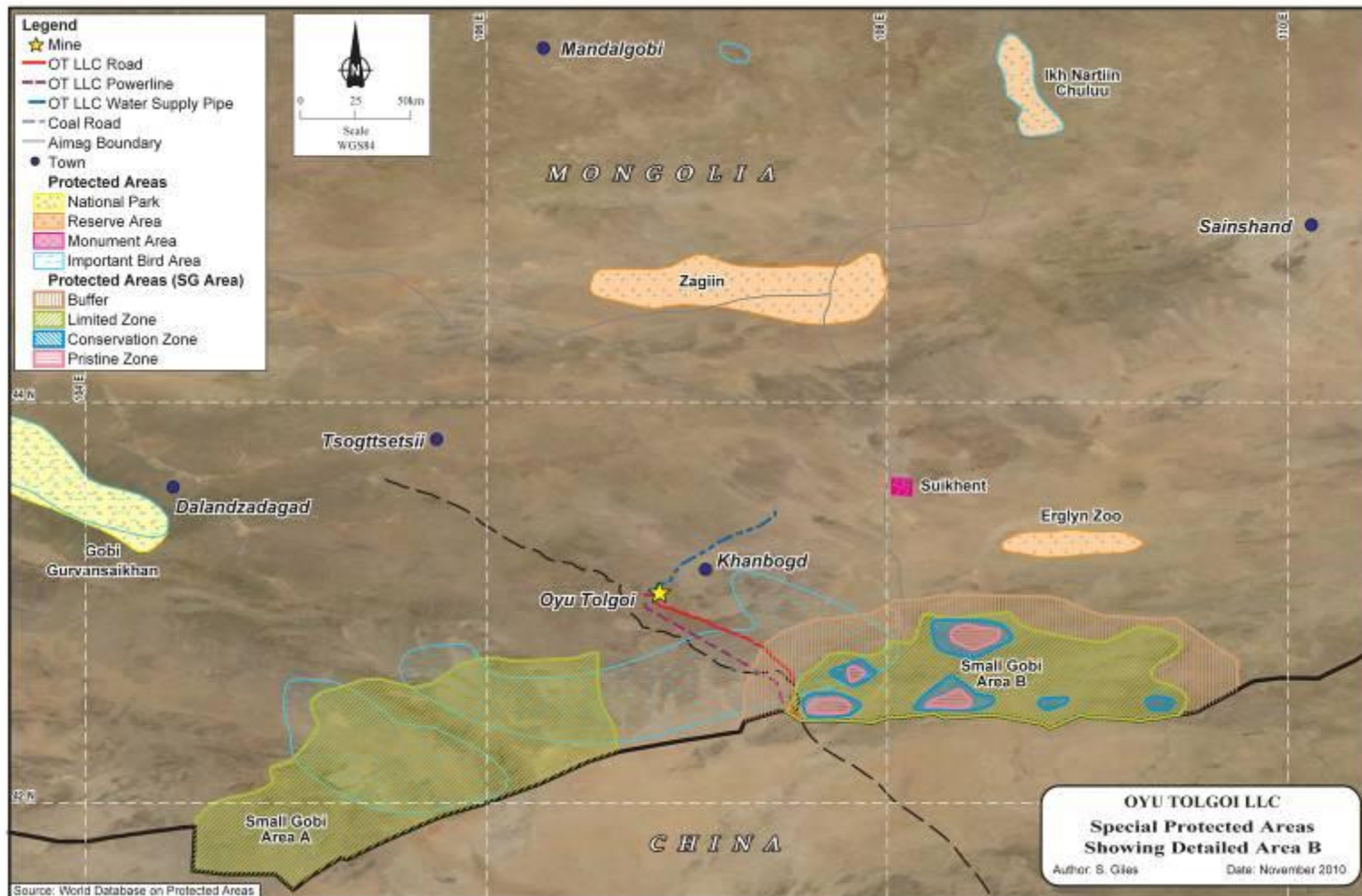
Table 7.9: State Special Protected Areas within Omnogovi Aimag

Protected Areas	Total Area (ha)	Area within Omnogovi (ha)
Small Gobi Strictly Protected Areas A & B	1,839,176	1,291,927
Gobi Gurvan Saikhan National Park	2,694,737	2,171,737
Zagyn Us Nature Reserve	273,606	27,230
Total	4,807,519	3,490,894

²⁰ Grayson R, Eenjin N and Dorjsuren C. Revitalization of Mongolia's protected areas through effective forest management of Bogd Khan Uul. World Bank. May 2010.

²¹ United Nations Development Programme, Strengthening of the Protected Area Network in Mongolia (SPAN).

Figure 7.26: Protected Areas and Important Bird Areas within the Omnogovi Aimag



7.8.3 Small Gobi Strictly Protected Area

The Small Gobi Strictly Protected Area (SGSPA) is an IUCN Category Ib Protected Area that is composed of two separate units located approximately 36 km SW (“A” unit) and 70 km SE (“B” unit) of the Oyu Tolgoi Licence Area. The SGSPA occupies a total of 1,839,176 ha in the Nongon, Bayn-Ovoo and Khanbogd *soums* of Omnogovi *Aimag* and Khatanbulag *Soum* of Dornogobi *Aimag*. The western Part A is largely uninhabited with the exception of rangers and border guards whereas the eastern Part B is seasonally used by herders and its far western end is traversed by the existing unimproved road to Gashuun Sukhait.

The SGSPA was established in 1993 (through Parliament Resolution No. 83) as representative of the southeastern Gobi regional ecosystem because of the then relatively low disturbance from grazing and hunting. Anecdotal evidence suggests that the gap between areas A and B of the SGSPA may have been due to historical oil leasing activity at the time when the protected area was designated.

The SGSPA is categorised as Ib under the IUCN designation. This designation refers to *a large area of unmodified or slightly modified land, and/or sea, retaining its natural character and influence, without permanent or significant habitation, which is protected and managed so as to preserve its natural condition.*

The SGSPA contains a variety of habitats including cliffs, sand dunes, dried lakes, wide wadi and oases with streams, which provide important habitats for species including Asiatic wild ass, black-tailed gazelle, argali Siberian ibex.

Socioeconomic surveys undertaken for the access road corridor EIA in 2004, found eight herder families raising approximately 4,000 head of livestock within Part B of the SGSPA (Eco-Trade, 2004). These traditional herder families occupied the area prior to the establishment of the protected area and have not been required to relocate. The rangers are primarily herders who graze stock within the protected area and undertake some patrolling for illegal hunting.

In 2006, the SGSPA administration was established in Khanbogd *Soum*. 14 people are reported to be employed by the administration of whom 9 are rangers. Due to the size of the protected area, the number of rangers is considered low and Oyu Tolgoi plans to support expansion of the rangers programme is discussed further in *Chapter D8: Biodiversity Management Plan*. *Figure 7.27* below illustrates the relationship between the SGSPA and the route of the Oyu Tolgoi Road to Gashuun Sukhait.

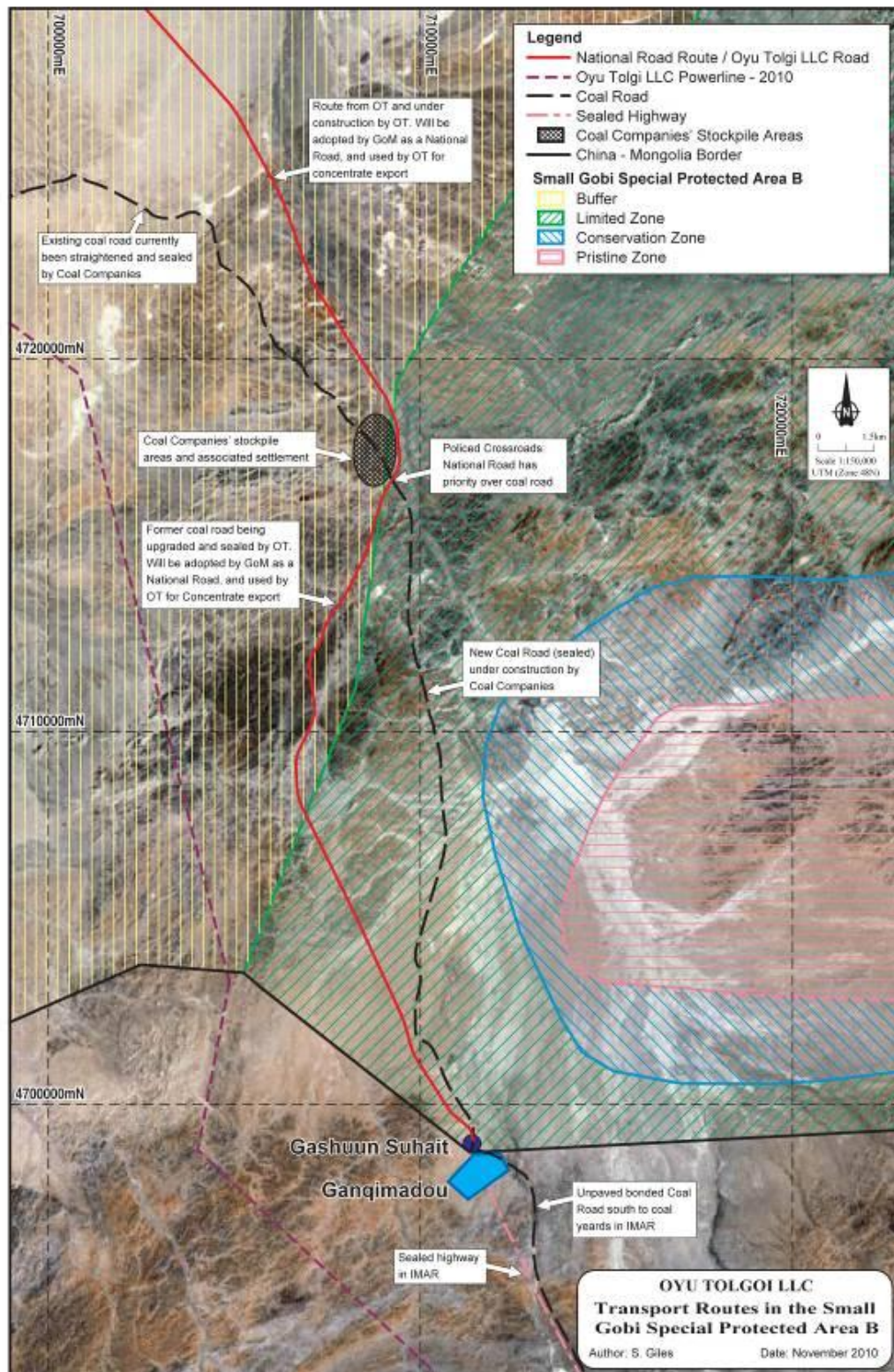
The southern part of the proposed Oyu Tolgoi road will pass through 32 km of Part B of the Small Gobi Strictly Protected Area (SGSPA) buffer zone and 13km of the limited use zone. The buffer zone is not included within the Protected Area and is a designated land use planning zone that is subject to land use planning controls to ensure developments in the buffer zone do not adversely impact the protected area. The buffer zone area is not subject to the protected area legislation. Within the buffer zone, some 22 km follow existing tracks and 10 km the existing coal road; within the limited use zone, 13 km follow the existing coal road route. The Gashuun Sukhait border crossing point on the Mongolian-Chinese border is also located within the SGSPA. The power transmission line that connects Oyu Tolgoi to the Chinese Inner-Mongolian electricity grid, is located outside of the SGSPA and traverses within the buffer zone only. There are no statutory impediments to power transmission or roads within the buffer zone area.

Allowable activities in the protected areas are described in Section 7.1.3.

In accordance with Paragraph 15 of EBRD PR6, and with Paragraph 11 of IFC PR6 Oyu Tolgoi has:

- Consulted with applicable Protected Area Authority, local communities and other key stakeholders, including MNET, through the DEIA proves for the Mongolian permitting approvals;
- Ensured that the upgrade of the National road from Gashuun Sukhait to Oyu Tolgoi through the Small Gobi Strictly Protected Area (Part B) has been approved by the applicable authorities;
- Ensured that the Project’s environment management, mitigation and offset commitments are consistent with the management objectives stated within the Protected Area Management Plan; and
- Ensured that the Offset Management Strategy (*Chapter C6: Biodiversity and Ecosystems Services Impact Assessment*, Annex C, section 4.5) includes offset measures to strengthen the protected areas.

Figure 7.27: Roads Crossing the SGSPA



7.8.4 Important Bird Areas

BirdLife International has identified Important Bird Areas (IBAs) worldwide. IBAs are key sites for conservation that may hold significant numbers of one or more globally threatened species, be one of a

set of sites that together hold a suite of restricted-range species or biome-restricted species, and/or have exceptionally large numbers of migratory or congregatory species. While not having legal recognition or protection status in Mongolia, IBAs are recognised internationally as key biodiversity areas and IFC and EBRD policies require special consideration of projects in these areas.

Within Mongolia, the Galba Gobi Important Bird Area (MN048) encompasses lands in Parts A and B of the SGSPA, as well as unprotected lands in between and to the north of the SGSPA (Figure 7.26). This IBA supports important breeding populations of three globally-threatened bird species, saker falcon, houbara bustard and the lesser kestrel, as well as two globally-threatened mammals khulan and black-tailed gazelle (Batbayar *et al.*, 2011). As habitat for these species, the Galba Gobi IBA is recognised under Mongolia's participation in the Bonn Convention. This IBA is characterized as a desert valley, with rolling hills, sand dunes, and dry river beds with elm and saxaul trees. The site also supports numerous species typical of the steppe and desert biomes, such as Mongolian ground jay, saxaul sparrow, and Pallas's sandgrouse. This IBA is transected by the existing "coal road" and the proposed Oyu Tolgoi Infrastructure Corridor.

7.9 SUMMARY OF BASELINE BIODIVERSITY INFORMATION FOR THE OYU TOLGOI PROJECT

The landscapes of the Oyu Tolgoi Aol are characterized by a mosaic of low-statured desert and steppe vegetation typical of the South Gobi region of Mongolia and neighbouring China. Numerous species legally recognised as "rare" or "very rare" exist in the Oyu Tolgoi Project footprint but none of these species are microendemics with distributions limited to the Oyu Tolgoi Aol. Vegetation of special significance as habitat for fauna includes the tall saxaul forests and elm groves, both of which are associated with localised substrate conditions with greater available soil moisture or shallow groundwater. Localised substrate-specific floral assemblages are thought to occur on granite outcrops in the region, but these have not been described and are not within the Project footprint. As described in this Chapter, nearly all vegetation in the region has some degree of significance in terms of ecosystem services to local communities, particularly as a source of forage for livestock.

The Oyu Tolgoi Aol, despite its location in an extreme continental environment with generally sparse vegetation and scant surface waters, supports a diverse fauna with populations of global conservation significance for a number of globally and/or nationally threatened species, among which the Asiatic wild ass or khulan, the goitered or black-tailed gazelle, the houbara bustard, and the saker falcon stand out. Many of the fauna demonstrate migratory or nomadic behaviour as a strategy for coping with the seasonal and geographic climatic variability that drives the availability of resources. Due to the near absence of permanent surface waters, no fish and only a single amphibian species are known from the Oyu Tolgoi Aol. Reptiles, especially toad-headed agamas, are very common during the warm months and these provide important food resources for predatory birds and mammals. Diverse bird assemblages are common and the area supports important breeding populations of globally threatened species, particularly in the Galba Gobi Important Bird Area. Despite the general aridity of the region, artificial ponds constructed by the Oyu Tolgoi Project attract aquatic birds and migrants. Small mammals are generally nocturnal but burrows are commonly observed across the landscape. Both wild and domesticated large herbivores are key elements of the regional ecosystems and these depend on the ability to move freely across the landscape to track changing patterns of available forage plants. The survival of globally threatened fauna of the South Gobi and the Oyu Tolgoi Aol will depend upon the sound development of natural resource extraction and transportation and electrical transmission infrastructure, as well as control of illegal hunting and competition with domesticated livestock for key water and forage resources.

Following the criteria of Paragraph 9 within the International Finance Corporation's 2006 version of Performance Standard 6 (Biodiversity Conservation and Sustainable Natural Resource Management) and Paragraph 13 within the European Bank for Reconstruction and Development's Performance Requirement 6, this report finds that both units of analysis defined for Oyu Tolgoi are Critical Habitat. The larger unit of analysis (identified as the spatial unit of analysis for large mammals) – comprising Khanbogd, Manlai and Bayan-Ovoo *soums* and Small Gobi SPA sectors A and B (51,415 km²) – qualifies as Critical Habitat under criteria 1 and 3 of PS6 Paragraph 9. The smaller unit of analysis (identified as the spatial unit of analysis for all species other than large mammals, and for unique assemblages, evolutionary processes, and ecosystem services) – comprising Khanbogd and Manlai *soums* (27,375 km²) – qualifies as Critical Habitat under criteria 1, 4, 6 and 7 of PS6 Paragraph 9. These results mean that development within the Oyu Tolgoi units of analysis will be subject to the requirements of Paragraph

10 of the 2006 version of IFC Performance Standard 6 and Paragraph 14 of EBRD Performance Requirement 6.

Priority biodiversity features for the Oyu Tolgoi Project comprise all biodiversity features for which the Oyu Tolgoi Project Area of Influence qualifies as Critical Habitat under Paragraph 9 of the 2006 version of the IFC PS6 and Paragraph 13 of EBRD PR6 as well as all biodiversity features which are considered significant under Rio Tinto Biodiversity Action Plan guidelines.

The Critical Habitat Assessment (TBC/FFI 2011) found that the applicable units of analysis are:

- Tier 1 Critical Habitat for Asiatic Wild Ass; and
- Tier 2 Critical Habitat for Mongolian Chesney, Argali, Goitered Gazelle, Short-toed Snake-eagle, granite outcrop floral communities, and four ecosystem services (water regulation, livestock [pasture], biomass fuel and freshwater).

In addition, Rio Tinto considers other key stakeholder biodiversity features (which may include features of local as well global concern) within Biodiversity Action Plans. Within the Oyu Tolgoi Project Area of Influence, these are considered to comprise: three species of mammals (snow leopard, Mongolian gazelle and long-eared jerboa), eight birds (saker falcon, Egyptian vulture, great bustard, houbara bustard, relict gull, Mongolian accentor, Mongolian ground-jay and yellow-breasted bunting) and three habitats (Riverine elm trees, ephemeral lakes and pools, Tall saxual forest).

The Oyu Tolgoi Area of Influence includes portions of two protected and designated areas that are priority biodiversity features, the Small Gobi Strictly Protected Area (SGSPA) and the Galba Gobi Important Bird Area (IBA). While the SGSPA is a legally protected area under Mongolian law, the resources allocated to its protection are low in consideration of the size of the area and the needs for management, surveillance, enforcement, and monitoring. While the Galba Gobi IBA is recognised internationally as a designated area of high biodiversity value, it has no legal status in Mongolia and has no management plan or monitoring program.

ANNEX A: Plant Communities and Associations

South Gobi Communities identified by Hilbig & Tungalag (2006):

Desert and Semidesert Communities

- Stipo glareosae-Anabasetum brevifoliae, typical Subass;
 - *Allium polyrhizum* stands
- Stipo glareosae-Anabasetum brevifoliae, *Reaumuria soongarica*-Subass;
- Salsolo passerinae-Kalidietum foliatae;
- Salsolo passerinae-Nitrarietum sibiricae;
- Salsolo passerinae-Reaumurietum soongoricae;
- Potaninio mongolicae-Sympegmetum regelii;
- Nitrario sibiricae-Kalidietum gracilis;
- Eurotio ceratoidis-Zygophylletum xanthoxyli;
- Brachanthemo gobici-Potaninietum mongolicae;
- Calligono mongolici-Haloxyletum ammodendronis; and
- Amygdalo pedunculatae-Caraganetum leucophloae (*Amygdalus mongolica*-Ges).

Elm stands

- *Ulmus pumila* gallery stands

Herbaceous communities near shallow groundwater

- Phragmitetum communis;
- Glycyrrhizo-Achnatheretum splendentis;
- Halerpesto-Hordeetum brevisubulati;
 - *Iris lactea* stands
- *Chloris virgata* community.

Anthropogenic Communities

- Brassico-Malvetum mohileviensis;
- *Artemisia sieversiana* community; and
- *Chenopodio prostrati*-Lepidietum densiflori.

Non-montane South Gobi Associations/Communities identified by von Wehrden *et al.* (2009):

Desert steppes of pediments and moister semi-deserts

- *Allio polyrrhizi*-Stipetum glareosae, stipetosum gobicae; and
- *Allio polyrrhizi*-Stipetum glareosae, eurotietosum ceratoidis.

Scrub of moderately dry semi-deserts

- *Oxytropidi aciphyllae*-Caraganetum leucophloae;
- *Oxytropidi aciphyllae*-Caraganetum leucophloae, iridetosum bungei;
- *Oxytropidi aciphyllae*-Caraganetum leucophloae, iridetosum tenuifoliae;
- *Sympegmo regelii*-Caraganetum leucophloae and related transition stands; and

- *Psammochloa villosa* community.

Dry desert steppes

- *Stipo glareosae-Anabasetum brevifoliae*, *stipetosum gobicae*;
- *Stipo glareosae-Anabasetum brevifoliae*, *typicum* (= *Convolvulus ammanii*, Hilbig 1990);
- *Stipo glareosae-Anabasetum brevifoliae*, *Reaumuria songarica* sub-association; and
- *Stipo glareosae-Anabasetum brevifoliae*, *Salsola passerina* variant of the *R. songarica* sub-association.

***Convolvulus gortschakovii*-communities**

- *Lappula stricta* sub-community; and
- *Convolvulus gortschakovii*-community – *Oxytropis aciphylla* sub-community.

Artemisia sublessingiana*-*Nanophytetum erinacei

- *Calligono mongolici-Haloxyletum ammodendronis* and *Ilijinietum regelii*;
- *Calligono mongolici-Haloxyletum ammodendronis*, mono-dominant stands;
- *Calligono mongolici-Haloxyletum ammodendronis typicum*;
- *Calligono mongolici-Haloxyletum ammodendronis*, *Reaumuria songarica* sub-association; and
- *Ilijinietum regelii*.

Dry scrub vegetation

- *Ephedro przewalskii-Zygophylletum xanthoxyli*;
- *Ephedro przewalskii-Zygophylletum xanthoxyli*, *sympegmetosum regelii*;
- *Ephedro przewalskii-Zygophylletum xanthoxyli*, *nitrarietosum roborovskii*;
- *Caragana tibetica*-*Ammopiptanthus mongolicus* community;
- *Salsolo passerinae-Reaumurietum songaricae*;
- *Salsolo passerinae-Reaumurietum songaricae*, *nitrarietosum sphaerocarpae*;
- *Salsolo passerinae-Reaumurietum songaricae*, *nitrarietosum sphaerocarpae* – western regional variant;
- *Nitrario sibiricae-Kalidietum gracilis*;
- *Nitraria sibirica* community;
- *Nitrario sibiricae-Kalidietum gracilis*, *Phragmites communis* variant; and
- Ephemeral vegetation of true deserts (rankless unit).

Vegetation of saline water-surplus sites

- *Ulmus pumila* community;
- *Glycyrhizo uralensis-Populetum euphraticae*;
- *Tamarix ramosissima* community;
- *Salicornia europaea* community;
- *Crypsietum aculeatae*;
- *Blysmetum rufi*; and
- Replacement communities of the semi-deserts and their riparian ecosystems.

ANNEX B: Species Lists

Table A-1: Vascular Plants reported from DEIAs and Oyu Tolgoi Monitoring, Families by Alphabetical Order²².

FAMILY	SPECIES	LOCATIONS	Ann/Per
Aizoaceae	<i>Mollugo cerviana</i> (L.) Ser.	Undai River	a
Amaranthaceae	<i>Agriophyllum squarrosum</i> (L.) Moq.	GH, Khunjer sand	a
Amaranthaceae	<i>Amaranthus retroflexus</i> L.	MLA	a
Amaranthaceae	<i>Anabasis brevifolia</i> C.A. Mey.	Airport, MLA, GH, IC	p
Amaranthaceae	<i>Atriplex sibirica</i> L.	Airport, MLA, IC	a
Amaranthaceae	<i>Bassia dasyphylla</i> (Fisch. & C.A. Mey.) Kuntze	Airport, MLA, GH, IC	a
Amaranthaceae	<i>Chenopodium acuminatum</i> Willd.	MLA	a
Amaranthaceae	<i>Chenopodium album</i> L.	MLA, IC	a
Amaranthaceae	<i>Chenopodium glaucum</i> L.	MLA	a
Amaranthaceae	<i>Corispermum mongolicum</i> Iljin	Airport, MLA	a
Amaranthaceae	<i>Halogeton arachnoideus</i> Moq.	Airport, MLA	a
Amaranthaceae	<i>Halogeton glomeratus</i> (M. Bieb.) C.A. Mey.	Airport, MLA	a
Amaranthaceae	<i>Haloxyton ammodendron</i> (C.A. Mey.) Bunge	GH	p
Amaranthaceae	<i>Kalidium foliatum</i> (Pall.) Moq.	Airport, MLA	p
Amaranthaceae	<i>Kalidium gracile</i> Fenzl	MLA, IC	p
Amaranthaceae	<i>Kochia krylovii</i> Litv.	IC	a
Amaranthaceae	<i>Kochia scoparia</i> (L.) Schrad.	IC	a
Amaranthaceae	<i>Krascheninnikovia ceratoides</i> (L.) Gueldenst.	Airport, MLA, GH	p
Amaranthaceae	<i>Salsola arbuscula</i> Pall.	Khanbogd	p
Amaranthaceae	<i>Salsola collina</i> Pall.	Airport, MLA, GH	a
Amaranthaceae	<i>Salsola laricifolia</i> Turcz. ex Litv.	MLA, IC	p
Amaranthaceae	<i>Salsola passerina</i> Bunge	Airport, MLA, GH, IC	p
Amaranthaceae	<i>Salsola tragus</i> L.	Airport, MLA, IC	a
Amaranthaceae	<i>Suaeda corniculata</i> (C.A. Mey.) Bunge	Airport, MLA, IC	a
Amaranthaceae	<i>Suaeda glauca</i> (Bunge) Bunge	MLA	a
Amaranthaceae	<i>Suaeda salsa</i> (L.) Pall.	MLA	a
Amaranthaceae	<i>Suaeda</i> sp.	GH	?
Amaranthaceae	<i>Sympegma regelii</i> Bunge	Airport, MLA, IC	p
Amaryllidaceae	<i>Allium eduardii</i> Stearn	MLA, IC	p
Amaryllidaceae	<i>Allium mongolicum</i> Turcz. ex Regel	Airport, MLA, GH, IC	p
Amaryllidaceae	<i>Allium polyrhizum</i> Turcz. ex Regel	Airport, MLA, GH, IC	p
Apiaceae	<i>Ferula bungeana</i> Kitag	MLA	p
Asclepiadaceae	<i>Cynanchum gobicum</i> Grubov	IC	p
Asclepiadaceae	<i>Cynanchum sibiricum</i> Willd.	MLA	p
Asclepiadaceae	<i>Cynanchum thesioides</i> (Freyn) K. Schum.	Airport, MLA	p
Asparagaceae	<i>Asparagus gobicus</i> Ivanov. ex Grubov	Airport, MLA	p
Asparagaceae	<i>Asparagus trichophyllus</i> Bunge	GH	p
Asteraceae	<i>Ajania achilloides</i> (Turcz.) Poljakov ex Grubov	Airport, MLA, GH, IC	p

²² Taxonomy and authorities following MOBOT/Tropicos.org (www.tropicos.org), Flora of China (www.efloras.org), Virtual Guide to the Flora of Mongolia (<http://greif.uni-greifswald.de/floragreif/>), and International Plant Names Index (www.ipni.org), in the above order of priority.

FAMILY	SPECIES	LOCATIONS	Ann/Per
Asteraceae	<i>Ajania fruticulosa</i> (Ledeb.) Poljakov	IC	p
Asteraceae	<i>Artemisia anethifolia</i> Weber ex Stechm.	Airport, MLA	a
Asteraceae	<i>Artemisia anethoides</i> Mattf.	IC	?
Asteraceae	<i>Artemisia annua</i> L.	OT	a
Asteraceae	<i>Artemisia blepharolepis</i> Bunge	MLA	a
Asteraceae	<i>Artemisia caespitosa</i> Ledeb.	Khanbogd	p
Asteraceae	<i>Artemisia dracunculus</i> L.	MLA	p
Asteraceae	<i>Artemisia gobica</i> (Krasch.) Grubov	Gunii Hooloi	p
Asteraceae	<i>Artemisia intricata</i> Franch.	MLA	a
Asteraceae	<i>Artemisia macrocephala</i> Jacquem. ex Besser	Khanbogd	a
Asteraceae	<i>Artemisia mongolorum</i> Krasch.	IC	?
Asteraceae	<i>Artemisia rutilifolia</i> Stephan ex Spreng.	Khanbogd	p
Asteraceae	<i>Artemisia scoparia</i> Waldst. & Kit.	Airport, MLA, IC	p
Asteraceae	<i>Artemisia siversiana</i> Ehrh. ex Willd.	MLA	a
Asteraceae	<i>Artemisia sphaerocephala</i> Krasch.	GH	p
Asteraceae	<i>Artemisia tschnernieviana</i> Besser	GH	?
Asteraceae	<i>Artemisia xanthochloa</i> Krasch.	GH, IC	p
Asteraceae	<i>Artemisia xerophytica</i> Krasch.	OT, GH, IC	p
Asteraceae	<i>Asterothamnus alyssoides</i> (Turcz.) Novopokr.	IC	p
Asteraceae	<i>Asterothamnus centrali-asiaticus</i> Novopokr.	Airport, MLA, IC	p
Asteraceae	<i>Brachanthemum gobicum</i> Krasch.	MLA	p
Asteraceae	<i>Cancrinia discoidea</i> (Ledeb.) Poljakov	MLA, IC	a
Asteraceae	<i>Cirsium arvense</i> (L.) Scop.	OT	p
Asteraceae	<i>Echinops gmelinii</i> Turcz.	Airport, MLA, GH, IC	p
Asteraceae	<i>Heteropappus altaicus</i> (Willd.) Novopokr.	Airport, IC, MLA	p
Asteraceae	<i>Heteropappus hyspidus</i> (Thunb.) Less.	GH Amendment	p
Asteraceae	<i>Hippolytia trifida</i> (Turcz.) Poljakov	IC	p
Asteraceae	<i>Inula salsoloides</i> (Turcz.) Ostenf.	MLA	p
Asteraceae	<i>Jurinea mongolica</i> Maxim.	Gunii Gol (river)	p
Asteraceae	<i>Lactuca tatarica</i> (L.) C.A. Mey.	OT, IC	p
Asteraceae	<i>Neopallasia pectinata</i> (Pall.) Poljakov	MLA	a
Asteraceae	<i>Olgaea leucophylla</i> (Turcz.) Iljin	Gunii Hooloi	p
Asteraceae	<i>Olgaea lomonosowii</i> (Trautv.) Iljin	IC	p
Asteraceae	<i>Saussurea amara</i> (L.) DC.	OT	p
Asteraceae	<i>Saussurea laciniata</i> Ledeb.	OT	p
Asteraceae	<i>Scorzonera capito</i> Maxim.	Khanbogd	p
Asteraceae	<i>Scorzonera divaricata</i> Turcz.	Airport, OT, IC	p
Asteraceae	<i>Scorzonera pseudodivaricata</i> Lipsch.	Airport, OT, IC	p
Asteraceae	<i>Sonchus arvensis</i> L.	OT	p
Asteraceae	<i>Taraxacum dealbatum</i> Hand.-Mazz.	OT	p
Asteraceae	<i>Tugarinovia mongolica</i> Iljin	MLA, IC	p
Boraginaceae	<i>Argusia sibirica</i> (L.) Dandy	GH Amendment	p
Boraginaceae	<i>Arnebia fimbriata</i> Maxim.	MLA, IC	p
Boraginaceae	<i>Arnebia guttata</i> Bunge	Airport, MLA, IC	a
Boraginaceae	<i>Lappula intermedia</i> (Ledeb.) Popov	Airport, MLA, IC	a

FAMILY	SPECIES	LOCATIONS	Ann/Per
Brassicaceae	<i>Dontostemon crassifolius</i> (Bunge) Maxim.	MLA	p
Brassicaceae	<i>Dontostemon integrifolius</i> (L.) C.A. Mey.	MLA	a
Brassicaceae	<i>Dontostemon senilis</i> Maxim.	Airport, MLA, GH, IC	p
Brassicaceae	<i>Isatis costata</i> C.A. Mey.	Bulan Sukhait	p
Brassicaceae	<i>Isatis oblongata</i> DC.	MLA	a
Brassicaceae	<i>Lepidium densiflorum</i> Schrad.	MLA	a
Brassicaceae	<i>Microstigma deflexum</i> Juz.	MLA	p
Brassicaceae	<i>Ptilotrichum canescens</i> (DC.) C.A. Mey.	MLA, IC	p
Caprifoliaceae	<i>Lonicera caerulea</i> var. <i>altaica</i> Pall.	Khanbogd	p
Caprifoliaceae	<i>Lonicera</i> sp.	IC	p
Caryophyllaceae	<i>Stellaria dichotoma</i> L.	MLA	p
Caryophyllaceae	<i>Stellaria dichotoma</i> var. <i>lanceolata</i> Bunge	Khanbogd	p
Convolvulaceae	<i>Convolvulus ammanii</i> Desr.	Airport, MLA, IC	p
Convolvulaceae	<i>Convolvulus arvensis</i> L.	MLA	p
Convolvulaceae	<i>Convolvulus fruticosus</i> Pall.	MLA, IC	p
Convolvulaceae	<i>Convolvulus gortschakovii</i> Schrenk	IC	p
Convolvulaceae	<i>Convolvulus tragacanthoides</i> Turcz.	IC	p
Crassulaceae	<i>Orostachys thyrsoiflora</i> Fisch.	Khanbogd	p
Cuscutaceae	<i>Cuscuta chinensis</i> Lam.	Khanbogd	a
Cynomoriaceae	<i>Cynomorium songaricum</i> Rupr.	Khaliv River	p
Cyperaceae	<i>Carex duriuscula</i> C.A. Mey.	MLA, GH, IC	p
Cyperaceae	<i>Eleocharis palustris</i> (L.) Roem. & Schult.	IC	p
Elaeagnaceae	<i>Elaeagnus angustifolia</i> L.	Bulan Sukhait	p
Ephedraceae	<i>Ephedra dahurica</i> Turcz.	MLA	p
Ephedraceae	<i>Ephedra equisetina</i> Bunge	IC, Khanbogd	p
Ephedraceae	<i>Ephedra przewalskii</i> Stapf	IC	p
Euphorbiaceae	<i>Euphorbia humifusa</i> Willd.	MLA	a
Euphorbiaceae	<i>Euphorbia kozlovii</i> Prokh.	IC, Khanbogd	p
Fabaceae	<i>Astragalus grubovii</i> Sanchir	Airport, MLA	p
Fabaceae	<i>Astragalus junatovii</i> Sanchir	Airport, MLA	p
Fabaceae	<i>Astragalus melilotoides</i> Pall.	MLA	p
Fabaceae	<i>Astragalus monophyllus</i> Maxim.	Airport, MLA	p
Fabaceae	<i>Astragalus pavlovii</i> B. Fedtsch. & Basil.	IC	p
Fabaceae	<i>Astragalus tenuis</i> Turcz.	MLA	p
Fabaceae	<i>Astragalus vellestris</i> Kamelin	Airport, MLA	p
Fabaceae	<i>Astragalus variabilis</i> Bunge	MLA	p
Fabaceae	<i>Caragana versicolor</i> (L.) DC.	IC	p
Fabaceae	<i>Caragana brachypoda</i> Pojark.	MLA, IC	p
Fabaceae	<i>Caragana korshinskii</i> Kom.	MLA	p
Fabaceae	<i>Caragana leucophloea</i> Pojark.	MLA, IC	p
Fabaceae	<i>Caragana tibetica</i> (Maxim. ex C.K. Schneid.) Kom.	IC	p
Fabaceae	<i>Chesneya macrantha</i> S.H. Cheng ex H.C Fu ²³	MLA, IC	p
Fabaceae	<i>Chesniella mongolica</i> (Maxim.) Boriss.	MLA	p

²³ Reported previously as *Oxytropis grubovii* N. Ulziykh.

FAMILY	SPECIES	LOCATIONS	Ann/Per
Fabaceae	<i>Glycyrrhiza uralensis</i> Fisch. ex DC.	MLA, IC (Daichin saxaul forest)	p
Fabaceae	<i>Gueldenstaedtia monophylla</i> Fisch. ex DC.	MLA, IC	p
Fabaceae	<i>Hedysarum pumilum</i> (Ledeb.) B. Fedtsch.	MLA, IC	p
Fabaceae	<i>Oxytropis aciphylla</i> Ledeb.	Airport, MLA, GH, IC	p
Fabaceae	<i>Oxytropis glabra</i> DC.	IC	p
Fabaceae	<i>Oxytropis tragacanthoides</i> Fisch. ex DC.	IC	p
Fabaceae	<i>Sophora alopecuroides</i> L.	IC (Daichin saxaul forest)	p
Geraniaceae	<i>Erodium tibetanum</i> Edgew.	MLA, GH, IC	a
Geraniaceae	<i>Erodium stephanianum</i> Willd.	MLA	a
Iridaceae	<i>Iris bungei</i> Maxim.	IC	p
Iridaceae	<i>Iris lactea</i> Pall.	Airport, MLA, IC	p
Iridaceae	<i>Iris tenuifolia</i> Pall.	Airport, MLA	p
Iridaceae	<i>Iris</i> sp.	IC	p
Juncaginaceae	<i>Triglochin palustris</i> L.	MLA	p
Lamiaceae	<i>Caryopteris mongholica</i> Bunge	MLA	p
Lamiaceae	<i>Lagochilus ilicifolius</i> Bunge	Airport, MLA, IC	p
Lamiaceae	<i>Panzerina lanata</i> (L.) Soják	Airport, MLA, IC	p
Lamiaceae	<i>Thymus</i> sp.	GH	p
Nitrariaceae	<i>Nitraria roborowskii</i> Kom. (= <i>N. schoberi</i> L.)	Undai River	p
Nitrariaceae	<i>Nitraria sibirica</i> Pall.	Airport, MLA, GH, IC	p
Nitrariaceae	<i>Peganum harmala</i> L.	IC	p
Nitrariaceae	<i>Peganum nigellastrum</i> Bunge	Airport, MLA, GH, IC	p
Orobanchaceae	<i>Cistanche salsa</i> (C.A. Mey.) Beck	MLA	p
Orobanchaceae	<i>Orobanche cernua</i> var. <i>hansii</i> (A. Kern.) Beck	MLA	p
Orobanchaceae	<i>Orobanche coerulescens</i> Stephan	MLA	p
Papaveraceae	<i>Hypecoum lactiflorum</i> (Kar. & Kir.) Pazij	MLA, GH, IC	a
Plantaginaceae	<i>Plantago minuta</i> Pall.	Airport, MLA	
Plumbaginaceae	<i>Limonium aureum</i> (L.) Hill	MLA, IC	p
Plumbaginaceae	<i>Limonium erythrorrhizum</i> Ikonn.-Gal. ex Lincz.	MLA, IC	p
Plumbaginaceae	<i>Limonium gobicum</i> Ikonn.-Gal.	IC	p
Plumbaginaceae	<i>Limonium tenellum</i> (Turcz.) Kuntze	Airport, MLA, IC	p
Poaceae	<i>Achnatherum splendens</i> (Trin.) Nevski	Airport, MLA, GH, IC	p
Poaceae	<i>Agropyron cristatum</i> (L.) Gaertn.	IC	p
Poaceae	<i>Agropyron</i> sp.	IC	p
Poaceae	<i>Aristida heymannii</i> Regel	Airport, MLA	a
Poaceae	<i>Chloris virgata</i> Sw.	MLA	a
Poaceae	<i>Cleistogenes songorica</i> (Roshev.) Ohwi	Airport, MLA, GH, IC	p
Poaceae	<i>Elymus</i> sp.	IC	p
Poaceae	<i>Enneapogon borealis</i> (Griesb.) Honda	Airport, MLA, IC	a
Poaceae	<i>Eragrostis minor</i> Host	Airport, MLA, IC	a
Poaceae	<i>Hordeum brevisubulatum</i> (Trin.) Link	MLA	p
Poaceae	<i>Phragmites communis</i> Trin.	MLA, IC	p
Poaceae	<i>Psammochloa villosa</i> (Trin.) Bor	MLA	p

FAMILY	SPECIES	LOCATIONS	Ann/Per
Poaceae	<i>Psathyrostachys juncea</i> (Fisch.) Nevski	Khanbogd	p
Poaceae	<i>Ptilagrostis pelliotii</i> (Danguy) Grubov	Airport, MLA, IC	p
Poaceae	<i>Puccinellia tenuiflora</i> (Griesb.) Scribn. & Merr.	MLA	p
Poaceae	<i>Setaria glauca</i> (L.) P. Beauv.	MLA, IC	a
Poaceae	<i>Setaria viridis</i> (L.) P. Beauv.	MLA	a
Poaceae	<i>Stipa caucasica</i> subsp. <i>glareosa</i> (P.Smirm.) Tzvelev	MLA, IC	p
Poaceae	<i>Stipa sareptana</i> var. <i>krylovii</i> (Roshev) P.C.Kuo & Y.H. Sun	MLA	p
Poaceae	<i>Stipa tianschanica</i> var. <i>gobica</i> (Roshev.) P.C. Kuo & Y.H. Sun	Airport, MLA, GH	p
Poaceae	<i>Tragus berteronianus</i> Schult.	MLA	a
Poaceae	<i>Tripogon purpurascens</i> Duthie	Khanbogd	p
Polygonaceae	<i>Atraphaxis frutescens</i> (L.) K. Koch	MLA, IC	p
Polygonaceae	<i>Atraphaxis pungens</i> (M. Bieb.) Jaub. & Spach	MLA, IC	p
Polygonaceae	<i>Atraphaxis virgata</i> (Regel) Krasn.	IC	p
Polygonaceae	<i>Calligonum gobicum</i> (Bunge ex Meisn.) Losinsk.	IC	p
Polygonaceae	<i>Calligonum mongolicum</i> Turcz.	GH, IC	p
Polygonaceae	<i>Polygonum aviculare</i> L.	MLA	a
Polygonaceae	<i>Rheum nanum</i> Siev. ex Pall.	Airport, MLA, GH, IC	p
Primulaceae	<i>Glaux maritima</i> L.	MLA, IC	p
Ranunculaceae	<i>Clematis fruticosa</i> Turcz.	MLA, IC	p
Ranunculaceae	<i>Clematis tangutica</i> (Maxim.) Korsh.	MLA	p
Ranunculaceae	<i>Halerpestes sarmentosa</i> var. <i>sarmentosa</i> (Pall. ex Georgi) Greene	MLA	p
Rhamnaceae	<i>Rhamnus erythroxylum</i> Pall.	Khanbogd	p
Rosaceae	<i>Potaninia mongolica</i> Maxim.	Airport, MLA, GH, IC	p
Rosaceae	<i>Sibbaldia adpressa</i> Bunge	IC	p
Rosaceae	<i>Amygdalus mongolica</i> (Maxim.) Ricker	IC, Jabjlant Mountain	p
Rosaceae	<i>Amygdalus pedunculata</i> Pall.	MLA	p
Rosaceae	<i>Potentilla bifurca</i> L.	MLA	p
Rosaceae	<i>Potentilla multifida</i> L.	Khukh Khad (Blue Rock)	p
Rosaceae	<i>Potentilla</i> sp.	IC	p
Rutaceae	<i>Haplophyllum dauricum</i> (L.) G.Don	Khanbogd	p
Salicaceae	<i>Populus euphratica</i> Olivier	IC	p
Scrophulariaceae	<i>Scrophularia incisa</i> Weinm.	MLA	p
Solanaceae	<i>Lycium truncatum</i> Y.C. Wang	MLA	p
Tamaricaceae	<i>Reaumuria soongarica</i> (Pall.) Maxim.	Airport, MLA, GH, IC	p
Tamaricaceae	<i>Tamarix gracilis</i> Willd.	Bulan Suhait	p
Tamaricaceae	<i>Tamarix ramosissima</i> Ledeb. (= <i>T. chinensis</i> Lour.)	Bulan Suhait	p
Ulmaceae	<i>Ulmus pumila</i> L.	MLA, IC	p
Zygophyllaceae	<i>Tribulus terrestris</i> L.	Airport. MLA, GH, IC	a
Zygophyllaceae	<i>Zygophyllum potaninii</i> Maxim.	MLA, IC	p
Zygophyllaceae	<i>Zygophyllum pterocarpum</i> Bunge	MLA, GH, IC	p
Zygophyllaceae	<i>Zygophyllum rosowii</i> Bunge	MLA, IC	p
Zygophyllaceae	<i>Zygophyllum xanthoxylon</i> (Bunge) Maxim.	IC, Khanbogd	p

Table A-2: Squamata registered from the Project Area of Influence

Family	Species	Common Names	Conservation Status	Range
Agamidae	<i>Phrynocephalus cf. przewalskii</i> . IUCN maps this species as present in Oyu Tolgoi Aol. Listed as <i>P. versicolor</i> Terbish <i>et al.</i> (2006). Genetic studies of Chinese populations indicate this species is not present in the South Gobi.	Przewalski's toad-headed agama, khonin gurvel	IUCN: LC MRL: LC (as <i>P. versicolor</i>)	Northern China (Nei Mongol); Southern Mongolia
Gekkonidae	<i>Teratoscincus przewalskii</i>	Przewalski's wonder gecko, plate-tailed gecko, nokhoi gurvel	IUCN: LC MRL: NT	China, Mongolia
Lacertidae	<i>Eremias argus</i>	Mongolian racerunner, Mongol gurvel	IUCN: NE MRL: LC	Russian Federation, China, Mongolia, Democratic People's Republic of Korea
Lacertidae	<i>Eremias multiocellata</i>	Multi-ocellated racerunner, mogoi gurvel	IUCN: NE MRL: LC	Russian Federation, China, Mongolia
Lacertidae	<i>Eremias przewalskii</i>	Gobi racerunner, Goviin gurvel	IUCN: NE MRL: LC	Russian Federation, China, Mongolia
Lacertidae	<i>Eremias vermiculata</i>	Vermiculated racerunner, zagalt gurvel	IUCN: NE MRL: LC	Kazakhstan, China, Mongolia
Boidae	<i>Eryx tataricus</i>	Tartary sand boa, temeen suul mogoi	IUCN: NE MRL: NT	Reported by SGSPA Staff. Northern Iran; eastern Kazakhstan; Turkmenistan; Uzbekistan; Afghanistan; western Pakistan; Tajikistan; western China (Xinjiang through Gansu to western Inner Mongolia and Ningxia); southern Mongolia; Kyrgyzstan.
Colubridae	<i>Coluber spinalis</i>	Slender racer, nariikhan mogoi, nariin mogoi	IUCN: NE MRL: NT	Russian Federation, China, Mongolia, North and South Korea.
Colubridae	<i>Elaphe dione</i>	Steppes rat snake, dione snake, Pallas' coluber, rashaanii mogoi	IUCN: NE MRL: LC	Ukraine, Russian Federation, Georgia, Armenia, Iran, Azerbaijan, Kazakhstan, Turkmenistan, Uzbekistan, Afghanistan, Tajikistan, China Mongolia, Kyrgyzstan, North and South Korea
Colubridae	<i>Psammophis lineolatus</i>	Steppe ribbon racer, sum mogoi	IUCN: NE MRL: LC	Iran, Azerbaijan, Kazakhstan, Turkmenistan, Uzbekistan, Afghanistan, Pakistan, Tajikistan, Kyrgyzstan, China, Mongolia
Viperidae	<i>Gloydius halys</i>	Halys pit viper, Asian viper, bambai	IUCN: NE MRL: LC	Russian Federation, Iran, Kazakhstan, Uzbekistan,

Family	Species	Common Names	Conservation Status	Range
		honshoort		Afghanistan, Tajikistan, Kyrgyzstan, China, Mongolia, Turkmenistan

MRL=Mongolian Red List (Terbish *et al.*, 2006).

Source: Data from Terbish *et al.* (2006).

Table A-3: Species of Birds reported from the Oyu Tolgoi Aol

Scientific name	Mongolian name	English name
Family :	PODICIPEDIDAE	
<i>Podiceps auritus</i>	Ухаа шунгуур	Horned Grebe
Family :	PHALACROCORACIDAE	
<i>Phalacrocorax carbo</i>	Тураг гогой	Great Cormorant
Family :	ARDEIDAE	
<i>Ardeola bacchus</i>	Цагаан дэвлээ	Chinese Pond Heron
<i>Egretta alba</i>	Цасч дэглий	Great Egret
<i>Ardea cinerea</i>	Хөх дэглий	Grey Heron
Family :	THRESKIORNITHIDAE	
<i>Platalea leucorodia</i>	Цагаагчин халбагат	White Spoonbill
Family :	CICONIIDAE	
<i>Ciconia nigra</i>	Хар өрөвтас	Black Stork
Family :	ANATIDAE	
<i>Anser anser</i>	Бор галуу	Greylag Goose
<i>Anser cygnoides</i>	Хошуу галуу	Swan Goose
<i>Cygnus cygnus</i>	Гангар хун	Whooper Swan
<i>Tadorna ferruginea</i>	Хондон ангир	Ruddy Shelduck
<i>Anas zonorhyncha</i>	Зэрлэгшир нугас	Eastern Spot-billed Duck
<i>Anas crecca</i>	Ногоохон нугас	Common Teal
<i>Anas strepera</i>	Бор нугас	Gadwall
<i>Anas penelope</i>	Зээрд нугас	Eurasian Wigeon
<i>Anas acuta</i>	Шовтгоралаг нугас	Northern Pintail
<i>Anas querquedula</i>	Цагаан хөмсөгт нугас	Garganey
<i>Anas clypeata</i>	Халбага нугас	Northern Shoveler
<i>Aythya ferina</i>	Улаанхүзүү шумбуур	Common Pochard
<i>Aythya nyroca</i>	Ундар шумбуур	Ferruginous Duck
<i>Aythya fuligula</i>	Гэээгт шумбуур	Tufted Duck
<i>Bucephala clangula</i>	Алаг шунгаач	Common Goldeneye
Family :	ACCIPITRIDAE	
<i>Milvus migrans</i>	Сохор элээ	Black Kite
<i>Accipiter nisus</i>	Морин харцага	Eurasian Sparrowhawk
<i>Buteo hemilasius</i>	Шилийн сар	Upland Buzzard
<i>Buteo rufinus</i>	Талын сар	Long-legged Buzzard
<i>Circaetus gallicus</i>	Могойч загалай	Short-toed Snake Eagle
<i>Hieraetus pennatus</i>	Бахим бүргэдэй	Booted Eagle
<i>Aquila nipalensis</i>	Тарважи бүргэд	Steppe Eagle

Scientific name	Mongolian name	English name
<i>Aquila chrysaetos</i>	Цармын бүргэд	Golden eagle
<i>Haliaeetus albicilla</i>	Цагаансүүл нөмрөг бүргэд	White-tailed Eagle
<i>Gypaetus barbatus</i>	Ооч ёл	Bearded Vulture
<i>Neophron percnopterus</i>	Дэлт ёлон	Egyptian Vulture
<i>Aegypius monachus</i>	Нөмрөг тас	Cinereous Vulture
Family :	FALCONIDAE	
<i>Falco cherrug</i>	Идлэг шонхор	Saker Falcon
<i>Falco peregrinus</i>	Эгэл шонхор	Peregrine Falcon
<i>Falco subbuteo</i>	Шууман шонхор	Eurasian Hobby
<i>Falco tinnunculus</i>	Начин шонхор	Common Kestrel
<i>Falco amurensis</i>	Амарын шонхор	Amur Falcon
<i>Falco naumanni</i>	Зээрд шонхор	Lesser Kestrel
Family :	PHASIANIDAE	
<i>Alectoris chukar</i>	Эрэнхавирга хахилга	Chukar
<i>Perdix daurica</i>	Дагуур ятуу	Daurian Partridge
<i>Coturnix japonica</i>	Наран бөднө	Japanese Quail
Family :	TURNICIDAE	
<i>Anthropoides virgo</i>	Өвөгт тогоруу	Demoiselle Crane
Family :	OTIDIDAE	
<i>Otis tarda</i>	Хонин тоодог	Great Bustard
<i>Chlamydotis undulata</i>	Жороо тоодог	Houbara Bustard
Family :	CHARADRIIDAE	
<i>Charadrius dubius</i>	Нарийн хиазат	Little Ringed Plover
<i>Charadrius leschenaultii</i>	Зэвэн хиазат	Greater Sand Plover
<i>Charadrius veredus</i>	Дорнын хиазат	Oriental Plover
<i>Charadrius alexandrinus</i>	Тэнгисийн хиазат	Kentish Plover
<i>Vanellus cinereus</i>	Саарал зуунхурга, хавтгаалж	Grey-headed Lapwing
Family:	RECURVIROSRIDAE	
<i>Himantopus himantopus</i>	Эгэл хилэнжигүүр	Black-winged Stilt
Family :	SCOLOPACIDAE	
<i>Tringa ochropus</i>	Сүүлцагаан хөгчүү	Green Sandpiper
<i>Tringa glareola</i>	Шугуйн хөгчүү	Wood Sandpiper
<i>Tringa nebularia</i>	Үхэр хөгчүү	Common Greenshank
<i>Tringa totanus</i>	Улаанхөлт хөгчүү	Common Redshank
<i>Actitis hypoleucos</i>	Эгэл хайргын хөгчүү	Common Sandpiper
<i>Phalaropus lobatus</i>	Нарийн сэлээхэй	Red-necked Phalarope
<i>Calidris subminuta</i>	Савар элсэг	Long-toed Stint
<i>Scolopax rusticola</i>	Буурал хомноот	Eurasian Woodcock
Family :	LARIDAE	
<i>Larus ridibundus</i>	Хүрэн толгойт цахлай	Black-headed Gull
<i>Larus relictus</i>	Реликт цахлай	Relict Gull
Family :	PTEROCLIDIDAE	
<i>Syrrhaptes paradoxus</i>	Монгол ногтруу	Pallas's Sandgrouse
Family :	COLOUMBIDAE	

Scientific name	Mongolian name	English name
<i>Columba livia</i>	Хөхвөр тагтаа	Rock Pigeon
<i>Columba rupestris</i>	Хадны тагтаа	Hill Pigeon
<i>Streptopelia decaocto</i>	Буулгат хүүрэгэнэ	Collared Dove
Family :	CUCULIDAE	
<i>Cuculus canorus</i>	Эгэл хөхөө	Common Cuckoo
Family :	STRIGIDAE	
<i>Bubo bubo</i>	Эгэл шар шувуу	Eurasian Eagle Owl
<i>Asio otus</i>	Соотон гуйванга	Long-eared Owl
<i>Athene noctua</i>	Хотны бүгээхэй	Little Owl
Family :	CAPRIMULGIDAE	
<i>Caprimulgus europaeus</i>	Өрнийн эргүү бор	Eurasian Nightjar
Family :	APODIDAE	
<i>Apus apus</i>	Хурын ураацай	Common Swift
<i>Apus pacificus</i>	Хондлой цагаан ураацай	Pacific Swift
Family :	UPUPIDAE	
<i>Upupa epops</i>	Бөвөөлжин өвөөлж	Hoopoe
Family :	PICIDAE	
<i>Dendrocopos major</i>	Их алаг тоншуул	Great Spotted Woodpecker
<i>Jynx torquilla</i>	Холтсон гоётуул	Wryneck
Family :	HIRUNDINIDAE	
<i>Ptyonoprogne rupestris</i>	Харагчин хараацгай	Eurasian Crag Martin
Family :	ALAUDIDAE	
<i>Galerida cristata</i>	Согсоот болжмор	Crested lark
<i>Calandrella cinerea</i>	Талын жиргэмэл	Greater Short-toed Lark
<i>Calandrella cheleensis</i>	Дэрсний жиргэмэл	Asian Short-toed Lark
<i>Melanocorypha mongolica</i>	Монгол болжмор	Mongolian Lark
<i>Eremophila alpestris</i>	Шоорон эвэрт болжмор	Horned lark
<i>Alauda arvensis</i>	Боролзой богширго	Common Skylark
Family :	MOTACILLIDAE	
<i>Anthus richardi</i>	Хээрийн шийхнүүхэй	Richard's Pipit
<i>Anthus hodgsoni</i>	Бөртөт шийхнүүхэй	Olive-backed Pipit
<i>Anthus spinoletta</i>	Харзан шийхнүүхэй	Water Pipit
<i>Motacilla alba</i>	Хөх цэгцгий	White Wagtail
<i>Motacilla flava</i>	Шар цэгцгий	Yellow Wagtail
<i>Motacilla citreola</i>	Шартүрүүт цэгцгий	Citrine Wagtail
<i>Motacilla cinerea</i>	Уулын цэгцгий	Gray Wagtail
Family :	LANIIDAE	
<i>Lanius cristatus</i>	Ухаа дунхай	Brown Shrike
<i>Lanius isabellinus</i>	Улбар сүүлт дунхай	Isabelline Shrike
<i>Lanius excubitor</i>	Үнсэн дунхай	Great Grey Shrike
Family :	STURNIDAE	
<i>Poliopsar cineraceus</i>	Бор тодол	White-cheeked Starling
Family :	CORVIDAE	
<i>Pica pica</i>	Алаг шаазгай	Magpie

Scientific name	Mongolian name	English name
<i>Pyrrhocorax pyrrhocorax</i>	Улаан хушуут жунгаа	Red-billed Chough
<i>Corvus corax</i>	Хон хэрээ	Common Raven
<i>Corvus frugilegus</i>	Турлиах	Eurasian Rook
<i>Corvus dauuricus</i>	Алагтуу	Daurian Jackdaw
<i>Podoces hendersoni</i>	Монгол хулан жороо	Mongolian Ground-jay
Family :	BOMBYCILLIDAE	
<i>Bombycilla garrulus</i>	Шивэр энхэтбялзуухай	Bohemian Waxwing
Family :	PRUNELLIDAE	
<i>Prunella collaris</i>	Тагийн хайруулдай	Alpine Accentor
<i>Prunella fulvescens</i>	Шарга хайруулдай	Brown Accentor
<i>Prunella montanella</i>	Сибирийн хайруулдай	Siberian Accentor
Family :	SYLVIIDAE	
<i>Sylvia curruca</i>	Тарчигнаа зэржигэнэ	Lesser Whitethroat
<i>Sylvia nana</i>	Цөлийн зэржигэнэ	Desert Warbler
<i>Phylloscopus proregulus</i>	Жирхэн дууч шувуу	Pallas's Warbler
Family :	MUSCICAPIDAE	
<i>Muscicapa sibirica</i>	Шивэр намнаахай	Dark-sided Flycatcher
<i>Muscicapa latirostris</i>	Дагуур намнаахай	Asian Brown Flycatcher
<i>Ficedula albicilla</i>	Хурган намнаахай	Taiga Flycatcher
<i>Oenanthe oenanthe</i>	Адууч чогчиго	Northern Wheatear
<i>Oenanthe pleschanka</i>	Мяраан чогчиго	Pied Wheatear
<i>Oenanthe deserti</i>	Цөлийн чогчиго	Desert Wheatear
<i>Oenanthe isabellina</i>	Бүжимч чогчиго	Isabelline Wheatear
<i>Monticola saxatilis</i>	Хадны жижир	Rufous-tailed Rock Thrush
<i>Turdus obscurus</i>	Халиун хөөндэй	Eye-browed Thrush
<i>Zoothera dauma</i>	Алаг хөөндэй	White's Thrush
<i>Turdus ruficollis</i>	Улангүеэ хөөндэй	Red-throated Thrush
<i>Turdus naumanni</i>	Науманны хөөндэй	Naumann's Thrush
<i>Turdus eunomus</i>	Хүрэн хөөндэй	Dusky Thrush
<i>Phoenicurus aureus</i>	Дагуур галсүүлт	Daurian Redstart
<i>Phoenicurus erythrogastrus</i>	Цээжмэгт галсүүлт	Guldenstadt's Redstart
<i>Tarsiger cyanurus</i>	Гургалдай хөхзоот	Red-flanked Bluetail
Family :	SITTIDAE	
<i>Tichodroma muraria</i>	Хэрмийн бялзуухай	Wallcreeper
Family :	PASSERIDAE	
<i>Passer montanus</i>	Хээрийн бор шувуу	Eurasian Tree Sparrow
<i>Passer domesticus</i>	Оронгийн бор шувуу	House Sparrow
<i>Petronia petronia</i>	Хадны бор шувуу	Rock Sparrow
<i>Passer ammodendri</i>	Загийн бор шувуу	Saxaul Sparrow
Family :	FRINGILLIDAE	
<i>Fringilla coelebs</i>	Дуулгат бужирга	Common Chaffinch
<i>Fringilla montifringilla</i>	Алаг бужирга	Brambling
<i>Acanthis flammea</i>	Дөлөн цэгцүүхэй	Common Redpoll
<i>Bucanetes mongolica</i>	Монгол алтанжигүүр	Mongolian Finch

Scientific name	Mongolian name	English name
Family :	EMBERIZIDAE	
<i>Emberiza aureola</i>	Шарэлэгт хөмрөг	Yellow-breasted Bunting
<i>Emberiza cioides</i>	Шархөмсөг хөмрөг	Meadow Bunting
<i>Emberiza godlewskii</i>	Годлевскийн хөмрөг	Godlewski's Bunting
<i>Emberiza pusilla</i>	Бор хөмрөг	Little Bunting
<i>Emberiza pallasii</i>	Цагаанхэвэлт хөмрөг	Pallas's Reed Bunting

Source: Compiled by P. Tsolmonjav.

Table A-4: Mammals reported from the Oyu Tolgoi Aol

Orders, Families	Scientific Name	English name	Mongolian name	IUCN 2010	Mongolian Red List
EULIPOTYPHLA					
Erinaceidae					
	<i>Hemiechinus auritus</i>	Long-eared hedgehog	Дэлдэн зараа	LC	LC
Soricidae					
	<i>Crocidura sibirica</i>	Siberian shrew	Малтаахай жөвүү	LC	DD
CHIROPTERA					
Vespertilionidae					
	<i>Myotis mystacinus</i>	Whiskered myotis bat	Сахалт багваахай	LC	LC
	<i>Eptesicus gobiensis</i>	Gobi big brown bat	Говийн сармаахай	LC	LC
	<i>Eptesicus cf. serotinus</i>	Serotine	Хожуу сарсаахай	LC	NE
LAGOMORPHA					
Ochotonidae					
	<i>Ochotona dauurica</i>	Daurian pika	Дагуур огдой		LC
	<i>Ochotona pallasii</i>	Pallas' pika	Монгол огдой	LC	LC
Leporidae					
	<i>Lepus tolai</i>	Tolai hare	Бор туулай	LC	LC
RODENTIA					
Sciuridae					
	<i>Spermophilus pallidicauda</i>	Pallid ground squirrel	Бозлог	LC	LC
Cricetidae					
	<i>Phodopus campbellii</i>	Campbell's hamster	Орог зусар	LC	LC
	<i>Phodopus roborovskii</i>	Roborowski's dwarf hamster	Элсний зусар	LC	LC
	<i>Cricetulus barabensis</i>	Striped dwarf hamster	Говийн шишүүхэй	LC	LC
	<i>Cricetulus longicaudatus</i>	Long-tailed dwarf hamster	Урт сүүлт шишүүхэй	LC	LC
	<i>Cricetulus migratorius</i>	Grey hamster	Бор шишүүхэй	LC	DD
	<i>Allocricetulus</i>	Mongolian hamster	Цомч шишүүхэй	LC	LC

Orders, Families	Scientific Name	English name	Mongolian name	IUCN 2010	Mongolian Red List
	<i>curtatus</i>				
	<i>Ellobius tancrei</i>	Zaisan mole vole	Сохдой оготно	LC	LC
	<i>Alticola semicanus</i>	Mongolian silver vole, Royle's mountain vole	Хадны барагчин	LC	LC
	<i>Eolagarus luteus</i>	Yellow steppe lemming	Шар ов	LC	DD
Muridae					
	<i>Meriones unguiculatus</i>	Mongolian gerbil	Монгол чичүүл	LC	LC
	<i>Meriones meridianus</i>	Southern jird or midday gerbil	Шар чичүүл	LC	LC
	<i>Rhombomys opimus</i>	Great gerbil	Морин чичүүл	LC	LC
	<i>Mus musculus</i>	House mouse	Гэрийн хулгана	LC	LC
Dipodidae					
	<i>Allactaga sibirica</i>	Siberian jerboa	Сибирь алагдаага	LC	LC
	<i>Allactaga bullata</i>	Gobi jerboa	Говийн алагдаага	LC	DD
	<i>Allactaga balikunica</i>	South Gobi jerboa	Өмнөговийн алагдаага	LC	LC
	<i>Dipus sagitta</i>	Northern three-toed jerboa	Савагдаахай	LC	LC
	<i>Cardiocranius paradoxus</i>	Five-toed pygmy jerboa	Таван хуруут атигдаахай	DD	DD
	<i>Euchoreutes naso</i>	Long-eared jerboa	Соотон алагдаага	LC	VU
	<i>Salpingotus kozlovi</i>	Kozlov's pygmy jerboa	Козловын атигдаахай	DD	DD
	<i>Salpingotus crassicauda</i>	Thick-tailed pygmy jerboa	Өөхөн сүүлт атигдаахай	LC	DD
	<i>Stylodipus andrewsi</i>	Andrews' three-toed jerboa	Монгол даахай	LC	
CARNIVORA					
Felidae					
	<i>Felis silvestris</i>	European Wild cat	Цоохондой	LC	LC
	<i>Otocolobus manul</i>	Manul or Pallas' cat	Мануул	NT	NT
	<i>Lynx lynx</i>	Eurasian lynx	Шилүүс	LC	NT
Canidae					
	<i>Canis lupus</i>	Grey wolf	Саарал чоно	LC	NT
	<i>Vulpes vulpes</i>	Red Fox	Шар үнэг	LC	NT
	<i>Vulpes corsac</i>	Corsac fox	Хярс	LC	NT
Mustelidae					
	<i>Vormela peregusna</i>	Marbled polecat	Эрээн хүрэн	VU	DD
	<i>Mustela nivalis</i>	Least weasel	Хотны үен	LC	LC
	<i>Mustela eversmanni</i>	Steppe polecat	Өмхий хүрэн	LC	LC
PERISSODACTYLA					
Equidae					

Orders, Families	Scientific Name	English name	Mongolian name	IUCN 2010	Mongolian Red List
	<i>Equus hemionus</i>	Asiatic wild ass or Khulan	Хулан	EN	EN
ARTIODACTYLA					
Bovidae					
	<i>Gazella subgutturosa</i>	Goitered or Black-tailed gazelle	Хар сүүлт зээр	VU	VU
	<i>Procapra guttorosa</i>	Mongolian gazelle	Цагаан зээр	LC	EN
	<i>Capra sibirica</i>	Siberian ibex	Янгир	LC	LC
	<i>Ovis ammon</i>	Argali or wild mountain sheep	Аргаль	NT	EN

ANNEX C: RBA Appendix 2: Critical Habitat Assessment: IFC Performance Standard 6 / EBRD Performance Requirement 6

ESIA Appendix 2

Oyu Tolgoi Project

Critical Habitat Assessment:

**IFC Performance Standard 6/
EBRD Performance Requirement 6**

August 2012

This report has been written by:
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REPORT AT A GLANCE

Following the criteria of Paragraph 9 within the 2006 version of the International Finance Corporation's Performance Standard 6 (Biodiversity Conservation and Sustainable Natural Resource Management; IFC PS6), the IFC Oyu Tolgoi Project Guidance Note on Critical Habitat, and Paragraph 13 within the European Bank for Reconstruction and Development's (EBRD's) Performance Requirement 6 (EBRD PR6), this report determines the extent of, and qualifying criteria for, Critical Habitat relevant to the Oyu Tolgoi LLC project in southern Mongolia.

Units of analysis

This report assesses two units of analysis for the Oyu Tolgoi project:

- ▲ a larger (51,415 km²) unit of analysis comprising Khanbogd, Manlai and Bayan-Ovoo soums, and Sectors A and B of Small Gobi Strictly Protected Area (identified as ecologically appropriate for wide-ranging/hunted large mammals);
- ▲ a smaller (27,375 km²) unit of analysis comprising Khanbogd and Manlai soums (identified as ecologically appropriate for all other species, species assemblages, evolutionary processes and ecosystem services owing to potential impacts from the mine and associated infrastructure, notably potential hydrological impacts across both soums).

These units of analysis form the basis for the Critical Habitat determination, rather than necessarily any future mitigation or monitoring requirement.

Critical Habitat qualifying biodiversity values

Criterion	Qualifying value	Biodiversity type	Critical Habitat category
1. Critically Endangered or Endangered species	Asiatic Wild Ass <i>Equus hemionus</i>	mammal	Tier 1 (globally important concentrations of a globally Endangered species)
	Mongolian Chesney <i>Chesneya/Chesniella mongolica</i>	plant	Tier 2 (nationally important concentrations of a potentially nationally Endangered species)
	Argali <i>Ovis ammon</i>	mammal	Tier 2 (nationally important concentrations of a nationally Endangered species)
	Short-toed Snake-eagle <i>Circaetus gallicus</i>	bird	Tier 2 (nationally important concentrations of a nationally Endangered species)
2. Endemic or restricted-range species	Not triggered		
3. Migratory or congregatory species	Goitered Gazelle <i>Gazella subgutturosa</i>	mammal	Tier 2 (nationally important concentrations of a migratory species)
4. Unique assemblages of species	Granite outcrop floral communities	species assemblage	N/a
5. Key evolutionary processes	Not triggered		
6. Key ecosystem services	Water regulation	ecosystem service	N/a
7. Biodiversity of social, economic or cultural importance to local communities	Livestock (pasture)	ecosystem service	N/a
	Biomass fuel	ecosystem service	N/a
	Freshwater	ecosystem service	N/a

Conclusions

Under the criteria of the 2006 version of IFC PS6 Paragraph 9, the IFC Oyu Tolgoi Project Guidance Note on Critical Habitat, and EBRD PR6 Paragraph 13, **this report finds that the entirety¹ of both units of analysis defined for Oyu Tolgoi are Critical Habitat:**

- the majority of the larger unit of analysis is Tier 1 Critical Habitat for Asiatic Wild Ass;
- the whole of the larger unit of analysis is Tier 2 Critical Habitat for Argali and Goitered Gazelle;
- the whole of the smaller unit of analysis is Tier 2 Critical Habitat for Mongolian Chesney, Short-toed Snake-eagle, granite outcrop floral communities, and four ecosystem services (water regulation, livestock [pasture], biomass fuel and freshwater).

Implications

These results mean that development within the units of analysis will be subject to the following lender requirements:

1. to ensure no measurable adverse impacts on Critical Habitat-qualifying biodiversity values over the long term at the regional scale;

- It is accepted that there may be some measurable negative impacts at the project site scale (particularly in the short term), although these should be avoided, minimized and mitigated as far as possible, following the mitigation hierarchy.
- A biodiversity monitoring and evaluation programme is required to be put in place to measure losses and gains to Critical Habitat-triggering biodiversity values.

2. to ensure no significant reduction in populations of Critically Endangered or Endangered species;

- The acceptable 'reduction' in population should not be interpreted as the survival of every individual, but as a significant impact on the ability of the species to persist into the long-term (such as a change in a species' regional [e.g. South-east Gobi], national or global conservation status).
- Monitoring and evaluation of all project impacts on all of these species is required (though not necessarily species-specific population monitoring for all of these species).

3. to mitigate impacts on Critical Habitat through avoidance, minimization or rehabilitation, with residual impacts mitigated through biodiversity offsets.

- This requirement refers to all lesser impacts not defined in requirements 1 and 2, and requires the client to mitigate these in accord with PS6 Paragraph 8/PR6 Paragraph 12 for Natural Habitat.
- This requirement specifically allows offsets. Although Tier 1 Critical Habitat is generally not considered to be 'offsetable', the following issues will be particularly taken into account by lenders when considering proposals for offsets: the type and scale of impacts; the capacity of the client and government; the willingness of the client to form partnerships with conservation organisations for offset planning, design and management; government endorsement of offset plans; efforts to ensure a Net Positive Impact on biodiversity at a regional scale.

1 See Section 3.5.1

EXECUTIVE SUMMARY

This report determines the extent of, and qualifying criteria for, Critical Habitat relevant to the Oyu Tolgoi LLC project in southern Mongolia. The 11-page **Executive Summary**, designed for decision makers, provides the essential technical information and the resulting key conclusions and implications. The **Technical Report**, designed for financial and technical advisors, analysts, and project stakeholders, provides: details of the requirements of Paragraph 9 of IFC Performance Standard 6 (PS6), Paragraph 13 of EBRD Performance Requirement 6 (PR6) and the IFC Oyu Tolgoi Project Guidance Note on Critical Habitat; the custom-built methods developed to respond to this guidance; maps of the spatial units of analysis evaluated; full results for each PS6 Paragraph 9/PR6 Paragraph 13 criterion; the implications of these results for the project; and the next steps required. This document is being complemented by Biodiversity Management Plans for each infrastructure component, an offsets strategy and a Net Positive Impact Forecast. These complementary documents will contain the information to form the basis of compliance against PS6 Paragraph 10/PR6 Paragraph 14, which cover project impacts and the mitigation options available.

I Conclusions and implications

Following the criteria of Paragraph 9 within the 2006 version of the International Finance Corporation's Performance Standard 6 (Biodiversity Conservation and Sustainable Natural Resource Management), the IFC Oyu Tolgoi Project Guidance Note on Critical Habitat, and Paragraph 13 within the European Bank for Reconstruction and Development's Performance Requirement 6, **this report finds that the entirety² of both units of analysis defined for Oyu Tolgoi are Critical Habitat.**

The larger unit of analysis (identified as the spatial unit of analysis for large mammals) – comprising Khanbogd, Manlai and Bayan-Ovoo soums and Small Gobi SPA sectors A and B (51,415 km²) – qualifies as Critical Habitat under criteria 1 and 3 of PS6 Paragraph 9. The boundary of this Critical Habitat is therefore the boundary of this unit of analysis, encompassing Khanbogd, Bayan-Ovoo and Manlai soums and both A and B sectors of Small Gobi Strictly Protected Area, a total area of c. 51,000 km². This unit of analysis triggers **Critical Habitat under two PS6 Paragraph 9 criteria: Criterion 1 - its significance for globally and nationally Endangered species (two species) and Criterion 3 - its significance for migratory and congregatory species (one species).** Therefore this unit of analysis does not qualify for Critical Habitat under Criterion 2 - restricted range and endemic species, and was not considered to be an appropriate scale for assessing Criterion 4 - unique assemblages; Criterion 5 – evolutionary processes; Criterion 6 - ecosystem services; and Criterion 7 – biodiversity of social, economic or cultural importance.

Within this larger unit of analysis there are several grades of Critical Habitat. The most sensitive in terms of irreplaceability and vulnerability are defined as IFC Tier 1. **The range of Asiatic Wild Ass *Equus hemionus* in this unit of analysis is currently defined as Tier 1, and covers the majority of the unit of analysis. This is due to this unit of analysis representing more than 10% of the population of this globally Endangered species.** All other habitats within the unit of analysis are currently classified as Tier 2 due to other relevant criteria (see Methods).

The smaller unit of analysis (identified as the spatial unit of analysis for all species other than large mammals, and for unique assemblages, evolutionary processes, and ecosystem services) – comprising Khanbogd and Manlai soums (27,375 km²) – qualifies as Critical Habitat under criteria 1, 4, 6 and 7 of PS6 Paragraph 9. The boundary of this Critical Habitat is therefore the boundary of this unit of analysis, encompassing Khanbogd and Manlai soums, a total area of 27,375 km². This unit of analysis triggers **Critical Habitat under four PS6 Paragraph 9 criteria: Criterion 1 - its significance for globally and**

² See Section 3.5.1

nationally Endangered species (two species); Criterion 4 – its significance for unique assemblages of species (one assemblage); Criterion 6 – its significance for key ecosystem services (one ecosystem service); and Criterion 7 – its significance for biodiversity of social, economic or cultural importance to local communities (three ecosystem services). Therefore this unit of analysis does not qualify for Critical Habitat under Criterion 2 - restricted range and endemic species; Criterion 3 – migratory and congregatory species; and Criterion 5 – evolutionary processes. The entirety of this smaller unit of analysis is Tier 2 Critical Habitat.

These results mean that development within the Oyu Tolgoi units of analysis will be subject to the requirements of Paragraph 10 of the 2006 version of the IFC Performance Standard 6/Paragraph 14 of EBRD Performance Requirement 6 and also the interpretation of PS6 Paragraph 10 as set out in the Oyu Tolgoi Project Guidance Note (IFC 2009). These requirements and their implications for the project can be summarised with reference to the Project Guidance Note as:

IFC Requirement 1: *“In areas of critical habitat, the client will not implement any project activities unless... There are no **measurable adverse impacts** on the ability of the critical habitat to support the established **population** of species described in paragraph 9 or the **functions** of the critical habitat described in paragraph 9”*

Project Implications of Requirement 1: The terms highlighted in bold in the IFC requirements have very specific definitions in the Oyu Tolgoi Project Guidance Note (IFC 2009), see Section 6.2 for further details. Requirement 1 means that there should be no measurable adverse impacts on Paragraph 9-qualifying biodiversity values over the long term at the broader regional scale. It is accepted that there may be some measurable negative impacts at the project site scale (particularly in the short term), although these should be avoided, minimized and mitigated as far as possible, following the mitigation hierarchy. Particular attention should be given to managing long-term indirect impacts (especially habitat fragmentation, the spread of invasive species and induced access) (IFC 2009). Monitoring and evaluation of all project impacts on Critical Habitat is required.

IFC Requirement 2: *“In areas of critical habitat, the client will not implement any project activities unless... There is no **reduction** in the **population** of any recognized critically endangered or endangered species”*

Project Implications of Requirement 2: The impact of potential losses at the project site on species populations should be considered at the global level (or at the national/regional level, where appropriate). A combination of on-site and offset mitigation measures should be used to further the conservation of Critically Endangered and Endangered species qualifying for Paragraph 9. Monitoring and evaluation of all project impacts on these species is required.

IFC Requirement 3: *“In areas of critical habitat, the client will not implement any project activities unless... Any **lesser impacts** are mitigated in accordance with paragraph 8”*

Project Implications of Requirement 3: Residual impacts on Critical Habitat (e.g. those that are impossible or not cost effective in terms of benefits to biodiversity to mitigate through avoidance, minimization or rehabilitation) should be mitigated through the implementation of biodiversity offsets (IFC 2009). Tier 1 Critical Habitat is generally not considered to be ‘offsetable’, although there are some situations (for example due to the degree of impact, the client’s capacity and the quality of their biodiversity programme) in which such offsets would be acceptable; this needs to be determined on a case-by-case basis with input from appropriate experts and stakeholders. Some Critical Habitat as per

Criteria 4 through 7 (which do not distinguish between Tier 1 and Tier 2) may also be “*very difficult, or impossible, to offset*” (IFC 2009).

Two further important points are made in the Oyu Tolgoi Project Guidance Note (IFC 2009) that apply to all three requirements. First, a biodiversity monitoring programme is essential to ensure that Requirements 1-3 are being met. A set of biodiversity indicators should be developed that specify thresholds for acceptable and unacceptable levels of loss at the site scale for both species and habitats, and these indicators should be incorporated into the broader Social and Environmental Management System. Second, all three requirements allow for the use of biodiversity offsets to compensate for residual impacts on Critical Habitat biodiversity values, while acknowledging that offsets are not appropriate in all cases (some biodiversity values are not offsetable).

The IFC and EBRD requirements do not substantially differ from the requirements set out within the Rio Tinto Biodiversity Strategy with the aim of a Net Positive Impact on biodiversity (Rio Tinto 2004; Rio Tinto 2008). The similarity between IFC PS6 and EBRD PR6 policies and the pre-existing Rio Tinto Biodiversity Strategy for Net Positive Impact will facilitate the implementation of such requirements using the tools and systems which have been developed internally within Rio Tinto since 2004.

II An introduction to the Oyu Tolgoi project

The Oyu Tolgoi project is co-owned by Ivanhoe Mines Ltd and Rio Tinto International Holdings Ltd, in partnership with the Government of Mongolia. The project is co-financed by the International Finance Corporation (IFC), European Bank for Reconstruction and Development (EBRD) and Export Development Canada (EDC) and is therefore subject to several Performance Standards (PS) and Performance Requirements (PR), including PS6/PR6 concerning Biodiversity Conservation and Sustainable Natural Resource Management. The aim of this report is to determine which biodiversity and ecosystem services present in the spatial unit of analysis studied qualify for Critical Habitat under Paragraph 9 of PS6/Paragraph 13 of PR6.

The Oyu Tolgoi project includes a copper and gold mine (85 km² mine lease), an upgraded road link to the Chinese border, a high-voltage power transmission line parallel to the road corridor, an international airport, development of a borefield, a water pipeline and medium-voltage power distribution line connecting the borefield to the mine lease, and worker housing. This report concerns all of these infrastructure components. The project has the potential to stimulate significant social and economic development at both national and local levels in Mongolia.

III What is Critical habitat? A resumé of Paragraph 9 of Performance Standard 6/Paragraph 13 of Performance Requirement 6

Critical Habitat is a concept within the International Finance Corporation Performance Standard 6 and the European Bank for Reconstruction and Development Performance Requirement 6 to facilitate the identification of areas of High Biodiversity Value. The intention of delineating Critical Habitat is to define areas in which development would be of a particularly sensitive nature and require special attention were it to go ahead. This report follows the IFC Oyu Tolgoi Project Guidance Note on Critical Habitat which states that: “*Critical habitats are areas of high biodiversity value that include at least one of the seven criteria specified in para. 9 of PS6*”. These seven criteria are:

1. Critically Endangered and Endangered Species (see Table 1 for more detail)
2. Endemic and Restricted-range Species (see Table 1 for more detail)

3. Migratory and Congregatory Species
4. Unique Assemblages of Species
5. Key Evolutionary Processes
6. Key Ecosystem Services
7. Biodiversity of Significant Social, Economic or Cultural Importance to Local Communities

Critical Habitat is triggered if the requirements of any one of these seven Criteria are met. Quantitative thresholds have been set for Criteria 1-3 (species), for the purposes of guiding Critical Habitat assessments; qualitative thresholds exist for Criteria 4-7 (habitats, functions, processes and ecosystem services) but depend on quantitative assessment, and expert and participatory judgement. The Oyu Tolgoi Project Critical Habitat Guidance Note (IFC 2009) provides significant detail concerning the interpretation of PS6 for the Oyu Tolgoi Project. This is summarised in Section 3 of this report. The most salient of the project-specific Guidance Note’s points are as follows:

- 3.1. The regional context of the project site must be studied to provide the ecological context for the project site: what is the relationship between the project site and the surrounding environment?
- 3.2. Critical Habitat is delimited using a recognised spatial unit of analysis. The boundary of the unit of analysis is defined by a sensible ecological (e.g. watershed) or management (e.g. protected area) unit within which the project site is found. Critical Habitat does not consist of small polygons in and around the project site. Hence a project can be “within Critical Habitat” even if the biodiversity values in question exist outside of the proposed project footprint³.
- 3.3. Tiers of Critical Habitat: Grades of significance of Critical Habitat are now recognised, and have been defined in terms of difficulty in assuring compliance with Critical Habitat requirements. Most important amongst these grades are the two Tiers of Critical Habitat defined for Criteria 1-3 of Paragraph 9. Tier 1 Critical Habitat is of high significance, and less likely to be offsetable. Tier 2 Critical Habitat is more likely to be offsetable, although both Tier 1 and Tier 2 Critical Habitat are bound by identical requirements.
- 3.4. Quantitative thresholds are proposed as guidance for the species Criteria 1-3 within the 2006 version of PS6 Paragraph 9 which define whether Critical Habitat is triggered and for which Tier. Qualitative thresholds remain for Criteria 4-7. For Criteria 1-2, these thresholds are summarised in Table 1.

Table 1. Quantitative thresholds to define Critical Habitat and Tiers 1 and 2 for Critically Endangered/Endangered and endemic/restricted-range species (Criteria 1 and 2 of PS6 Paragraph 9). Note this table was constructed by TBC (2010) in response to the interim Project Guidance Notes issued by the IFC.

Criteria	Tier 1	Tier 2
1. Critically Endangered/Endangered	a) Habitat required to sustain ≥ 10 percent of the global population of an IUCN Red-listed CR or EN species/subspecies where there are known, regular occurrences of the species/subspecies and where that habitat could be considered a discrete management unit for that species/subspecies. b) Habitat with known, regular occurrences of CR or EN species/subspecies where that habitat is one of 10 or fewer discrete management sites globally for that species/subspecies.	c) Habitat that supports the regular occurrence of a single individual of an IUCN Red-listed CR species/subspecies and/or habitat containing regionally-important concentrations of an IUCN Red-listed EN species/subspecies where that habitat could be considered a discrete management unit for that species/subspecies. d) Habitat of significant importance to CR or EN species/subspecies that are wide-ranging and/or whose population distribution is not well understood and where the loss of such a habitat could potentially impact the long-term survivability of the species/subspecies. e) Habitat required to sustain ≥ 10 percent of the national (or regional) population of a nationally-listed (or regionally-listed) CR or EN (or equivalent) species/subspecies (i.e., habitat is one of 10 or fewer in-country or regional locations) and where that habitat could be considered a discrete management unit.
2. Endemic/	a) Habitat known to sustain ≥ 95	b) Habitat known to sustain ≥ 1 percent but < 95 percent of the global

³ See Section 3.5.1

restricted-range	percent of the global population of an endemic or restricted-range species/subspecies where that habitat could be considered a discrete management unit for that species/subspecies (e.g., a single-site endemic).	population of an endemic or restricted-range species/subspecies where that habitat could be considered a discrete management unit for that species/subspecies, where data are available. c) Habitat known to sustain an endemic or restricted-range species/ subspecies where that habitat is restricted to 2 to 100 discrete management sites globally, where data are available.
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IV Methods

There are three steps used to identify Critical Habitat. Detailed descriptions are given in the methods section of the technical report.

- 4.1. Define scope of assessment, the project area of influence, and the spatial units of analysis.
- 4.2. Collect and verify available information on biodiversity and ecosystem services using biological and social fieldwork, literature review, expert consultation and analysis.
- 4.3. Screen and select biodiversity components (species, habitats, ecosystem processes and services) possibly qualifying under Paragraph 9 criteria; conduct detailed assessments to identify which components qualify as Critical Habitat using stated quantitative thresholds (Criteria 1-3), or deriving appropriate thresholds from peer reviewed literature (Criteria 4-7).

V Results

- 5.1. **Spatial Scope and Units of Analysis.** The area of influence of the project extends beyond the borders of the Oyu Tolgoi mine lease area, covering the whole of Khanbogd *soum* – an area of c. 15,000 km² (Oyu Tolgoi LLC in prep.). Following the Oyu Tolgoi Project Guidance Note on Critical Habitat, the spatial scope used for assessment included not just the area of influence but also the neighbouring soums of Bayan-Ovoo, Manlai and both A and B sectors of the Small Gobi Strictly Protected Area (a total area of c. 51,000 km²). Two different units of analysis were identified, related to the ecology and/or impacts relevant to particular biodiversity features. First, the area comprising Khanbogd, Manlai and Bayan-Ovoo soums, and Small Gobi Strictly Protected Area sectors A and B was identified as the spatial unit of analysis for large mammals, owing to the nomadic movements of some species of ungulate⁴ and to potential secondary impacts across this whole area, notably including increased hunting owing to in-migrants and increased wealth (and consequent availability of vehicles and firearms). This unit of analysis covers 51,415 km². Second, a smaller area comprising Khanbogd and Manlai soums was identified as the spatial unit of analysis for all other species, unique assemblages of species, key evolutionary processes, key ecosystem services and biodiversity of significant social, economic or cultural importance to local communities. This unit of analysis incorporates not only Khanbogd *soum*, across which there will be primary impacts from the mine and associated infrastructure, but also Manlai *soum*, into which the Gunii Hooloi aquifer appears to extend (and thus into which significant secondary impacts may potentially occur from mine-related water extraction⁵). This unit of analysis covers 27,375 km².
- 5.2. **Criterion 1: Critically Endangered and Endangered species: Triggered.** No Critically Endangered species are known or predicted to occur in the units of analysis. Eighteen candidate plants listed as 'very rare' in national law, three candidate globally Endangered animal species, and four additional candidate nationally Endangered animal species are known or predicted to occur in the respective relevant units of analysis. Of these candidate species, one (Asiatic Wild Ass *Equus hemionus*) qualifies for Tier 1 Critical Habitat under Criterion 1, and a further three (the plant *Chesneya/Chesniella mongolica*, Argali *Ovis ammon* and Short-toed Snake-eagle *Circaetus gallicus*) qualify for Tier 2 Critical Habitat under Criterion 1. A species summary is given in Table 2.

4 Particularly Asiatic Wild Ass, which persists in all but the most northern parts of this unit of analysis and which comprises a primary reason for establishing the two parts of the Small Gobi Special Protected Area.

5 Although these potential impacts have a low likelihood, the consequences if they did occur could be very significant for all biodiversity in the impact area.

- 5.3. **Criterion 2: Restricted-range and endemic species: Not Triggered.** One candidate restricted-range species (Mongolian Accentor *Prunella koslowi*) is believed to occur in the relevant (smaller) unit of analysis but does not qualify for Critical Habitat under Criterion 2.
- 5.4. **Criterion 3: Migratory and congregatory species: Triggered.** 174 candidate migratory bird species, one candidate migratory ungulate species, one candidate migratory hamster species and two candidate migratory bat species are known or predicted to occur in the respective relevant units of analysis. The two bat species, and two others, also form nesting and/or roosting colonies, and so could be considered to be candidate congregatory species. One of the candidate species, Goitered Gazelle *Gazella subgutturosa*, exceeds the 1% threshold and so qualifies for Tier 2 Critical Habitat under Criterion 3 (Table 2).
- 5.5. **Criterion 4: Unique assemblages of species: Triggered.** The fauna and flora assemblages of the relevant (smaller) unit of analysis are broadly similar in species composition to nearby areas. Although some landscape-level features were considered important (notably large ungulate communities, riverine Elm trees along seasonal watercourses, ephemeral lakes/ponds, and exceptionally high quality Saxaul forests), these are at a scale larger than 'unique assemblages' are usually considered. On the contrary, granite outcrops do occur at this scale in this unit of analysis and have distinct floral communities owing to the aridity of the surrounding region. Consequently, in the sense of Criterion 4 this unit of analysis can be considered as Critical Habitat for these particular granite outcrop floral communities.
- 5.6. **Criterion 5: Key evolutionary processes: Not Triggered.** The relevant (smaller) unit of analysis does not appear to have been the subject of the significant evolutionary processes required to meet this criterion. Rather, it is representative of the two broad ecoregions (the Eastern Gobi desert steppe and the Alashan Plateau semi-desert) within which it is embedded. This unit of analysis thus does not qualify as Critical Habitat under criterion 5.
- 5.7. **Criterion 6: Key ecosystem services: Triggered.** Water regulation triggers Critical Habitat under this category. This criterion largely refers to regulating and supporting ecosystem services (Millenium Ecosystem Assessment 2005). Regulating services are benefits obtained from the regulation of ecosystem processes such as flood control; one regulating service triggered Critical Habitat. Supporting services are those such as soil formation that form the base of support for ecosystems to function; no supporting services were assessed to be of sufficient importance to qualify for Critical Habitat. This study assessed all relevant ecosystem services, including air quality regulation, climate regulation, water regulation, erosion regulation, water purification and waste treatment, disease regulation, pest regulation and natural hazard regulation. The spatial unit of analysis for this criterion was the smaller unit comprising Khanbogd and Manlai soums.
- 5.8. **Criterion 7: Biodiversity of social, economic or cultural significance for local communities: Triggered.** Biodiversity supporting provision of three ecosystem services triggered Critical Habitat under this category, namely: livestock; biomass fuel; and freshwater. No cultural services were assessed as qualifying for Critical Habitat. Note that this criterion largely refers to provisioning and cultural ecosystem services: provisioning services are goods or products obtained from ecosystems, such as food, freshwater, timber, fibre and other goods (Millenium Ecosystem Assessment 2005). Cultural services are non-material benefits obtained from an ecosystem, such as spiritual enrichment, intellectual development, religious experience and recreation (Millenium Ecosystem Assessment 2005). The spatial unit of analysis for this criterion was the smaller unit comprising Khanbogd and Manlai soums.

Table 2. Criteria 1, 2 and 3 candidate species and their assessment against Paragraph 9 (Critical Habitat trigger species are highlighted in bold)

Note: four species triggered Criterion 1 on endangered species. No species triggered Criterion 2 on restricted-range and endemic species. One species triggered Criterion 3 on migratory and congregatory species. Overall, one species triggered Tier 1 Critical Habitat and four species triggered Tier 2 Critical Habitat.

No.	Species	Common name ⁶	CRITERION 1 CR and EN species	CRITERION 2 Restricted- range and Endemic species	CRITERION 3 Migratory and congregatory species	Tier 1 Critical Habitat	Tier 2 Critical Habitat	Rationale
	PLANTS							
1	<i>Cistanche deserticola</i>	Desert Cistanche	Potentially nationally EN	-	-	-	-	Does not meet Criterion 1 thresholds
2	<i>Iljinia regelii</i>	Regelian Iljinia	Potentially nationally EN	-	-	-	-	Does not meet Criterion 1 thresholds
3	<i>Chesneya/Chesniella mongolica</i>	Mongolian Chesney	Potentially nationally EN	-	-	-	Yes	Criterion 1. 'nationally-important concentrations of a nationally Red Listed EN species' (>10% of the national population in the unit of analysis)
4	<i>Limonium aureum</i>	Golden Limonium	Potentially nationally EN	-	-	-	-	Does not meet Criterion 1 thresholds
5	<i>Arnebia guttata</i>	Yellow Arnebia	Potentially nationally EN	-	-	-	-	Does not meet Criterion 1 thresholds
6	<i>Asterothamnus centrali-asiaticus</i>	Central Asian Asterthemny	Potentially nationally EN	-	-	-	-	Does not meet Criterion 1 thresholds
7	<i>Gymnocarpus przewalskii</i>	Przewalskii's Gymnocarpus	Potentially nationally EN	-	-	-	-	Does not meet Criterion 1 thresholds
8	<i>Oxytropis grubovii</i> ⁷	Grubov's Oxytrope	Potentially nationally EN	-	-	-	-	Does not meet Criterion 1 thresholds
9	<i>Brachanthemum gobicum</i>	Gobi Brachanthemia	Potentially nationally EN	-	-	-	-	Does not meet Criterion 1 thresholds
10	<i>Incarvillea potaninii</i>	Potanin's Incarvillea	Potentially nationally EN	-	-	-	-	Does not meet Criterion 1 thresholds
11	<i>Caragana gobica</i>	Gobi Pea Shrub	Potentially nationally EN	-	-	-	-	Does not meet Criterion 1 thresholds
12	<i>Caragana brachypoda</i>	Brachypodous Pea Shrub	Potentially nationally EN	-	-	-	-	Does not meet Criterion 1 thresholds
13	<i>Olgaea leucophylla</i>	White-leaved Olgaee	Potentially nationally EN	-	-	-	-	Does not meet Criterion 1 thresholds

6 Most common names for plants are taken from the Mongolian Law on Natural Plants and are rarely used elsewhere (most of these species are only regularly referred to by their scientific names).

7 Also referred to in other publications as *Chesneya macrantha* or *Chesneya grubovii*.

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14	<i>Potania mongolica</i>	Mongolian Potania	Potentially nationally EN	-	-	-	-	Does not meet Criterion 1 thresholds
15	<i>Zygophyllum potaninii</i>	Potanin's Zygophyllia	Potentially nationally EN	-	-	-	-	Does not meet Criterion 1 thresholds
16	<i>Jurinea mongolica</i>	Mongolian Jurinea	Potentially nationally EN	-	-	-	-	Does not meet Criterion 1 thresholds
17	<i>Tugarinovia mongolica</i>	Mongolian Tugarinovy	Potentially nationally EN	-	-	-	-	Does not meet Criterion 1 thresholds
18	<i>Artemisia xanthochroa</i>	Yellow Wormwood	Potentially nationally EN	-	-	-	-	Does not meet Criterion 1 thresholds
MAMMALS								
19	<i>Panthera uncia</i>	Snow Leopard	EN	-	-	-	-	Does not meet Criterion 1 thresholds
20	<i>Equus hemionus</i>	Asiatic Wild Ass or 'Khulan'	EN	-	-	Yes	-	Criterion 1. 'globally-important concentrations of an IUCN Red Listed EN species' (>10% of the global population in the unit of analysis)
21	<i>Ovis ammon</i>	Argali	EN (nationally)	-	-	-	Yes	Criterion 1. 'nationally-important concentrations of a nationally Red Listed EN species' (>10% of the national population in the unit of analysis)
22	<i>Gazella subgutturosa</i>	Goitered Gazelle	-	-	migratory	-	Yes	Criterion 3. 'globally-important concentrations of a migratory species' (>1% of the global population in the unit of analysis)
23	<i>Procapra gutturosa</i>	Mongolian Gazelle	EN (nationally)	-	-	-	-	Does not meet Criterion 1 thresholds
BIRDS								
24	<i>Circaetus gallicus</i>	Short-toed Snake-eagle	EN (nationally)	-	migratory	-	Yes	Criterion 1. 'nationally-important concentrations of a nationally Red Listed EN species' (>10% of the national population in the unit of analysis); Does not meet Criterion 3 thresholds
25	<i>Neophron percnopterus</i>	Egyptian Vulture	EN	-	-	-	-	Does not meet Criterion 1 thresholds
26	<i>Larus relictus</i>	Relict Gull	EN (nationally)	-	migratory	-	-	Does not meet Criterion 1 or Criterion 3 thresholds
27	<i>Prunella koslowi</i>	Mongolian Accentor	-	Yes	migratory	-	-	Does not meet Criterion 2 or 3 thresholds
OTHER MIGRATORY/CONGREGATORY SPECIES								
	Three migratory mammals, two congregatory mammals (bats), 171 migratory birds		-	-	migratory	-	-	Do not meet Criterion 3 thresholds
Total number of candidate species assessed against each criterion & total no. of species triggering each Tier.			25	1	180	1	4	Tier 1 Critical Habitat triggered by one species. Tier 2 Critical Habitat triggered by four species.

VI Next steps and recommendations

These results and conclusions suggest a number of important next steps for the Oyu Tolgoi project, a number of which are partially underway as part of the Full Biodiversity Management Plan fulfilling PS6 Paragraph 10/PR6 Paragraph 14. The following steps and research are necessary to assess the options available for the Oyu Tolgoi Project with respect to the Critical Habitat determinations made in this report and the requirements of PS6 Paragraph 10/PR6 Paragraph 14. It is not an exhaustive list and it is expected that further research requirements will become clear as impact assessment continues. These steps in fact constitute some of the main stages of the Rio Tinto Biodiversity Action Planning process.

Eight of the following 14 key actions are currently underway or complete as RBA team outputs.

What are the likely impacts? Residual Impact Assessment

- Carry out a risk assessment to understand the potential magnitude and likelihood of impacts upon the biodiversity values identified and prioritised through the baseline reports, Critical Habitat assessment and other studies. This will soon be completed by the Rapid Biodiversity Assessment team in the 'Biodiversity Management Plan options papers'.
- Calculate the total residual impact by measuring (i) the area, and (ii) the quality or condition of habitat of biodiversity value likely to be lost after the mitigation hierarchy has been followed. Start this with overlays of biodiversity maps with mine plan maps to derive a preliminary spatial impact assessment. This will be completed by the Rapid Biodiversity Assessment team in the 'Net Positive Impact forecast' using the Rio Tinto Quality Hectares metric.
- Monitor actual residual impacts including avoidance distances of priority species, and surveys of collisions of such species with powerlines and vehicles. Requirements for this will be developed by the Rapid Biodiversity Assessment team as the 'PS6 Monitoring and Evaluation Requirements'.

What mitigation measures are possible?

- Investigate avoidance, minimisation and restoration options to mitigate impacts caused by proposed infrastructure on the biodiversity values for which Critical Habitat has been defined (according to this report). This will soon be completed by the Rapid Biodiversity Assessment team in the 'Biodiversity Management Plan options papers'.

Where is the biodiversity and how does it live? Distribution and Ecology

- Create maps of habitat use by, and habitat preference of, all Critical Habitat species (major habitats and also microhabitats where appropriate). This will be completed at a coarse scale by the Rapid Biodiversity Assessment team in the 'Net Positive Impact forecast'.
- Complete further surveys on the distribution of large ungulates in space and time, including surveys of potential road avoidance.
- Research the distribution, ecology, and conservation status of, threats to, the species of plant (*Chesneya/Chesniella mongolica*) which appears to trigger Critical Habitat in the smaller unit of analysis (parallel research on the borderline Critical Habitat species *Caragana gobica* and *Potaninia mongolica* would also be advisable).
- Complete surveys of other key species as per the appropriate Biodiversity Management Plans.

Which sites in the region are possible biodiversity offsets?

These steps closely mirror main stages in the Rio Tinto Biodiversity Offset Design and Implementation Guidance Note.

- Screen possible offset sites for their potential by assessing their biodiversity assets (e.g. species and habitat in terms of area, abundance and quality) and the potential to conserve or improve them.

- Assess each offset site for social, economic and political factors such as land cost and tenure, local community requirements and the political implications of the different offsets.
- Investigate the conservation interventions required to conserve biodiversity at the different offset sites, such as prevention of habitat loss or eradication of invasive species.
- Ensure additionality of biodiversity gains is possible.
- Combine these assessment into a biodiversity offset options evaluation which meets Rio Tinto Net Positive Impact, IFC Performance Standard 6 and EBRD Performance Requirement 6 requirements simultaneously.

Note: these recommendations are already underway through the Oyu Tolgoi Biodiversity Offsets Strategy.

Involvement of project biodiversity stakeholders

- Compile all documentation and distribute in a transparent manner.
- Hold workshops to provide forums for both national and international partners to comment on, and evaluate, all Oyu Tolgoi biodiversity work completed to date.

These recommendations are expanded on in Section 6 (Conclusions and Recommendations) of the Technical Report.

TECHNICAL REPORT

1 Introduction: the Oyu Tolgoi project, the environment, and project stakeholders

1.1 The Oyu Tolgoi Project

Oyu Tolgoi LLC (co-owned by Ivanhoe Mines Ltd and Rio Tinto International Holdings Ltd, in partnership with the Government of Mongolia) is developing a series of mineral deposits containing copper, gold, silver, and molybdenum. The Oyu Tolgoi project is located in Khanbogd soum, Omnogovi aimag, in the South Gobi region of Mongolia (Figure 1). The Oyu Tolgoi project includes an 85 km² mine lease area, a 97 km upgraded road link to the Chinese border, an 95 km high-voltage power transmission line parallel to the road corridor, an international airport, development of the Gunii Hooloi borefield, an 82 km water pipeline and medium-voltage power distribution line connecting the borefield to the mine lease, and worker housing in and around Khanbogd town.

According to the ESIA (Oyu Tolgoi LLC in prep.), the expected area of influence of the project extends beyond the borders of the mine lease area, covering the whole of Khanbogd soum – an area of c. 15,000 km². In addition, the core indirect and/or cumulative impact area is expected to also include Bayan-Ovoo, Manlai and Tsogt-Tsetsii soums (Oyu Tolgoi LLC in prep.). In all, an area of c. 46,000 km² is thus expected to be particularly influenced by the project directly or indirectly. This area includes direct and indirect (including third party) impacts and therefore includes the land that will be directly disturbed by mining activities, as well as human settlements, immigration, infrastructure, water resources and physical and biological environments. The scale of the project means that it is likely that potential impacts will occur more widely even than the core indirect/cumulative impact area of 46,000 km². For example, positive financial impacts are expected to occur across the Mongolian economy as a whole. Conversely, because the project is situated in a dynamic ecosystem which contains wide-ranging, nomadic species, negative biodiversity impacts could potentially occur across the South Gobi region.

The Oyu Tolgoi project is the largest financial undertaking in Mongolia and has the potential to stimulate significant social and economic development in Mongolia. A key opportunity for the project is to promote and catalyse landscape-level planning across the South Gobi region in order to ensure that such social and economic development occurs in a coordinated, socially- and environmentally-sustainable way. Particularly key from an environmental point of view may be efforts to rationalise development of linear infrastructure. Such infrastructure has significant potential economic benefits to the region, but also high potential environmental costs in terms of fragmenting a largely contiguous landscape.

1.2 The environment and biodiversity of the Oyu Tolgoi project

1.2.1 The South Gobi Region

The project spans parts of the 'Eastern Gobi desert steppe' and the 'Alashan Plateau semi-desert' ecoregions (Olson *et al.* 2001). These ecoregions are not well-separated, being rather a grade between more steppe-like ecosystems to the north and more arid ecosystems to the south. Aside from this north-south grade, there is also an east-west grade, owing to slightly higher monsoonal precipitation coming into the east of South Gobi, originating from the south-east. The South Gobi region as a whole is characterised by very cold winters and very limited precipitation, which falls geographically unpredictably. This extreme and unpredictable climate has resulted in a non-equilibrium, dynamic ecosystem and led to the evolution of broad-scale nomadism among resident large herbivores. These species, including Asiatic Wild Ass *Equus hemionus* and Goitered Gazelle *Gazella subgutturosa*, make very extensive nomadic and semi-migratory movements throughout the year in response to changes in pasture quality. Within Asia, the only comparable large ungulate communities that remain on a significant scale are on the Tibetan Plateau and the Kazakhstan steppes⁸. Indeed, the A and B sectors of the Small Gobi Strictly Protected Area (to the south of the Oyu Tolgoi project, and potentially impacted

⁸ Other areas, including the eastern steppes of Mongolia, once had comparable assemblages but have lost species over time and now usually retain just one dominant species in depleted numbers (in the eastern steppes this is Mongolian Gazelle).

by a road upgrade being implemented by the project) were primarily established in recognition of the importance of the South Gobi region for Asiatic Wild Ass.

The South Gobi region is not noted for its endemism – the distributions of most species known from this region also extend quite far through arid areas to the west (particularly to western Mongolia and north-west China). The main global biodiversity value of the South Gobi region lies in its relative lack of anthropogenic disturbance to date. Traditional extensive nomadic pastoralism has had only a limited impact on natural ecosystems, and large-scale development has only recently had significant impacts in the region. This relatively low level of disturbance has helped to maintain the large ungulate assemblage mentioned above, which has disappeared across most of its former range outside of Mongolia, and has also helped to maintain good populations of other species sensitive to hunting or disturbance. Notably, Houbara Bustard *Chlamydotis undulata* and Saker Falcon *Falco cherrug* have sufficiently important populations in the area that the Galba Gobi Important Bird Area has been designated to the south of the mine lease area (an area that is traversed by a power transmission line installation and road upgrade being implemented by the project).

1.2.2 Environmental studies to date

A number of environmental studies have been completed, but few cover biodiversity issues. Environmental studies to date are summarised in a set of Detailed Environmental Impact Assessments (DEIAs on the road upgrade, high-voltage powerline, groundwater extraction from Gunii Hooloi, the water supply pipeline, the airport, and various DEIAs on the mine site itself) and in the draft Environmental and Social Impact Assessment (Oyu Tolgoi LLC in prep.).

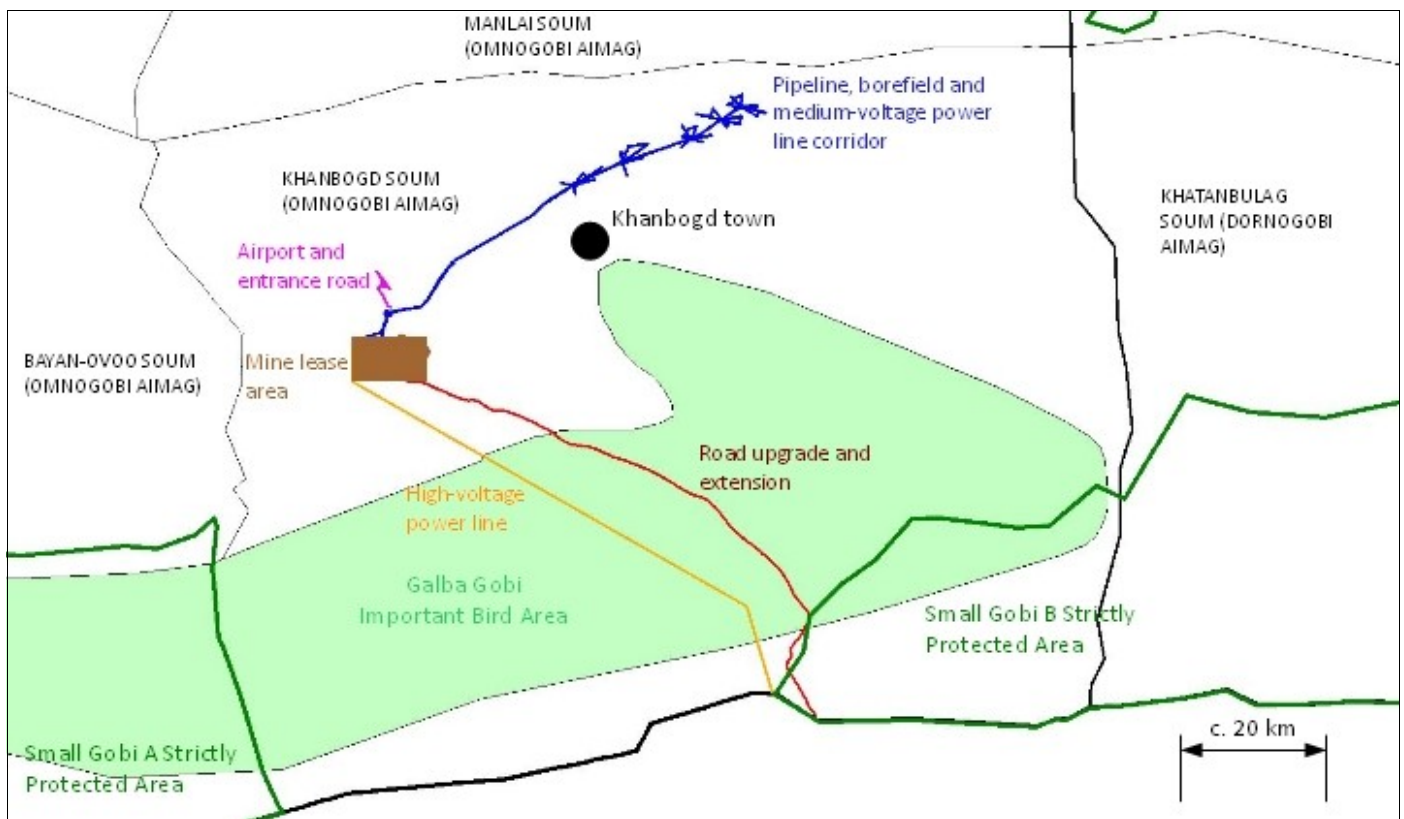


Figure 1. The Oyu Tolgoi mine lease area (brown), pipeline and medium-voltage power line corridor (blue), airport (pink), road upgrade and extension (red) and high-voltage power line (orange).

2 Justification and scope

2.1 Report purpose

Within International Finance Corporation (IFC) Performance Standard 6 (PS6) on Biodiversity Conservation and Sustainable Natural Resource Management and European Bank for Reconstruction and Development (EBRD) Performance Requirement 6 (PR6) on Biodiversity Conservation and Sustainable Management of Living Natural Resources, a key issue is to determine whether or not areas of the project area of influence may be designated as Critical Habitat. The provisions by which Critical Habitat is identified are laid out in Paragraph 9 of the 2006 version of the PS6 and Paragraph 13 of PR6. This report provides the technical analyses to understand whether the Oyu Tolgoi Project triggers PS6 by meeting the Critical Habitat clause. Therefore the report investigates the relevance of the seven criteria of Paragraphs 9 and 13 for the biodiversity and natural resources of the units of analysis identified for the Oyu Tolgoi project, in particular those of Khanbogd, Bayan-Ovoo and Manlai soums and Small Gobi A and B Strictly Protected Areas.

2.2 Report delimitation: inclusions and exclusions

2.2.1 Performance Standard 6/Performance Requirement 6

This report deals with the requirements of Paragraph 9 of the 2006 version of the IFC PS6 and Paragraph 13 of EBRD PR6. Earlier paragraphs covering the occurrence of Natural and Modified Habitat (PS6 Paragraphs 5-7/PR6 Paragraphs 11-12) and later paragraphs covering Protected Areas and Alien Invasive Species (PS6 Paragraphs 11-13/PR6 Paragraphs 15-16) are covered in other reports. The requirements of PS6 Paragraph 10/PR6 Paragraph 14 are covered through the forthcoming Biodiversity Management Plan option papers and Biodiversity Offsets Strategy. This study has been conducted irrespective of project impacts and involves no reference to any type of impact assessment.

2.2.2 Scope of report

This report focuses on the mine lease area itself, plus a number of related infrastructure components: the high-voltage power transmission line to the Chinese border; the Oyu Tolgoi-Gashuun Sukhait road; the medium-voltage power distribution line to the Gunii Hooloi borefield; the pipeline to the borefield and associated extraction and storage infrastructure; the Umdai River diversion; and the airport. There is a possibility that the project may also involve construction of a power plant at a later stage, but there is no information on this at present. It is thus not possible to assess this potential project component at present, but it would be appropriate to conduct Critical Habitat assessments for any additional infrastructure when data become available.

3 Understanding Paragraph 9 of Performance Standard 6/Paragraph 13 of Performance Requirement 6

3.1 Context: the IFC Performance Standards and EBRD Performance Requirements

The International Finance Corporation (IFC) requires clients to assess all projects with social or environmental risks and potential impacts against a series of eight strict Performance Standards. The client is required to demonstrate whether a Performance Standard is triggered or not. Where projects trigger a Performance Standard, they must show in a detailed report whether mitigation measures can be designed and implemented in a satisfactory way following the requirements set out in the relevant Performance Standard. The implementation of actions necessary to meet the requirements of the Performance Standards is managed through the client's Social and Environmental Management System – in the case of PS6, this is the Biodiversity Management Plan.

There are eight IFC Performance Standards, covering: Social and Environmental Assessment and Management Systems; Labor and Working Conditions; Pollution Prevention and Abatement; Community Health, Safety and Security; Land Acquisition and Involuntary Resettlement; Biodiversity Conservation and Sustainable Natural Resource Management; Indigenous Peoples; and Cultural Heritage. These Performance Standards were developed as part of the IFC's environmental and social safeguard policies⁹, and contribute to the IFC's Sustainability Policy¹⁰. Guidance Notes¹¹ have been produced for each Performance Standard, to aid interpretation and implementation of the standards.

This report and project benefit from a project-specific Guidance Note concerning the identification of Critical Habitat – the Oyu Tolgoi/Ivanhoe Mines Project Guidance Note on Critical Habitat (IFC 2009). Importantly this Guidance Note is not official IFC policy but was prepared to facilitate the assessment of Critical Habitat at the Oyu Tolgoi Project whilst IFC policy is undergoing review and public consultation.

The European Bank for Reconstruction and Development has ten Performance Requirements¹², which operate in a very similar way to the Performance Standards of the IFC. The first eight requirements are also very similar in content, covering: Environmental and Social Appraisal and Management; Labour and Working Conditions; Pollution Prevention and Abatement; Community Health, Safety and Security; Land Acquisition, Involuntary Resettlement and Economic Displacement; Biodiversity Conservation and Sustainable Natural Resource Management; Indigenous Peoples; and Cultural Heritage. The last two requirements are additional to those of IFC, and cover: Financial Intermediaries; and Information Disclosure and Stakeholder Engagement.

The Environment and Social Risk Management Policy¹³ of Export Development Canada (EDC) outlines how EDC conducts environmental and social review, including under the Environmental and Social Review Directive (ERD). EDC is aligned with IFC and EBRD standards in two key ways. First, EDC has adopted the Equator Principles, which state that "For projects located in non-OECD countries... the [Social and Environmental] Assessment will refer to the then applicable IFC Performance Standards". Second, the EDC Environmental and Social Risk Management Policy states that "EDC assesses the design of a proposed project against... standards specified in the ERD; generally, EDC benchmarks projects to the IFC Performance Standards".

3.2 The concept of Critical Habitat

Critical Habitat is a concept constructed by the International Finance Corporation (IFC) within Performance Standard 6 (PS6) and by the European Bank for Reconstruction (EBRD) and Development in

9 <http://www.ifc.org/ifcext/sustainability.nsf/Content/EnvSocStandards>

10 <http://www.ifc.org/ifcext/sustainability.nsf/Content/SustainabilityPolicy>

11 <http://www.ifc.org/ifcext/sustainability.nsf/Content/GuidanceNotes>

12 <http://www.ebrd.com/pages/about/principles/sustainability/standards.shtml>

13 http://www.edc.ca/english/docs/ESRM_Policy_e.pdf

Performance Requirement 6 (PR6) in order to facilitate the identification of areas of high biodiversity value. PS6 and PR6 establish the criteria by which Natural, Modified and Critical Habitat are defined. Critical Habitat is a subset of both Natural and Modified Habitats, defined through the criteria of Paragraph 9 of PS6 and Paragraph 13 of PR6. The intention of delineating Critical Habitat is to define areas in which development would be of a particularly sensitive nature and require special attention if it were to go ahead. The Oyu Tolgoi Project Guidance Note on Critical Habitat (IFC 2009) states that “Critical habitats are areas of high biodiversity value that include at least one of the seven criteria specified in para. 9 of PS6”. Hence biodiversity components as broad as evolutionary processes, biodiversity-based livelihoods, rare habitats and locally endemic species can all define Critical Habitat. In this way, it is a single umbrella concept for biodiversity of high value. The breadth of the provisions of Paragraph 9 of PS6 and Paragraph 13 of PR6 reflects the breadth of biodiversity rights- and stake-holders of interest to the IFC, EBRD and their clients.

3.3 The seven PS6 Paragraph 9/PR6 Paragraph 13 Critical Habitat Criteria

PS6 Paragraph 9 contains seven criteria through which Critical Habitat may be identified:

1. Critically Endangered and Endangered species
2. Endemic and restricted-range species
3. Migratory and congregatory species
4. Unique assemblages of species
5. Key evolutionary processes
6. Key ecosystem services
7. Biodiversity of significant social, economic or cultural importance to local communities

The identification of Critical Habitat is not entirely limited to the seven formal criteria. On a case by case basis, areas may be defined as Critical Habitat for individual reasons which may have greater relevance in certain biogeographic realms, countries or under rapidly changing circumstances. Examples include sites of demonstrated importance to threatened or endemic species for climate change adaptation; sites required for the reintroduction of threatened or endemic species; and areas of old growth, primary or notably pristine habitats.

PR6 Paragraph 13 also contains seven criteria through which Critical Habitat may be identified:

1. High biodiversity value
2. Critically Endangered and Endangered species
3. Endemic and geographically restricted species and sub-species
4. Migratory and congregatory species
5. Assemblages of species associated with key evolutionary processes
6. Biodiversity of significant social, economical or cultural importance to local communities
7. Species that are vital to the ecosystem as a whole (keystone species)

Thus, criteria 2, 3, 4 and 6 of PR6 Paragraph 13 are essentially the same as criteria 1, 2, 3 and 7, respectively, of PS6 Paragraph 9. PR6 Paragraph 13 Criterion 5 essentially combines PS6 Paragraph 9 criteria 4 and 5. The key differences of PR6 Paragraph 13 are that it omits one criterion – key ecosystem services – and adds two criteria: 1. High biodiversity value, and 7. Species that are vital to the ecosystem as a whole (keystone species). Definitions and requirements are so similar among IFC PS6 and EBRD PR6 that the IFC Oyu Tolgoi Project Guidance Note (IFC 2009) is followed through the rest of this assessment.

3.4 Nature of the PS6 Paragraph 9/PR6 Paragraph 13 Criteria

3.4.1 As trigger criteria

The criteria are ‘triggers’ in that if an area of habitat meets any one of the criteria then it is considered to be Critical Habitat, irrespective of whether it meets or does not meet any other criterion. Hence Critical Habitat can be determined through a single criterion of Paragraph 9/Paragraph 13. Habitat which holds biodiversity meeting all seven criteria and habitat meeting just a single criterion are both Critical Habitat. The advantages of trigger criteria over aggregated criteria are discussed and relatively well known in the conservation literature (e.g. McDonald-Madden *et al.* 2009). Hence Critical Habitat criteria have two distinctive characteristics. First, components of biodiversity are essentially assigned to only two levels of conservation significance: those that trigger the Critical Habitat provisions and those that

do not (Tier considerations being secondary to this primary Critical Habitat determination). Second, each criterion is applied separately, not in combination, meaning that the scores are not cumulative.

3.4.2 As qualitative versus quantitative criteria

PS6 Paragraph 9 Critical Habitat criteria were until recently, as PR6 Paragraph 13 Critical Habitat criteria remain, qualitative criteria – meaning assessments were done without reference to any fixed numeric threshold. In PS6 Paragraph 9, this is still the case for Criteria 4-7 which are more subjective, human-based or descriptive in nature and do not lend themselves to generic quantitative thresholds. For PS6 Paragraph 9 Criteria 1-3 (concerning species) this report refers to the Oyu Tolgoi Project Guidance Note on Critical Habitat (IFC 2009) which includes draft quantitative thresholds for Criteria 1-3. These have been derived from pre-existing research and decision making by the authoritative global conservation agencies.

3.5 A summary of the IFC Oyu Tolgoi project Guidance Note for IFC Paragraph 9 Criteria 1-3

The IFC Oyu Tolgoi Project Guidance Note for PS6 outlines, in a more detailed and quantitative way, the units of analysis for Critical Habitat, the concept of grades or 'tiers' of Critical Habitat. There is no corresponding such guidance related to PR6.

3.5.1 Units of analysis

Earlier applications of PS6 involved clients delineating very specific portions of habitat within the project area of influence as Critical Habitat; for example, the few square metres at which a particular species had been found, or a corresponding stretch of river. As this makes little ecological sense and leaves little room for management intervention, the Oyu Tolgoi Guidance Note (IFC 2009) outlines the use of units of analysis whereby the entire spatial unit in which the species is found is determined to be Critical Habitat. This is a more ecologically appropriate way of viewing Critical Habitat. Hence for each species qualifying for consideration under Criteria 1-3, the relevant unit of analysis is first decided: this is a 'discrete management unit'. A discrete management unit is a distinct site whose boundaries can be relatively easily defined, such as a distinct patch of habitat, a mountain, an administrative boundary, a property boundary or a protected area. For each species, a suitable discrete management unit is chosen on the basis of the species' ecology and potential scope of impacts.

3.5.2 Tiers and the concept of grades of Critical Habitat

Through the Oyu Tolgoi Project Guidance Note (IFC 2009), Critical Habitat is now understood as representing the entire spatial unit of analysis in question, rather than micro-mapping of biodiversity distributions within a project area. At the same time, the guidance recognises 'grades' of Critical Habitat. Hence some habitat within a unit of analysis defined as Critical Habitat will be of greater significance than others – for example for the breeding or feeding of certain key species; or areas of particular importance in providing for local human livelihoods. This is reflected in the Oyu Tolgoi Guidance Note for Criteria 1-3, in which Critical Habitat is defined as Tier 1 Habitat and Tier 2 Habitat, where the former is of greater conservation significance for species. Quantitative thresholds expressed as percentages of global and national populations sizes, or of proportions of known species ranges or distributions, are provided to determine the Tiers. The Oyu Tolgoi Project Guidance Note states that it will generally be the case that Tier 1 habitats are not offsetable under Paragraph 10¹⁴, whereas Tier 2 habitats may be offsetable and impacts fully mitigated under Paragraph 10.

¹⁴ Cases where biodiversity offsets may be possible include assessment of the degree of impact on the Tier 1 Critical Habitat and the client's capacity and history in managing biodiversity and offsets in particular

Table 3. Quantitative thresholds for the determination of Critical Habitat in Tiers 1 and 2 of Criteria 1-3 of Paragraph 9.

Criteria	Tier 1	Tier 2
1. Critically Endangered/ Endangered	<p>a) Habitat required to sustain ≥ 10 percent of the global population of an IUCN Red-listed CR or EN species/subspecies where there are known, regular occurrences of the species/subspecies and where that habitat could be considered a discrete management unit for that species/subspecies.</p> <p>b) Habitat with known, regular occurrences of CR or EN species/subspecies where that habitat is one of 10 or fewer discrete management sites globally for that species/subspecies.</p>	<p>c) Habitat that supports the regular occurrence of a single individual of an IUCN Red-listed CR species/subspecies and/or habitat containing regionally-important concentrations of an IUCN Red-listed EN species/subspecies where that habitat could be considered a discrete management unit for that species/subspecies.</p> <p>d) Habitat of significant importance to CR or EN species/subspecies that are wide-ranging and/or whose population distribution is not well understood and where the loss of such a habitat could potentially impact the long-term survivability of the species/subspecies.</p> <p>e) Habitat required to sustain ≥ 10 percent of the national (or regional) population of a nationally-listed (or regionally-listed) CR or EN (or equivalent) species/subspecies (i.e., habitat is one of 10 or fewer in-country or regional locations) and where that habitat could be considered a discrete management unit.</p>
2. Endemic/ restricted-range	<p>a) Habitat known to sustain ≥ 95 percent of the global population of an endemic or restricted-range species/subspecies where that habitat could be considered a discrete management unit for that species/subspecies (e.g., a single-site endemic).</p>	<p>b) Habitat known to sustain ≥ 1 percent but < 95 percent of the global population of an endemic or restricted-range species/subspecies where that habitat could be considered a discrete management unit for that species/subspecies, where data are available.</p> <p>c) Habitat known to sustain an endemic or restricted-range species/subspecies where that habitat is restricted to 2 to 100 discrete management sites globally, where data are available.</p>
3. Migratory/ Congregatory	<p>a) Habitat known to sustain, on a cyclical or otherwise regular basis, ≥ 95 percent of the global population of a migratory or congregatory species/subspecies at any point of the species'/subspecies' lifecycle where that habitat could be considered a discrete management unit for that species/subspecies.</p>	<p>b) Habitat known to sustain, on a cyclical or otherwise regular basis, ≥ 1 percent but < 95 percent of the global population of a migratory or congregatory species/subspecies at any point of the species'/subspecies' lifecycle and where that habitat could be considered a discrete management unit for that species/subspecies, where data are available.</p> <p>c) Habitat known to sustain, on a cyclical or otherwise regular basis, a migratory or congregatory species/subspecies where that habitat is restricted to 2 to 100 discrete management sites globally, where data are available.</p> <p>d) For birds, habitat that meets BirdLife International's Criterion A4 for congregations¹⁵.</p> <p>e) For species with large but clumped distributions, a provisional threshold is set at ≥ 5 percent of the global population for both terrestrial and marine species.</p> <p>f) Source sites that contribute ≥ 1 percent of the global population of recruits.</p>

Note: This table was constructed by The Biodiversity Consultancy Ltd based on prose guidance in the IFC Oyu Tolgoi Project Guidance Note on Critical Habitat (IFC 2009) and is included in the latest IFC PS6 guidance (IFC 2011).

3.5.3 Global versus national population sizes

Within the quantitative thresholds outlined in the methods for determination of Tier 1 versus Tier 2 habitats for Criteria 1-3 there is reference to both global and national population sizes. This means that globally common species may still trigger Critical Habitat if their national populations are relatively small. For example, this could be the case for many species in the UK which find their northernmost European distributions on those islands. This guidance follows the generally accepted dictum within conservation biology that national level criteria can add to but not supersede global criteria.

3.5.4 Biodiversity offsets

The IFC Oyu Tolgoi Guidance Note on Critical Habitat (IFC 2009) makes clear that biodiversity offsets may be possible for Tier 2 habitats in some cases, but “the vast majority of Tier 1 habitats are not considered to be 'offsetable'”. This is in line with global trends towards understanding the benefits of re-examining

15 See IBA global criteria at http://www.birdlife.org/datazone/sites/european_criteria.html

the cost-effectiveness trade-offs that exist between mitigation and offsetting activities. Cases where biodiversity offsets may be possible include assessment of the degree of impact on the Tier 1 Critical Habitat and the client's capacity and history in managing biodiversity and offsets in particular. Biodiversity offsets for Natural Habitat are already included within the mitigation tools of the 2006 version of the Performance Standard 6 under Paragraph 8.

3.6 PS6 Paragraph 9 Criteria in detail

In this section, the detailed understanding of each criterion is reproduced from the IFC Oyu Tolgoi Project Guidance Note, and restructured (with some updated references) to provide clarity over the exact requirements that have been followed in the writing of this Critical Habitat report. Since PR6 Paragraph 13 is similar to PS6 Paragraph 9 in many ways (Section 8.1), the Project Guidance Note for PS6 Paragraph 9 is followed.

3.6.1 Understanding of PS6 Paragraph 9 Criterion 1/PR6 Paragraph 13 Criterion 2

*“Critical habitat includes areas with high biodiversity value, including habitat **required for the survival of critically endangered and endangered species...**”*

Critically Endangered (CR) species face an extremely high risk of extinction in the wild. Endangered (EN) species face a very high risk of extinction in the wild. The IUCN Red List of Threatened Species identifies both CR and EN species at the global scale.

Some countries and regions have developed their own lists of threatened species. Species contained on such lists may or may not be threatened at the global scale. Nationally/regionally-listed threatened species categories that best correspond to IUCN's definitions for CR and EN shall be considered under Criterion 1.

The client should determine if the project site is located in a habitat that meets any one of the following sub-criteria:

Tier 1

- (a) Habitat required to sustain ≥ 10 percent of the global population of an IUCN Red-listed CR or EN species/subspecies where there are known, regular occurrences of the species/sub-species and where that habitat could be considered a discrete management unit for that species/subspecies.
- (b) Habitat with known, regular occurrences of CR or EN species/subspecies where that habitat is one of 10 or fewer discrete management sites globally for that species/ subspecies.

Tier 2

- (c) Habitat that supports the regular occurrence of a single individual of an IUCN Red-listed CR species/subspecies and/or habitat containing regionally-important concentrations of an IUCN Red-listed EN species/subspecies where that habitat could be considered a discrete management unit for that species/subspecies.
- (d) Habitat of significant importance to CR or EN species/subspecies that are wide-ranging and/or whose population distribution is not well understood and where the loss of such a habitat could potentially impact the long-term survivability of the species/subspecies.
- (e) Habitat required to sustain ≥ 10 percent of the national (or regional) population of a nationally-listed (or regionally-listed) CR or EN (or equivalent) species/subspecies (i.e., habitat is one of 10 or fewer in-country or regional locations) and where that habitat could be considered a discrete management unit.

3.6.2 Understanding of PS6 Paragraph 9 Criterion 2/PR6 Paragraph 13 Criterion 3

*“Critical habitat includes areas with high biodiversity value, including... **areas having special significance for endemic or restricted range species...**”*

The client should determine if the project site is located in a habitat that meets any one of the following sub-criteria:

Tier 1

- (a) Habitat known to sustain ≥ 95 percent of the global population of an endemic or restricted-range species/subspecies where that habitat could be considered a discrete management unit for that species/subspecies (e.g., a single-site endemic).

Tier 2

- (b) Habitat known to sustain ≥ 1 percent but < 95 percent of the global population of an endemic or restricted-range species/subspecies where that habitat could be considered a discrete management unit for that species/subspecies, where data are available.
- (c) Habitat known to sustain an endemic or restricted-range species/subspecies where that habitat is restricted to 2 to 100 discrete management sites globally, where data are available.

3.6.3 Understanding of PS6 Paragraph 9 Criterion 3/PR6 Paragraph 13 Criterion 4

“Critical habitat includes areas with high biodiversity value, including... sites that are critical to the survival of migratory species; areas supporting globally significant concentrations or numbers of individuals of congregatory species...”

Migratory species are defined as any species of which a significant proportion of its members cyclically and predictably move from one geographical area to another (including within the same ecosystem). Congregatory species are defined as species whose individuals gather in large groups on a cyclically or otherwise regular and/or predictable basis; examples include the following:

- Species that form colonies.
- Species that form colonies for breeding purposes and/or where large numbers of individuals of a species gather at the same time for non-breeding purposes (e.g., foraging, roosting).
- Species that move through ‘bottleneck’ sites where significant numbers of individuals of a species pass over a concentrated period of time (e.g., during migration).
- Species with ‘large but clumped’ distributions where a large number of individuals may be concentrated in a single or a few sites while the rest of the species is largely dispersed (e.g., wildebeest distributions).
- ‘Source populations’ where certain sites hold populations of species that make an inordinate contribution to recruitment of the species elsewhere (especially important for marine species).

The client should determine if the project site is located in a habitat that meets any one of the following sub-criteria:

Tier 1

- (a) Habitat known to sustain, on a cyclical or otherwise regular basis, ≥ 95 percent of the global population of a migratory or congregatory species/subspecies at any point of the species’/subspecies’ lifecycle where that habitat could be considered a discrete management unit for that species/subspecies.

Tier 2

- (b) Habitat known to sustain, on a cyclical or otherwise regular basis, ≥ 1 percent but < 95 percent of the global population of a migratory or congregatory species/subspecies at any point of the species’/subspecies’ lifecycle and where that habitat could be considered a discrete management unit for that species/subspecies, where data are available.
- (c) Habitat known to sustain, on a cyclical or otherwise regular basis, a migratory or congregatory species/subspecies where that habitat is restricted to 2 to 100 discrete management sites globally, where data are available.
- (d) For birds, habitat that meets Birdlife International’s Criterion A4 for congregations¹⁶.
- (e) For species with large but clumped distributions, a provisional threshold is set at ≥ 5 percent of the global population for both terrestrial and marine species.
- (f) Source sites that contribute ≥ 1 percent of the global population of recruits.

3.6.4 Understanding of PS6 Paragraph 9 Criterion 4

“Critical habitat includes areas with high biodiversity value, including... areas with unique assemblages of species ...”

16 See http://www.birdlife.org/datazone/sites/global_criteria.html

The uniqueness of the assemblages of species associated with a particular habitat is one measure of that habitat's rarity. Unique assemblages of species could be associated with various factors and there is some overlap between this criterion and Criterion 5, Key Evolutionary Processes. Unique assemblages may be generated by the heterogeneity (variability) of the landscape produced by surface geology, microclimates, rugged terrains or vertical stratification. Species endemic to individual bioregions or areas of overlapping bioregions may also produce unique assemblages. The term 'contextual species' richness has been employed by Birdlife International to describe areas rich in species that are restricted to that biome (Heath & Evans 2000). Areas of high contextual species richness might also trigger this critical habitat criterion.

The significance of the habitat in terms of its associated assemblages of species will be determined on a case-by-case basis. In most cases, the client will be expected to consult with a recognized biodiversity specialist with expertise in the particular region in question to determine the uniqueness of the assemblages associated with the project site with respect to the regional context.

Examples of unique assemblages of species include the following:

- A site that holds a significant proportion of species whose distributions are restricted to that bioregion or one of its subdivisions;
- Assemblages of species that replace each other along a steep altitude gradient;
- Species particular to karst systems, sinkholes and subterranean river systems;
- Benthic communities associated with deep sea thermal vents;
- Marine species found on isolated sea mounts or sea mount chains;
- Desert endemics;
- Species associated with geothermal vents.

3.6.5 Understanding of PS6 Paragraph 9 Criterion 5

*“Critical habitat includes areas with high biodiversity value, including... **areas...which are associated with key evolutionary processes ...**”*

The structural attributes of a region, such as its topography, geology, soil, temperature and vegetation and combinations of these variables can influence the evolutionary processes that give rise to regional configurations of species. In some cases, spatial features that are unique or idiosyncratic of the landscape have been associated with genetically unique populations or subpopulations of plant and animal species. Physical or spatial features have sometimes been described as 'surrogates' or 'spatial catalysts' for evolutionary and ecological processes, and spatial catalysts are often associated with species diversification. Maintaining these key evolutionary processes inherent in a landscape as well as the resulting species (or subpopulations of species) has become a major focus of biodiversity conservation in recent decades, and particularly the conservation of 'genetic' diversity. By conserving the species diversity within a landscape, the processes that drive speciation, as well as the genetic diversity within species, evolutionary flexibility within the ecological system is maintained. Such flexibility is especially important in a rapidly changing climate.

There is considerable overlap between this criterion and Criterion 4, Unique Assemblages of Species. Whilst Criterion 4 is a measure of the assemblages of species themselves, this criterion is principally defined by the physical features of a landscape that might be associated with particular ecological and evolutionary processes. In some cases however this criterion will also include species, subspecies or subpopulations that are known to be phylogenetically distinct.

The significance of structural attributes in a habitat that may influence evolutionary processes will be determined on a case-by-case basis. In the majority of cases, this criterion will be triggered in areas that have been previously investigated and that are already known or suspected to be associated with unique evolutionary processes. Whilst systematic methods to measure and prioritize evolutionary processes in a landscape do exist, they are typically beyond a reasonable expectation of studies conducted by the private sector. At the very least though, the client should be aware of what constitutes a key

‘evolutionary process’ (or a ‘unique assemblage of species’) so that this aspect may be covered as part of its assessment through a literature search complemented, as needed, by an assessment in-field.

Examples of spatial features associated with evolutionary processes are as follows:

- Isolated areas (e.g., islands, mountaintops, lakes) are associated with species that are phylogenetically distinct;
- Areas of high endemism often contain flora and/or fauna species with unique evolutionary histories.
- Landscapes with high spatial heterogeneity are a driving force in speciation as species are naturally selected on their ability to adapt and diversify.
- Edaphic interfaces are specific juxtapositions of soil types (e.g. serpentine outcrops, limestone and gypsum deposits), which have led to the formation of unique plant communities characterized by both rarity and endemism.
- Connectivity between habitats (e.g., natural corridors) ensures species migration and gene flow, which is especially important in fragmented habitats and for the conservation of metapopulations.

3.6.6 Understanding of PS6 Paragraph 9 Criterion 6

“Critical habitat includes areas with high biodiversity value, including... areas...which... provide key ecosystem services”

Ecosystem services are generally defined as the benefits that people obtain from ecosystems. The Millennium Ecosystem Assessment defines four categories of ecosystem services (Millennium Ecosystem Assessment 2005):

- Provisioning services: The goods or products obtained from ecosystems such as food, freshwater, timber, fiber and other goods.
- Regulating services: The benefits obtained from an ecosystem’s control of natural processes such as climate, water flow, disease regulation, pollination and protection from natural hazards.
- Cultural services: The non-material benefits obtained from ecosystems such as recreation, spiritual values and aesthetic enjoyment.
- Supporting services: The natural processes such as erosion control, soil formation, nutrient cycling, and primary productivity that maintain other services.

Ecosystem services are measured by the suitability of an area to provide a service, but most importantly, by the proximity of that area to its ‘beneficiary’ (i.e., the user; Tallis *et al.* 2008). While biophysical processes are essential for the provision of ecosystem services, processes are not synonymous with services. Until there is a person or group of persons benefiting from the process, it is not a service (Tallis & Polasky 2009).

It should be noted however that there is a growing body of evidence to suggest that ecosystem services are not necessarily linked to areas of high biodiversity value. In some cases, there is a direct correlation (e.g., carbon storage), whereas in other situations, there is an inverse relationship (e.g., pollination) (e.g. Chan *et al.* 2006; Naidoo *et al.* 2006).

For the purposes of IFC’s implementation of PS6, a distinction is made between regional scale ecosystem services with the potential to provide regional or landscape scale benefits (Criterion 6) and smaller scale ecosystem processes or biodiversity products fundamental to meeting the economic and cultural needs of a local community (Criterion 7). Ecosystem services of the former dimension (Criterion 6) match closely with a Type 4 HCV area, which is defined as ‘areas that provide basic ecosystem services in critical situations’¹⁷. The Clients can usefully refer to guidance materials developed for determining HCV-4 (and other HCV areas) when determining if the project site is located in an area that might trigger this criterion¹⁸.

¹⁷ This is a generic usage of the term critical and not necessarily related to the IFC/EBRD term Critical Habitat.

¹⁸ E.g., the ProForest HCV Toolkit, <http://www.proforest.net/publication/pubcat.2007-01-19.4709481979>

3.6.7 Understanding of PS6 Paragraph 9 Criterion 7/PR6 Paragraph 13 Criterion 6

“Critical habitat includes areas with high biodiversity value, including... areas having biodiversity of significant social, economic or cultural importance to local communities.”

Biodiversity of this nature is summarized as follows: (i) natural resources that local communities derive from a particular environment such as food products (e.g., hunted meat or fish, leaves, nuts, berries), building materials (e.g., rattans, bamboo, timber), or medicinal plants; (ii) natural resources from which local communities are deriving or have the potential to derive economic benefits such as ecotourism or the sale of the products mentioned in point (i); and, (iii) natural resources of cultural importance such as sacred sites or sites at which regular traditional ceremonies take place¹⁹.

The ‘criticality’ or significance of such areas is determined by their inherent value/significance/importance to local communities and by the existence of viable alternatives. The significance of natural ecosystems will be high in situations where whole communities or significant portions of them are heavily dependent on those ecosystems for their livelihoods and where there is limited availability of alternatives. Best practice in HCV assessment employs a threshold approach for some resources; for example, if a food product harvested from a forest accounts for at least 25 percent of a local community’s diet, the area may be considered critical. The client should refer to guidance materials developed for determining HCV Types 5 (‘Forest areas fundamental to meeting the basic needs of local communities’) and Type 6 (‘Forest areas critical to local communities’ traditional cultural identity’).

There is some degree of overlap between Paragraph 9 (critical habitat) in PS6 and Paragraph 8 (critical cultural heritage) in PS8 (Cultural Heritage) in terms of natural resources of cultural or spiritual importance to local communities. For the purposes of Criterion 7, the IFC has advised that a cultural site should only qualify as Critical Habitat if “the spiritual/cultural value of the site is linked to its biodiversity and related ecosystem processes” (L. Conzo *in litt.* 2009). The critical habitat clause in PS6 pertains to areas of ‘high biodiversity value’; however, there are numerous examples of single natural resources (e.g., rocks, a tree, a waterfall) that may be of significant spiritual importance to local communities, but not necessarily tied to the biodiversity of the area. Singular natural resources of this type may be more appropriately covered under PS8, whilst natural resources intrinsic to the ecosystem (e.g., sacred groves, a collection of streams, a mountaintop containing a particular forested area or meadow of spiritual significance) may be covered by PS6. This distinction should be made on a case-by-case basis.

There is also overlap between PS6 and PS5 (Land Acquisition and Involuntary Resettlement). Notably, in PS5, ‘involuntary resettlement’ refers not only to physical displacement but also to economic displacement (loss of assets or access to assets that leads to loss of income sources or means of livelihood). Economic displacement is highlighted in PS5 to include changes in “*access to grazing land, forest and water resources*”, i.e. most or all provisioning services. Where the assessment of a resource’s value, and its mitigation and compensation possibilities, involves more socio-economic skills than biological skills, the resource is probably more suitably assessed and primarily dealt with under PS5.

19 Parts of this definition are taken directly from the definition of HCV Type 5 and 6 (ProForest 2008c).

4 Methods

4.1 Summary

As outlined in Section IV of the Executive Summary, three steps were used to identify Critical Habitat.

Step 1: Define scope of assessment and area of influence. The scope of the project, the area likely to be subject to impacts, and the likely spatial units of analysis, were all identified. This included but was not restricted to the likely project footprint. The broader regional context was also examined. Two different units of analysis were identified. First, the area comprising Khanbogd soum²⁰, neighbouring Manlai soum to the north and Bayan-Ovoo soum to the west, and both sectors A and B of the Small Gobi Strictly Protected Area (a total of 51,415 km²) was identified as the spatial unit of analysis for large mammals. This entire area is likely to experience secondary impacts arising from the mine and associated infrastructure, notably including increased hunting owing to in-migrants and increased wealth (and consequent availability of vehicles and firearms). The large size of this unit of analysis is mainly due to the nomadic and temporally irregular movements of certain species of large ungulate²¹, in combination with the scale of linear infrastructure under consideration in the Oyu Tolgoi project. Second, a smaller area comprising Khanbogd soum and neighbouring Manlai soum to the north (a total of 27,375 km²) was identified as the spatial unit of analysis for all other species, unique assemblages of species, key evolutionary processes, key ecosystem services and biodiversity of significant social, economic or cultural importance to local communities. This unit of analysis incorporates not only Khanbogd soum, across which there will be primary impacts from the mine and associated infrastructure, but also Manlai soum, into which the Gunii Hooloi aquifer appears to extend (and thus into which significant secondary impacts may potentially occur from mine-related water extraction²²).

Step 2: Collect and verify available information on biodiversity and ecosystem services. A combination of methods was used, including *inter alia* literature review, expert consultation, ecological field surveys and social research methods. Information was gathered on species, habitats, ecosystems, evolutionary processes, ecosystem services and biodiversity-based livelihoods and culture – both within the project's area of influence and also in the broader national, regional and global contexts. Particular attention was given to components of biodiversity likely to trigger Paragraph 9 Criteria ('candidate biodiversity'). Information on subspecies or populations below species level was not specifically collated, in accordance with TBC (2010), owing to the fact that most global and national threat assessments are conducted at the species level. Some biodiversity information was collected by the Oyu Tolgoi project, and some by Fauna & Flora International as part of a Rapid Biodiversity Assessment, but most was obtained from literature and expert consultation. The Biodiversity Consultancy collated and interpreted the data in the context of Critical Habitat.

Step 3: Screen data using Paragraph 9 criteria.

3.1 Which biodiversity values qualify against Paragraph 9 criteria?

From the broad pool of biodiversity and ecosystem services data ('candidate biodiversity') gathered in Step 2, information was extracted on those values particularly relevant to Criteria 1-7. For example, in assessment against Criterion 1, relevant values would include species threat status, size of population and range at the global, national, and project site level, and the number of known sites for the species.

3.2 Which biodiversity values trigger Paragraph 9 criteria?

Quantitative thresholds have been established for Criteria 1-3 of Paragraph 9, for the purposes of guiding Critical Habitat assessments. To screen candidate species against these thresholds, quantitative information on a range of species traits is needed at both the project site level and the global/national

20 A soum is a Mongolian administrative unit below an aimag, akin to a district below a province.

21 Particularly Asiatic Wild Ass, which persists in all but the most northern parts of this unit of analysis and which comprises a primary reason for establishing the two parts of the Small Gobi Special Protected Area.

22 Although these potential impacts have a low likelihood, the consequences if they did occur could be very significant for all biodiversity in the impact area.

level. For Criteria 4-7, quantitative significance thresholds have not been set and qualitative value judgements must be made based on expert opinion.

4.1.1 Step 1: Define scope of assessment, area of influence and units of analysis

The geographic scope of the assessment focuses on the project's area of influence. This is considered to be Khanbogd soum²³, neighbouring Manlai soum to the north and Bayan-Ovoo soum to the west, and both sectors A and B of the Small Gobi Strictly Protected Area (Figure 2a). This entire area is where the primary and secondary impacts arising from the mine and associated infrastructure are likely to be concentrated: owing to extensive infrastructure associated with the mine, potential primary impacts are spread across Khanbogd soum. Key secondary impacts of mine operations may potentially be (i) a road upgrade and high-voltage powerline from the mine site to Gashuun Sukhait interrupting connectivity of wildlife movements between sector A (in Bayan-Ovoo soum) and sector B (in Khanbogd soum) of Small Gobi Strictly Protected Area (SPA), (ii) increased hunting owing to large-scale in-migration (including many non-mine employees) and increased wealth (and consequent availability of vehicles and firearms), and (iii) water extraction from the Gunii Hooloi deep water aquifer (which edges into Manlai soum) having unclear connectivity with surface water aquifers important for local ecosystems and communities in this arid region.

Within this area of influence, the Critical Habitat assessment thus used two definitions of the unit of analysis throughout. First, the entire area comprising Khanbogd soum, neighbouring Manlai soum to the north and Bayan-Ovoo soum to the west, and both sectors A and B of the Small Gobi Strictly Protected Area was identified as the spatial unit of analysis for large mammals, owing to the potential impacts of increased hunting across this area (Figure 2a). This larger unit of analysis has an area of 51,415 km². Second, a smaller area comprising Khanbogd soum and neighbouring Manlai soum to the north was identified as the spatial unit of analysis for all other species, unique assemblages of species, key evolutionary processes, key ecosystem services and biodiversity of significant social, economic or cultural importance to local communities. This unit of analysis, covering 27,375 km², incorporates not only Khanbogd soum, across which there will be primary impacts from the mine and associated infrastructure, but also Manlai soum, owing to potentially significant secondary impacts from mine-related water extraction²⁴ (Figure 2b).

23 A soum is a Mongolian administrative unit below an aimag, akin to a district below a province

24 Although these potential impacts have a low likelihood, the consequences if they did occur could be very significant for all biodiversity in the impact area.

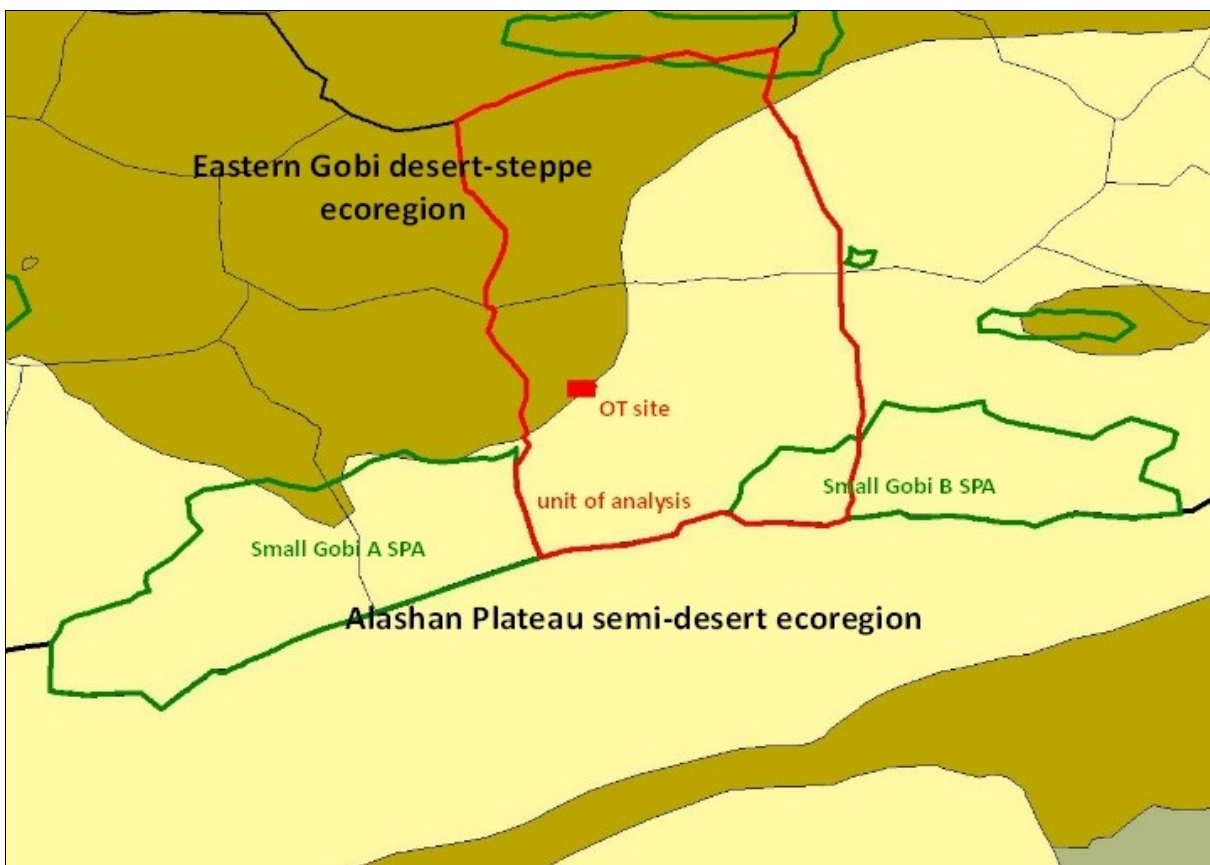


Figure 2a. Spatial Unit of Analysis for large mammals, and 2b. Spatial Unit of Analysis for all other species, unique assemblages of species, key evolutionary processes, key ecosystem services and biodiversity of significant social, economic or cultural importance to local communities. The limits of these spatial units of analysis as used in the Critical Habitat assessment of Paragraph 9 are shown in red.

4.1.2 Step 2: Collect and verify available information on biodiversity and ecosystem services

Biodiversity information on the Oyu Tolgoi site and surrounding areas has been collected by Oyu Tolgoi and its consultants over a number of years in a series of studies, summarised in a series of Detailed Environmental Impact Assessments specific to individual infrastructure components and the overarching draft Environmental and Social Impact Assessment.

In addition, in May, June and July 2011, a series of rapid assessments were carried out of biodiversity topics identified by the rapid biodiversity assessment team as gaps. Specifically, these comprised studies on small mammals, Houbara Bustard (within the area of the road upgrade and high-voltage powerline), Saxaul (*Haloxylon ammodendrum*) forest, key natural resource livelihoods, medicinal plants, and rangeland/pasture quality. The methods for these surveys appear in detail (objectives, team, periods, sampling effort and methods) in the baseline reports, which are currently in draft. The rapid biodiversity assessment team has identified additional surveys related to large ungulates as priorities, particularly to identify current use of the larger unit of analysis by Asiatic Wild Ass and gazelles and to assess current impacts of roads. Specifically, aerial surveys have been proposed to Oyu Tolgoi for east-west transects across the area containing the road upgrade and high-voltage powerline and substantive sections of the larger unit of analysis from the Oyu Tolgoi site to the border.

4.1.3 Step 3: Screen against Paragraph 9 Criteria

From the broad pool of biodiversity and ecosystem services data gathered in Step 2, information was extracted on those values particularly relevant to Criteria 1-7 in PS6 Paragraph 9/PR6 Paragraph 13. This was then screened against the quantitative thresholds established for Criteria 1-3 of PS6 Paragraph 9. For Criteria 4-7, the qualitative PS6 Paragraph 9 significance thresholds were applied to data made available in the project literature and from the Rapid Biodiversity Assessment team field studies, in consultation with experts and stakeholders where appropriate. The screening process was an inclusive procedure, and based on the broader foundation of the Rio Tinto Net Positive Impact Biodiversity Values Assessment (Ekstrom & Anstee 2007). The identification of biodiversity values meeting the Paragraph 9 criteria was achieved by using a series of fieldwork studies, expert advice and literature reviews. Specific details are given in the following sections.

4.2 PS6 Paragraph 9 Criteria 1-3/PR6 Paragraph 13 Criteria 2-4 species methods

4.2.1 Defining candidate taxa (Conservation Priority Species)

Criteria 1-3 of PS6 Paragraph 9/criteria 2-4 of PR6 Paragraph 13 focus at the species level. A large number of species are found in the project area of influence. Consequently the first step was to screen all those species present to determine which of them were candidate taxa that might possibly trigger Critical Habitat under PS6/PR6.

4.2.1.1 Criterion 1: Critically Endangered and Endangered species

Critically Endangered (CR) and Endangered (EN) species face, respectively, an extremely high risk and a very high risk of extinction in the wild. The application of this criterion was therefore mainly based on the 2010 IUCN Red List of Threatened Species, which is the authoritative source of information on the global threat status of species. Mongolian National Red Lists (Clark *et al.* 2006; Ocock *et al.* 2006; Terbish *et al.* 2006; draft Red List for birds per G. Sundev *in litt.* 2011) were also consulted in detail for nationally-threatened species, and assessed on a case by case basis using expert opinion.

4.2.1.2 Criterion 2: Endemic and restricted-range/geographically-restricted species

Mongolia has few obvious areas of distinct endemism. For the purposes of this assessment, the following definition of endemic was used: species endemic to South Gobi. South Gobi contains a biogeographic assemblage of species and habitats that is more internally similar than it is to surrounding areas. Species endemic to South Gobi are those known nowhere else in the world²⁵.

25 The IFC Oyu Tolgoi Project Guidance Note on Critical Habitat defines an endemic species as “one that has ≥ 95 percent of its global range inside the country or region of analysis”. The appropriate region of analysis for endemism was determined by FFI and TBC.

Restricted-range (approximating to 'geographically-restricted') is a concept which was first developed for birds, equating to bird species with a global breeding range less than 50,000 km² (Stattersfield *et al.* 1998). The definition developed for birds has commonly been applied since to all terrestrial vertebrates (mammals, reptiles and amphibians) and also seems robust for plants and freshwater fish, though evidence for those taxa is weaker to date (Langhammer *et al.* 2007). Restricted-range species of all taxa were thus defined in this assessment as all those with ranges of 50,000 km² or less.

4.2.1.3 Criterion 3: Congregatory and migratory species

Migratory species are defined as those where a significant proportion of the population cyclically and predictably move from one geographical area to another (including within the same ecosystem). Congregatory species are defined as those that gather in globally significant numbers or concentrations at a particular site, seasonally or permanently. As such, both of these groups of species exhibit a type of temporary irreplaceability in that they are dependent on distinct and restricted geographical sites for at least one part of the life cycle.

According to the Convention on Conservation of Migratory Species of Wild Animals (CMS 2003), a migratory species means “the entire population or any geographically separate part of the population of any species or lower taxon of wild animals, a significant proportion of whose members cyclically and predictably cross one or more national jurisdictional boundaries”. For the Global Register of Migratory Species (GROMS²⁶), migration is defined as a seasonal movement that implies some element of a return to some initial starting point, independently of national boundaries because it is a biological concept. Therefore (in contrast to CMS), according to the GROMS definition, a species migrating within a large range state would qualify as a migratory species (Riede 2001).

Congregatory species are those that gather in globally significant numbers or concentrations at a particular site at a particular time of their lifecycle for feeding, breeding or resting (during migration) (Langhammer *et al.* 2007; IFC 2008). The sites of globally significant congregations may comprise (Langhammer *et al.* 2007):

- Breeding colonies and/or other sites used during the non-breeding season where large numbers of individuals gather at the same time (e.g. for foraging and roosting);
- Bottleneck sites through which significant numbers of individuals of a species pass over a concentrated period of time (e.g. during migration).

Among the taxonomic groups covered in this baseline study, birds, bats and some large ungulates have the highest potential to trigger this criterion (although there are examples of migratory and congregatory species from other taxonomic groups, including invertebrates). Congregatory and migratory species were identified by review of literature and online databases and by expert consultation.

4.2.2 Interpretation of the Oyu Tolgoi Guidance Notes Methods for Criteria 1-3

The following steps were followed in assessing candidate species against the quantitative thresholds for Criteria 1-3:

1. Determine the units of analysis, which involves:
 - a. Understand the regional landscape in which the project is located
 - b. How is the taxon using the landscape?
 - c. How is the taxon using the project site?
 - d. What is the spatial scope of possible project impacts?
2. Obtain or calculate the global and national Extent of Occurrence (EOO), Area of Occupancy (AOO), total area of known sites, or population for each candidate species:
 - a. EOO
 - b. AOO
 - c. Population size
 - d. Number of known sites.

26 See www.groms.de

3. Calculate the population size within, and/or area of, the unit of analysis.
4. Calculate the proportion of the global or national population represented by the unit of analysis.
5. Screen this output against new significance thresholds within Tiers 1 and 2.

4.2.3 Determine the units of analysis

Following IFC guidance, evaluation of Critical Habitat should be carried out using a unit of analysis that makes sense in ecological and conservation management terms. In other words, the unit of analysis is not simply the project site/project footprint and the entirety of the unit of analysis is considered to be (or not to be) Critical Habitat (Section 3.5.1). The delineation of the unit of analysis may depend upon the taxon of concern.

The units of analysis for Criteria 1-3 are defined as 'discrete management units' (IFC 2009). Discrete management units are areas with a definable boundary within which the character of biological communities and/or management issues have more in common with each other than they do with those in adjacent areas²⁷. A discrete management unit "may or may not have an actual management boundary (e.g. legally protected areas, World Heritage sites, Key Biodiversity Areas, Important Bird Areas, community reserves) but could also be defined by some other sensible ecologically definable boundary (e.g., watershed, interfluvial zone, intact forest patch within patchy modified habitat, etc.)" (IFC 2009).

4.2.3.1 Understand the regional landscape in which the project is located

The regional landscape context was studied with reference to a variety of datasets including satellite images, GIS maps of physical and biological features (habitats, topography, watersheds, soil and vegetation type, etc.) and human landscape features (settlements, roads, administrative areas, etc.)

4.2.3.2 How is the taxon using the landscape?

Distribution and habitat preferences of taxa at the landscape scale were determined by literature review (including the IUCN Red List of Threatened Species: IUCN 2010) and expert consultation. Additionally, as part of the rapid biodiversity assessment, surveys were carried out on small mammals, Saxaul forest and medicinal plants within the project area of influence. These surveys provided additional information on how candidate taxa were using the broader landscape.

4.2.3.3 How is the taxon using the project site?

Taxon-specific surveys were carried out as part of the rapid biodiversity assessment and in other previous studies conducted by Oyu Tolgoi and others, to determine which taxa occur within the project area of influence and where they are distributed within this area. Because the surveys were very limited in space and time, the survey results alone do not give a full picture of how a particular taxon may be using the area. Consequently, distribution and habitat use (including feeding sites, breeding sites, dispersal corridors, etc.) was determined for certain species by a combination of literature review, expert consultation, and survey data from the rapid biodiversity assessment. This information was used to infer how candidate taxa are likely to be distributed across the project site and how they are using it.

4.2.3.4 What is the spatial scope of potential project impacts?

Documents from Oyu Tolgoi, notably the draft ESIA (Oyu Tolgoi LLC in prep.) and maps of project infrastructure, were used to assess the spatial scope of potential project impacts. These included direct footprint impacts and indirect (including third party) impacts.

4.2.3.5 Result: definition of the units of analysis

Two different units of analysis were identified. First, the area comprising Khanbogd soum, neighbouring Manlai soum to the north and Bayan-Ovoo soum to the west, and both sectors A and B of the Small Gobi Strictly Protected Area (a total of 51,415 km²) was identified as the spatial unit of analysis for large mammals. This entire area is likely to experience secondary impacts arising from the mine and associated infrastructure, notably including increased hunting owing to in-migrants and increased wealth (and consequent availability of vehicles and firearms). The large size of this unit of analysis is

²⁷ Adapted from the definition of 'discreteness' by the Alliance for Zero Extinction: www.zeroextinction.org/selection.htm as per IFC (2009)

mainly due to the nomadic and temporally irregular movements of certain species of large ungulate²⁸, in combination with the scale of linear infrastructure under consideration in the Oyu Tolgoi project. Second, a smaller area comprising Khanbogd soum and neighbouring Manlai soum to the north (a total of 27,375 km²) was identified as the spatial unit of analysis for all other species, unique assemblages of species, key evolutionary processes, key ecosystem services and biodiversity of significant social, economic or cultural importance to local communities. This unit of analysis incorporates not only Khanbogd soum, across which there will be primary impacts from the mine and associated infrastructure, but also Manlai soum, into which the Gunii Hooloi aquifer appears to extend (and thus into which significant secondary impacts may potentially occur from mine-related water extraction²⁹).

4.2.4 Obtain or calculate the global EOO, AOO, total area of known sites, or population

For many species, estimates of population size and/or population density will neither be already published nor feasible to calculate at either the global level, the national level, or the unit of analysis level. In this case, distribution area may be used as a surrogate for population size. Distribution is sometimes used as a surrogate for population in other types of species status assessment, e.g. in assessment of species for inclusion on the IUCN Red List of Threatened Species. For example, when assessing species against IUCN Criterion A (population reduction), the degree of population reduction may be inferred or suspected based on a reduction in EOO, AOO, number of sites or extent of potentially suitable habitat (IUCN Standards and Petitions Working Group 2008³⁰).

There are several different ways of estimating the distribution area of a species in Critical Habitat assessments (TBC 2010). However, the following methods were all assessed for utility during this Critical Habitat assessment. Ultimately, only one (extent of occurrence) was appropriate for the candidate taxa, environmental context and data availability of this project:

4.2.4.1 Extent of occurrence (EOO)

The EOO is generally the area encompassed by the external boundary or “minimum convex polygon” drawn around all known sites for the species (Figure 3), excepting large areas of unsuitable habitat within this boundary. IUCN (2001) defines EOO as “the area contained within the shortest continuous imaginary boundary which can be drawn to encompass all the known, inferred or projected sites of present occurrence of a taxon, excluding cases of vagrancy. This measure may exclude discontinuities or disjunctions within the overall distributions of taxa (e.g., large areas of obviously unsuitable habitat). Extent of occurrence can often be measured by a minimum convex polygon (the smallest polygon in which no internal angle exceeds 180 degrees and which contains all the sites of occurrence).”

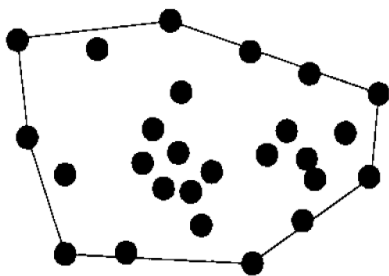


Figure 3. Extent of occurrence (EOO), generally the area encompassed by the external boundary or 'minimum convex polygon' drawn around all known sites for the species (IUCN 2001).

28 Particularly Asiatic Wild Ass, which persists in all but the most northern parts of this unit of analysis and which comprises a primary reason for establishing the two parts of the Small Gobi Special Protected Area.

29 Although these potential impacts have a low likelihood, the consequences if they did occur could be very significant for all biodiversity in the impact area

30 Guidelines for Using the IUCN Red List Categories and Criteria. Version 7.0. Prepared by the Standards and Petitions Working Group of the IUCN SSC Biodiversity Assessments Sub-Committee in August 2008. Downloadable from <http://intranet.iucn.org/webfiles/doc/SSC/RedList/RedListGuidelines.pdf>

4.2.4.2 Area of occupancy (AOO)

IUCN (2001) defines AOO as “the area within a species’ 'extent of occurrence' (see above), which is occupied by a taxon, excluding cases of vagrancy. The measure reflects the fact that a taxon will not usually occur throughout the area of its extent of occurrence, which may contain unsuitable or unoccupied habitats. In some cases, (e.g., irreplaceable colonial nesting sites, crucial feeding sites for migratory taxa) the area of occupancy is the smallest area essential at any stage to the survival of existing populations of a taxon.”

The standard IUCN method for estimating AOO is to count the number of occupied cells in a uniform grid (typically 2 km x 2 km) that covers the entire range of a taxon, and then tally the total area of all occupied cells (Figure 4). Consequently, accurate estimation of AOO depends upon the availability of reasonably detailed and comprehensive point locality data, which are lacking for many taxa. This level of data quality was not available for any of the candidate taxa in the units of analysis, so this method was not used.

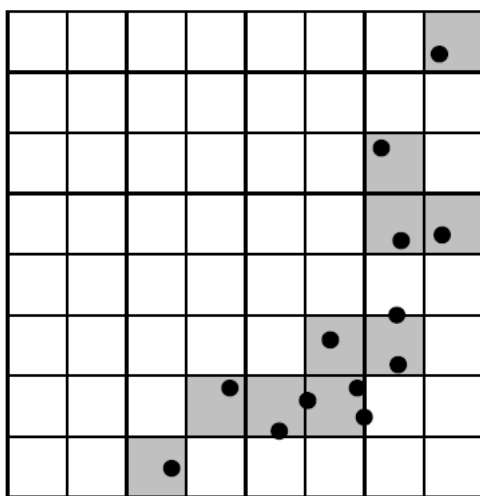


Figure 4. The IUCN method for calculating area of occupancy (AOO) based on point locality data using a 2 km x 2 km grid (Standards and Petitions Working Group 2008).

4.2.4.3 Total surface area of known sites

An alternative method for estimating the distribution area of a species is to calculate the total surface area of all known sites for the species. This method is most suitable when the sites for the taxon in question are fairly well known (i.e. the number of known sites is not too great an underestimate of the true number of sites), and when the taxon tends to be restricted to specific sites with clearly-defined borders (e.g. in the case of a primary forest-dependent species that is now found only in protected areas because almost all primary forest outside the protected areas has been lost). Standard reference works such as the World Database on Protected Areas (WDPA)³¹ can be used as a source of information on the surface area (e.g. in square kilometres) of particular sites. This was ascertained to not be the case for any species in the units of analysis, so this method was not used.

4.2.4.4 Population size

Following IUCN (2001), 'population' is here defined as the total number of individuals of a taxon, and 'population size' is defined as the number of mature individuals only (i.e. the number of individuals known, estimated or inferred to be capable of reproduction)³². This distinction is important as some populations include individuals that are senescent or otherwise incapable of reproduction, and that consequently do not contribute to recruitment.

For a few species (typically certain primates, other large mammals, and birds), published estimates of global population size are available. For other relatively well-known vertebrates, it is possible to derive

31 www.wdpa.org

32 www.iucnredlist.org/documents/redlist_guidelines_v1223290226.pdf

inferred estimates of global population size based on AOO and known density ranges. However, for many species data on population size will be lacking. In these cases, IFC guidance indicates that measures of range (e.g. EOO, AOO, total surface area of known sites) may be used as surrogates for population size if deemed appropriate by relevant experts. As indicated above, this was the case for candidate species in the units of analysis.

4.2.5 Obtain or calculate the national EOO, AOO, total area of known sites, or population

This was carried out using the same methods as described above for calculating these figures at the global level. It was only necessary to calculate this parameter for candidate taxa potentially meeting the requirements for subcriterion (e) of Criterion 1 – in other words, for those taxa that are regarded as Critically Endangered or Endangered at the *national* level in Mongolia. This is because this subcriterion has thresholds at proportions of the national range of a species, rather than the global range.

4.2.6 Calculate the population size within, and/or area of, the units of analysis

For all candidate taxa, no estimate of population size could be made, and consequently the area of their range within the units of analysis was measured.

4.2.7 Calculate the proportion of the global or national population represented by the units of analysis

The proportion of the global (or national) population represented by the units of analysis was calculated based on the estimates of population and/or distribution derived following the process described above. Hence if a species' global habitat extent (estimated by EOO, AOO, etc.) covers 1,000 km², and a unit of analysis covers 100 km² of this, the proportion is 10%.

4.2.8 Screen this output against significance thresholds within Tiers 1 and 2 of the Oyu Tolgoi Project Guidance Note on Critical Habitat

The results of the above calculations were screened against the PS6 quantitative thresholds for the species Criteria 1-3.

4.3 PS6 Paragraph 9 Criterion 4 methods: unique assemblages of species

All habitats within the project sphere of influence were inspected by experts to screen them against this criterion. Particular attention was paid to the possibility of unique assemblages of species arising due to a variety of factors as detailed in the Oyu Tolgoi Project Guidance Note on Critical Habitat. Botanical expertise in this area was fundamental to assessment under Criterion 4. All habitats, micro-habitats, and patterns of species composition were examined by taxonomic and ecological experts, and comparisons were made with sites elsewhere. No quantitative significance thresholds exist for this criterion: therefore there is a reliance on expert opinion and qualitative value judgement. Requests for statements on unique assemblages possibly occurring at the project site were made to Nyambayar Batbayar (Wildlife Science and Conservation Center of Mongolia), Chimed-Ochir Bazarsad (WWF Mongolia), Galbadrakh Davaa (TNC), Amanda Fine (WCS Mongolia), Peter Gunin (Severtsov Institute of Ecology & Evolution), Tsogtbaatar Jamsran (Institute of Geoecology), Andrew Laurie (UNDP-China), Kate Oddie, Kirk Olson (University of Massachusetts), Sabine Schmidt (New Zealand Nature Institute), Jonathan Stacey (BirdLife International), Gombobaatar Sundev (National University of Mongolia), and Henrik von Wehrden (Martin-Luther University).

4.4 PS6 Paragraph 9 Criterion 5 methods: key evolutionary processes

Areas associated with key evolutionary processes were screened using expert advice and appropriate cartography. In particular, the processes by which speciation has occurred within southern Mongolia were investigated. No quantitative significance thresholds exist for this criterion: therefore there is a reliance on expert opinion and qualitative value judgement. Requests for statements on evolutionary processes possibly occurring at the project site were made to Nyambayar Batbayar (Wildlife Science and Conservation Center of Mongolia), Chimed-Ochir Bazarsad (WWF Mongolia), Galbadrakh Davaa (TNC), Amanda Fine (WCS Mongolia), Peter Gunin (Severtsov Institute of Ecology & Evolution), Tsogtbaatar Jamsran (Institute of Geoecology), Andrew Laurie (UNDP-China), Kate Oddie, Kirk Olson (University of Massachusetts), Sabine Schmidt (New Zealand Nature Institute), Jonathan Stacey (BirdLife

International), Gombobaatar Sundev (National University of Mongolia), and Henrik von Wehrden (Martin-Luther University).

4.5 Criterion 6 and 7 general methods: key ecosystem services and biodiversity of significant social, economic or cultural importance to local communities

Custom-built methods were adapted from TBC (2010) to assess ecosystem services, biodiversity-based livelihoods and cultural values of biodiversity with respect to Criteria 6 and 7. Limited information is available regarding ecosystem services, biodiversity-based livelihoods and cultural values of biodiversity in the South Gobi region. As a contribution to the baseline, the rapid biodiversity assessment team conducted short field surveys in June and July 2011 in relation to identified gaps, namely medicinal plants (Urtnasan 2011) and pasture (Damdin 2011). In addition, rapid literature reviews were conducted, focused around an ecosystem services white paper (Environ 2011). Time constraints precluded more substantive engagement of stakeholders, local communities and experts. Ecosystem services – sometimes called 'environmental services' or 'ecological services' – are generally defined as the benefits that people obtain from ecosystems. The list of ecosystem services in Annex B of IFC Guidance Note 6 (Version 2; 7 January 2011) was adopted as a base list for assessment – regulating and supporting services were assessed under Criterion 6, and provisioning and cultural services under Criterion 7 (Table 4). The results from the literature review and field surveys informed this ecosystem service assessment for the Oyu Tolgoi project using a system based on the Corporate Ecosystem Services Review. This tool is implemented by Rio Tinto NGO biodiversity partners at a number of other Rio Tinto sites, such as MCR Corumba Brazil and has been refined and modified to fit the needs of the Oyu Tolgoi project, based on previous refinements for the Rio Tinto Simandou project (TBC 2010). The outcomes of the ecosystem services review are used here to determine Critical Habitat trigger criteria.

Table 4. Base list of ecosystem services used for assessment (from Annex B of IFC Guidance Note 6 Version 2).

	Ecosystem service
Regulating services	Air quality regulation
	Global climate regulation
	Regional/local climate regulation
	Water regulation
	Erosion regulation
	Water purification and waste treatment
	Disease regulation
	Pest regulation
	Pollination
	Natural hazard regulation
Supporting services	Nutrient capture and recycling
	Primary production
	Pathways for genetic exchange
Provisioning services	Crops
	Livestock
	Capture fisheries
	Aquaculture
	Wild foods
	Timber and other wood fiber
	Other fibers (e.g., cotton, hemp, silk)
	Biomass fuel
	Freshwater
	Genetic resources
	Biochemicals, natural medicines, and pharmaceuticals
Cultural services	Sacred or spiritual sites
	Areas used for religious purposes
	Recreational value
	Ecotourism areas
	Aesthetic value

4.5.1 Spatial scale

The benefits provided by ecosystem services may be experienced at the local, regional, national and (rarely, as in the case of carbon) at the global scale. For example, a species of bee which is critical as a pollination agent for crops may mainly have local value, where the bee and crops overlap in distribution. Table 5 gives three hypothetical examples of ecosystem services and the spatial scales over which their benefits may accrue.

Table 5. Examples of how different ecosystem services may accrue to beneficiaries at different spatial scales from local to global.

Ecosystem service	Local	Provincial	National	Biome	Global
Pollination	X				
Flood regulation	X	X			
Carbon sequestration			X		X

4.5.2 Two axes to define Critical Habitat for ecosystem services

The criticality of an ecosystem service was defined along two independent axes. The first is the importance, value or significance of the service's benefits to beneficiaries; the second is the availability of alternative areas of land ('spatial alternatives' per the IFC; TBC 2010) which have the potential to provide similar or equivalent services.

4.5.2.1 Significance of ecosystem services

The assessment of ecosystem service significance was based on literature reviews and expert assessment by the rapid biodiversity assessment team. Because this livelihood value significance is

determined mostly through social methods it is inherently more subjective than assessments of intrinsic biodiversity values. The 'significance' (Table 6) is made up of a combination of the intensity of use, scope of use (e.g. number of households) and degree of dependence (e.g. \$ value equivalents), amongst other factors. The result is a semi-quantitative expression of the significance of the ecosystem service in question for the stakeholder group, most often local human communities but also broader stakeholders at the provincial and national level. These assessments were completed by the rapid biodiversity assessment team.

Table 6. Semi-quantitative classification of ecosystem service significance.

Essential	High	Moderate	Low
Crucial to sustaining the economic, cultural or biological health of the area.	Having a major importance on the economic, cultural or biological health of the area.	Providing a recognised value or supporting service to a recognised value.	No evidence of significance to the project area.

4.5.2.2 Availability of spatial alternatives to ecosystem services

The second output of Stage 2 is an assessment of the replaceability of the ecosystem service on a scale appropriate to the beneficiary. 'Replaceability' refers here to the existence of spatial alternatives (other sites where the same ecosystem service is also provided; e.g. medicinal plants may be harvested from a number of areas within and outside the unit of analysis). It does not refer to the replacement of a particular ecosystem service with a different but comparable service (e.g. the replacement of bushmeat with other protein sources such as livestock husbandry).

Ecosystem services in general were thus classified into one of three categories: those with many alternatives, few alternatives, and no clear alternatives. Examples of these categories are given for three well known ecosystem services in Table 7.

Table 7. Examples of availability of spatial alternatives for ecosystem services.

Ecosystem service	Replaceability	Many alternatives	Few alternatives	No clear alternatives
Fuelwood		X		
Flood regulation				X
Carbon sequestration			X	

Owing to limited data availability and time constraints, this classification was necessarily a subjective one by the rapid biodiversity assessment team, supported by information available from literature, field surveys and experts. Delimitation between the three categories was carried out with reference to current best practice in High Conservation Value³³ assessments, where a threshold approach is employed for some resources. For example, if a food product harvested from a forest accounts for at least 25% of a local community's diet, the area may be considered critical (ProForest 2008a, b, c). A country toolkit developed to determine High Conservation Value Forests in Vietnam (WWF Vietnam 2008) used the following thresholds to determine which forest services were of 'fundamental importance': "A forest service which, 1) contributes in the range of 15-20% to either the family monetary economy or the family diet and which can not be replaced by an easily implemented alternative, i.e., the use is not discretionary and/or, 2) whose loss or degradation would seriously impact the health and well-being of the users." The same report also uses a threshold approach to determine

33 High Conservation Value is a concept and set of toolkits to aid natural resource managers (originally just foresters) identify areas of high conservation value based on existence, economic and cultural values: www.hcvnetwork.org

forest services required to meet the “basic needs” of the local community (defined as “requirements for the economic or bio-psychological survival of an individual or group”):

Basic Need	Threshold
Food	> 30% from forest
Medicine	> 80% from forest
Fuel	100 % from forest
Construction Material	> 80% from forest

(from the Vietnam High Conservation Value Forest Toolkit; WWF Vietnam 2008)

These thresholds were used in a national toolkit for Vietnam (although they have been applied in some other countries; TBC 2010) and as such may not be entirely appropriate to the Mongolian context. Further, the concepts of 'fundamental importance' and 'basic needs' do not map directly onto Critical Habitat. Nevertheless, these thresholds provide useful guidance for the appropriate levels of significance for differentiating between the different categories used in the present assessment.

4.5.2.3 Significance × Replaceability

These two independent axes of significance and replaceability were then combined using the following matrix to derive categories relating to Critical Habitat and those of lesser importance. Services of higher significance with fewer alternatives are qualitatively assessed to designate Critical Habitat.

	Replaceability	Many alternatives	Few alternatives	No clear alternatives
Significance	Essential	High Importance	Critical Habitat	Critical Habitat
High	Moderate	Moderate Importance	High Importance	Critical Habitat
Moderate	Low	Low Importance	Moderate Importance	High Importance
Low	Low	Low Importance	Low Importance	Moderate Importance

5 Results

5.1 Criteria 1 and 2: Critically Endangered and Endangered species; and endemic and restricted-range species

5.1.1 Criteria 1 and 2: Summary

Based on screening and detailed assessment of 399 species (Appendix 1) against the selection criteria, 26 candidate taxa were identified that might potentially trigger Critical Habitat under Criteria 1 or 2 of Paragraph 9 (Table 8). These include resident species as well as migrant species that do not permanently occur in the area. All 26 candidate taxa received detailed assessment against PS6 Paragraph 9/PR6 Paragraph 13 and four of these triggered Critical Habitat.

No restricted-range plants are known or predicted to occur in the relevant unit of analysis, and most Gobi ecosystem plants are rather widespread (H. von Wehrden pers. comm. 2011). No plants occurring in Mongolia are listed as threatened on the IUCN Red List (IUCN 2010), although this is at least partly because of the limited Red List assessments of plant species globally to date. Updated national Red List assessments for mammals (Clark *et al.* 2006), herptiles (Terbish *et al.* 2006) and fish (Ocock *et al.* 2006) have been completed and a national bird Red List is in preparation, but no similar assessment exists for plants. Some plant species are listed in the Mongolian Red Book (Shiirevdamba *et al.* 1997) and the Mongolian Law on Natural Plants (1995, updated 2004 and 2010) but these are quite subjective and do not follow the IUCN classification system. Mongolian experts consider the list of plant species in the Red Book to be more politicised and less credible than the Law. However, for South Gobi, the list of plants in the Red Book and Law on Natural Plants is very similar (Prof. Jamsran Tseden, Botany Department, University of Mongolia, pers. comm. 2011). Given this, on a precautionary basis, the full 133 'very rare' plant species listed in the Law were screened against Criteria 1 and 2. It is considered that one of these, ***Chesneya/Chesniella mongolica* qualifies for Tier 2 Critical Habitat under Criterion 1** (>10% of national population in the unit of analysis).

No Critically Endangered fauna species are known or predicted to occur in the relevant units of analysis. Three globally Endangered and four additional nationally Endangered species are found, of which **Asiatic Wild Ass or 'Khulan' *Equus hemionus* (IUCN Endangered) qualifies for Tier 1 Critical Habitat under Criterion 1 and Argali *Ovis ammon* (IUCN Near Threatened) and Short-toed Snake-eagle *Circaetus gallicus* (IUCN Least Concern) qualify for Tier 2 Critical Habitat under Criterion 1**. The single restricted-range species found in the unit of analysis, Mongolian Accentor *Prunella koslowi*, does not qualify for Critical Habitat under Criterion 2. Critical Habitat candidate and qualifying species under Criteria 1 and 2 are summarised in Table 8.

Table 8. Criteria 1 and 2 candidate species and their assessment against Paragraph 9 (Critical Habitat trigger species are highlighted in bold)

Note: four species triggered Criterion 1 on endangered species. No species triggered Criterion 2 on restricted-range and endemic species. Overall, one species triggered Tier 1 Critical Habitat and three species triggered Tier 2 Critical Habitat.

No.	Species	Common name ³⁴	CRITERION 1 CR and EN species	CRITERION 2 Restricted-range and Endemic species	Tier 1 Critical Habitat	Tier 2 Critical Habitat	Rationale
	PLANTS						
1	<i>Cistanche deserticola</i>	Desert Cistanche	Potentially nationally EN	-	-	-	Does not meet Criterion 1 thresholds
2	<i>Iljinia regelii</i>	Regelian Iljinia	Potentially nationally EN	-	-	-	Does not meet Criterion 1 thresholds
3	<i>Chesneya/Chesniella mongolica</i>	Mongolian Chesney	Potentially nationally EN	-	-	Yes	Criterion 1. 'nationally-important concentrations of a nationally Red Listed EN species' (>10% of the national population in the unit of analysis)
4	<i>Limonium aureum</i>	Golden Limonium	Potentially nationally EN	-	-	-	Does not meet Criterion 1 thresholds
5	<i>Arnebia guttata</i>	Yellow Arnebia	Potentially nationally EN	-	-	-	Does not meet Criterion 1 thresholds
6	<i>Asterothamnus centrali-asiaticus</i>	Central Asian Asterthemny	Potentially nationally EN	-	-	-	Does not meet Criterion 1 thresholds
7	<i>Gymnocarpus przewalskii</i>	Przewalskii's Gymnocarpus	Potentially nationally EN	-	-	-	Does not meet Criterion 1 thresholds
8	<i>Oxytropis grubovii</i>	Grubov's Oxytrope	Potentially nationally EN	-	-	-	Does not meet Criterion 1 thresholds
9	<i>Brachanthemum gobicum</i>	Gobi Brachanthemia	Potentially nationally EN	-	-	-	Does not meet Criterion 1 thresholds
10	<i>Incarvillea potaninii</i>	Potani's Incarvillea	Potentially nationally EN	-	-	-	Does not meet Criterion 1 thresholds
11	<i>Caragana gobica</i>	Gobi Pea Shrub	Potentially nationally EN	-	-	-	Does not meet Criterion 1 thresholds
12	<i>Caragana brachypoda</i>	Brachypodous Pea Shrub	Potentially nationally EN	-	-	-	Does not meet Criterion 1 thresholds
13	<i>Olgaea leucophylla</i>	White-leaved Olgaea	Potentially nationally EN	-	-	-	Does not meet Criterion 1 thresholds

34 Most common names for plants are taken from the Mongolian Law on Natural Plants and are rarely used elsewhere (most of these species are only regularly referred to by their scientific names).

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14	<i>Potania mongolica</i>	Mongolian Potania	Potentially nationally EN	-	-	-	Does not meet Criterion 1 thresholds
15	<i>Zygophyllum potaninii</i>	Potania's Zygophyllia	Potentially nationally EN	-	-	-	Does not meet Criterion 1 thresholds
16	<i>Jurinea mongolica</i>	Mongolian Jurinea	Potentially nationally EN	-	-	-	Does not meet Criterion 1 thresholds
17	<i>Tugarinovia mongolica</i>	Mongolian Tugarinov	Potentially nationally EN	-	-	-	Does not meet Criterion 1 thresholds
18	<i>Artemisia xanthochroa</i>	Yellow Wormwood	Potentially nationally EN	-	-	-	Does not meet Criterion 1 thresholds
MAMMALS							
19	<i>Panthera uncia</i>	Snow Leopard	EN	-	-	-	Does not meet Criterion 1 thresholds
20	<i>Equus hemionus</i>	Asiatic Wild Ass or 'Khulan'	EN	-	Yes	-	Criterion 1. 'globally-important concentrations of an IUCN Red Listed EN species' (>10% of the global population in the unit of analysis)
21	<i>Ovis ammon</i>	Argali	EN (nationally)	-	-	Yes	Criterion 1. 'nationally-important concentrations of a nationally Red Listed EN species' (>10% of the national population in the unit of analysis)
22	<i>Procapra gutturosa</i>	Mongolian Gazelle	EN (nationally)	-	-	-	Does not meet Criterion 1 thresholds
BIRDS							
23	<i>Circaetus gallicus</i>	Short-toed Snake-eagle	EN (nationally)	-	-	Yes	Criterion 1. 'nationally-important concentrations of a nationally Red Listed EN species' (>10% of the national population in the unit of analysis)
24	<i>Neophron percnopterus</i>	Egyptian Vulture	EN	-	-	-	Does not meet Criterion 1 thresholds
25	<i>Larus relictus</i>	Relict Gull	EN (nationally)	-	-	-	Does not meet Criterion 1 thresholds
26	<i>Prunella koslowi</i>	Mongolian Accentor	-	Yes	-	-	Does not meet Criterion 2 thresholds
Total Species triggering each Criterion or Tier			25	1	1	3	Tier 1 Critical Habitat triggered by one species. Tier 2 Critical Habitat triggered by three species.

5.1.2 Results for individual candidate species

5.1.2.1 Plants

The distributions of all 133 'very rare' plants listed in the national Law on Natural Plants were assessed. Prof. Jamsran Tsenden (Botany Department, University of Mongolia) identified 18 of these species as candidates, i.e. occurring or potentially occurring in the relevant (smaller) unit of analysis. The majority of these have a relatively small proportion of their global distribution in this unit of analysis, certainly less than 10% on the basis of current knowledge. For two candidate species (*Caragana gobica* and *Potaninia mongolica*) this unit of analysis may hold around 10% of their national population, but probably less. However, for one candidate species, *Chesneya/Chesniella*³⁵ *mongolica*, it is estimated that more than 10% of the national range – and thus population – may occur in this unit of analysis. Further, information on the Chinese range of this species from Prof. Ma Keping (Institute of Botany, Chinese Academy of Sciences) suggests that the unit of analysis may comprise more than 10% of the global distribution of this species. Pending further information on the distribution of this species, and assessment of its global or national conservation status using IUCN categories and criteria, it would be precautionary to consider it as nationally Endangered. As such, given that it appears likely to contain over 10% of this species' national population, **the unit of analysis qualifies as Tier 2 Critical Habitat for *Chesneya/Chesniella mongolica***. Further research is important to clarify the status and distribution of this species. Additional information on the national and global distribution of this species, or detailed assessment of its conservation assessment following IUCN guidelines, may reveal that it is actually more widely distributed and/or not nationally Endangered (in which case the unit of analysis may not comprise Critical Habitat for the species) or may reveal that the species is actually globally Endangered (in which case the unit of analysis may comprise Tier 1 Critical Habitat for the species).

5.1.2.2 Mammals

5.1.2.2.1 *Panthera uncia* (Snow Leopard) – Not Triggered

Species name	<i>Panthera uncia</i>
Globally categorised as CR/EN?	EN
Regionally/nationally categorised as CR/EN?	EN
Endemic/restricted range?	
Congregatory/migratory?	
Area of unit of analysis (km ²)	51,415
Global population	4,080-6,590
Global EOO (km ²)	c.3,400,000
Global AOO (km ²)	1,230,000
Regional/national population	500-1,000 (national)
Regional/national EOO (km ²)	c. 280,000 (national)
Regional/national AOO (km ²)	101,000 (national)

Snow Leopard *Panthera uncia* is listed as globally Endangered on the IUCN Red List of Threatened Species due to a small and declining population (Criterion C; IUCN 2010). In Mongolia, it is also

35 Two different generic names are commonly used.

considered (as *Uncia uncia*) to be Endangered under Criterion C at the regional level (Clark *et al.* 2006) and listed as 'extremely rare' in the Law on Fauna (2000).

It is known from 12 countries in South, Central and East Asia, with an extent of occurrence of c. 3.4 million km², including over 280,000 km² in Mongolia (IUCN 2010). McCarthy *et al.* (2003) estimated the global area of occupancy to be 1,230,000 km², and the area of occupancy in Mongolia to be 101,000 km². The population of this species was estimated by McCarthy *et al.* (2003) to be 1) 4,080-6,590 individuals at the global level, and 2) 500-1,000 individuals at the national level.

Snow Leopard are generally restricted to steep rocky habitats at 2,000-5,500 m altitude, although they do occur as low as 600 m altitude in the northern extent of their range in Mongolia and Russia (McCarthy 2000). In the relevant unit of analysis, the species is mapped by IUCN (2010) as occurring in three hilly areas at c. 1,200-1,900 m altitude: (i) on the border of Khanbogd and Bayan-Ovoo soums (as near as 3 km to the planned Oyu Tolgoi high-voltage powerline); (ii) in north-west Bayan-Ovoo soum; and (iii) in the north of Small Gobi A SPA (mainly in Nomgon soum, edging into the west of Bayan-Ovoo soum). This mapped area covers a total of c. 1,020 km², equivalent to less than 1% of the Mongolian Extent of Occurrence of this species.

This species is assessed under Criterion 1 because it is a globally Endangered species. It does not meet the requirements for defining Tier 1 Critical Habitat under Criterion 1, because less than 10% of the species' population is inferred to occur within its unit of analysis (based on measurements of local versus global Extent of Occurrence). For Tier 2 Critical Habitat under Criterion 1, no quantitative thresholds have been set but critical habitat is triggered if the unit of analysis contains "regionally-important concentrations of an IUCN Red-listed EN species". The relevant unit of analysis is not considered to contain regionally important concentrations of Snow Leopard because it contains less than 1% of its global range within Mongolia, does not contain large blocks of continuous suitable habitat for the species, and is not known to have particularly high population densities of the species. As such, it cannot be considered to sustain a regionally-important population of the species and **this unit of analysis does not qualify as Critical Habitat for Snow Leopard.**

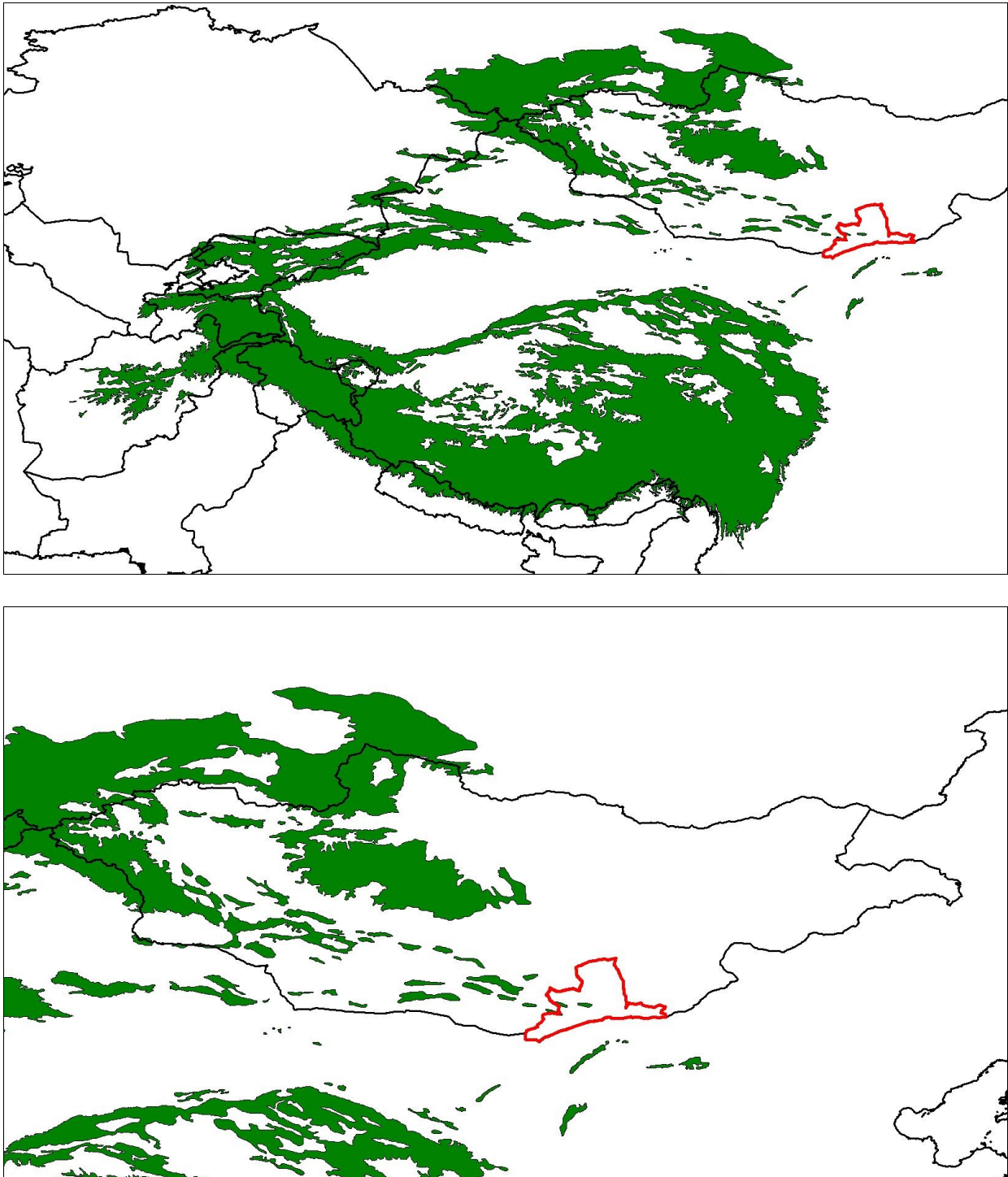


Figure 5. (a) Global and (b) national distribution of *Panthera uncia* (in green) (IUCN 2010). Red outline shows the boundary of its unit of analysis.

5.1.2.2.2 *Equus hemionus* (Asiatic Wild Ass or 'khulan') – Critical Habitat Tier 1

Species name	<i>Equus hemionus</i>
Globally categorised as CR/EN?	EN
Regionally/nationally categorised as CR/EN?	EN
Endemic/restricted range?	
Congregatory/migratory?	
Area of unit of analysis (km ²)	51,415
Global population	27,918-32,329 individuals
Global EOO (km ²)	c. 340,000
Global AOO (km ²)	
Regional/national population	17,513-19,309 (national)
Regional/national EOO (km ²)	c. 210,000
Regional/national AOO (km ²)	

The Asiatic Wild Ass *Equus hemionus* is listed as globally Endangered on the IUCN Red List of Threatened Species due to population declines (Criterion A; IUCN 2010). In Mongolia, it is also considered to be Endangered, under Criterion A at the regional level (Clark *et al.* 2006).

It formerly had an extensive range, from the Arabian Peninsula through the Middle East, Central Asia, northern South Asia, southern Russia, northern China and much of Mongolia. Its native range is now reduced to five or six countries, plus five countries where it has been reintroduced. Based on the total area of range polygons mapped by IUCN (2010), the global Extent Of Occurrence is about 340,000 km² and the national Extent Of Occurrence is about 210,000 km² (i.e. Mongolia holds more than 60% of the global range of this species). National population estimates are 17,513-19,309 in Mongolia (Lhagvasuren 2007), 2,000-4,200 in China (Yang 2007), 1,545-1,810 in Turkmenistan (Lukarevskii & Gorelov 2007), 3,900 in India (Shah & Qureshi 2007), 355-505 in Iran (P. Kaczensky *in litt.* 2011), a reported 2,486 reintroduced individuals in Kazakhstan (P. Kaczensky *in litt.* 2011), 100 reintroduced subspecies-hybrid individuals in Israel (Blank 2007), five reintroduced individuals of a non-native subspecies in Saudi Arabia (IUCN 2010), and 34 individuals of a non-native subspecies in Ukraine (Feh *et al.* 2002). 94 individuals of a non-native subspecies in Uzbekistan (Feh *et al.* 2002) are in a fenced enclosure and so should not be counted towards global population totals. Thus, the total global population (even including all introduced and hybrid individuals) is only 27,918-32,329 individuals.

It is a species of steppe, semi-desert and desert habitats. In at least the more arid of these environments, areas of plant productivity vary spatially year-on-year depending on the location of scarce rainfall. The species is nomadic in response to this unpredictability of its habitat, wandering widely between suitable pastures – particularly in times of drought or *dzud* (extremely snowy winters). Such nomadism means that the importance of any spatial unit to the species will vary from year to year. A suitable 'discrete management unit' for such a wide-ranging and nomadic species is difficult to define, with larger management units being more suitable to the species persistence needs over the long-term. It could be argued that the whole area of South-east Mongolia (per Reading *et al.* 2001 or Lhagvasuren 2007) is the most relevant management unit, given that this holds a relatively discrete population of the

species and even individuals of the species appear to range over a large proportion of the entire area (Kaczensky *et al.* 2006). However, for the purposes of this analysis a smaller area is more practical. The larger of the units of analysis used in this assessment, comprising Khanbogd, Bayan-Ovoo and Manlai soums and the Small Gobi Strictly Protected Area (SPA), is a suitable one given that a primary reason for setting up the Small Gobi SPA was for protection of this species, that Khanbogd soum holds the western part of Small Gobi B SPA, and that Bayan-Ovoo soum holds the eastern part of Small Gobi A SPA. The species' historic range extends well into Manlai soum, and the species persists in all but northern parts of Manlai soum³⁶. Manlai is included not just for this reason, but also because it has both potential impacts from borefield extraction at Gunii Hooloi (on the far northern border of Khanbogd soum) and potential importance as an east-west connection for Asiatic Wild Ass which will not be affected by the Oyu Tolgoi-Gashun Sukhait road upgrade and high-voltage powerline.

This species is assessed under Criterion 1 because it is a globally Endangered species. Despite the wide range and nomadism of this species, several methods can be used to ascertain its 'average' population in its unit of analysis. These are all based on population and density estimates for the species in South-east Mongolia, since population densities are considerably higher in this part of the country than elsewhere (Reading *et al.* 2001; P. Kaczensky *in litt.* 2011; Lkhagvasuren *et al.* 2010; Figure 8). Therefore, percentage of extent of occurrence (distribution/range) alone does not suffice as a population estimate surrogate.

The first method to ascertain the importance of the unit of analysis for this species is to use estimates of its population in South-east Mongolia, of 15,406-16,966 individuals (Lhagvasuren 2007). The unit of analysis holds about 34,000 km² of the range of the species, which is just over 16% of the Mongolian range and almost 27% of the range of the species within South-east Mongolia (Reading *et al.* 2001; IUCN 2010). Given that the population of the species in South-east Mongolia was estimated by Lhagvasuren (2007) to be 15,406-16,996 individuals, this suggests 4,096-4,511 individuals³⁷ would be present in its unit of analysis. Unpublished results of government-led surveys in 2009 suggest that the Mongolian population may have been reduced to c. 14,051 animals, with c. 11,187 in South-east Mongolia. Use of these figures would give an estimate of c. 2,975 individuals in its unit of analysis.

The second method to ascertain the importance of its unit of analysis is also based on the fact that the unit of analysis comprises almost 27% of the range of the species within South-east Mongolia, but takes a more recent (if less precise) estimate of the population of the species in this area as "likely as many as 70%" (Kaczensky *et al.* 2011). Using population estimates for the whole of Mongolia of 17,513-19,309 by Lhagvasuren (2007), 3,260-3,594 individuals³⁸ would thus be estimated to be present in its unit of analysis. Unpublished results of government-led surveys in 2009 suggest that the Mongolian population may have been reduced to c. 14,051 animals, with c. 11,187 in South-east Mongolia. Use of these figures would give an estimate of 2,615 individuals³⁹ in its unit of analysis.

The final method to ascertain the importance of its unit of analysis to the species uses estimates of its density in South-eastern Gobi of 17.94-19.13 individuals per 100 km² from ground and aerial surveys conducted in 1994 (Reading *et al.* 2001). These need adjusting downwards by c. 3-8%/year to account for the species' significant recent global population decline (52% over 16 years; IUCN 2010) and national population decline (up to 72% over nine years; Reading *et al.* 2001; Lhagvasuren 2007). Based on the fact that the unit of analysis holds about 33,500 km² of the range of the species (IUCN 2010), a population of 3,446-4,717 individuals would be estimated to be present in its unit of analysis.

36 Though this is not accounted for in the conservative data above, since IUCN maps show the species as largely absent from this soum.

37 A range of approximately (0.27 x 15,406) to (0.27 x 16,996).

38 A range of approximately (0.27 x 0.7 x 17,513) to (0.27 x 0.7 x 19,309).

39 Approximately (0.27 x 0.7 x 14,051).

Table 9. Population estimates of *Equus hemionus* in unit of analysis, using four different methods/data sources.

Method	Results: no. individuals in unit of analysis (% of global population)	Notes
1. Using population estimates from Lhagvasuren (2007)	4,096-4,511 (13.7-14.4%)	Most reliable estimate. If adjusted by recent unpublished government data, c. 2,615 individuals (10.5-11.8% global population)
2. Using population estimates from Kaczensky <i>et al.</i> (2011)	3,260-3,594 (10.9-11.4%)	Based on as “likely as many as 70%” in South-east Mongolia
3. Using density estimates from Reading <i>et al.</i> (2001)	3,446-4,717 (12.1-14.3%)	Based on old density estimates, and adjusted by decline rates, so least reliable estimate

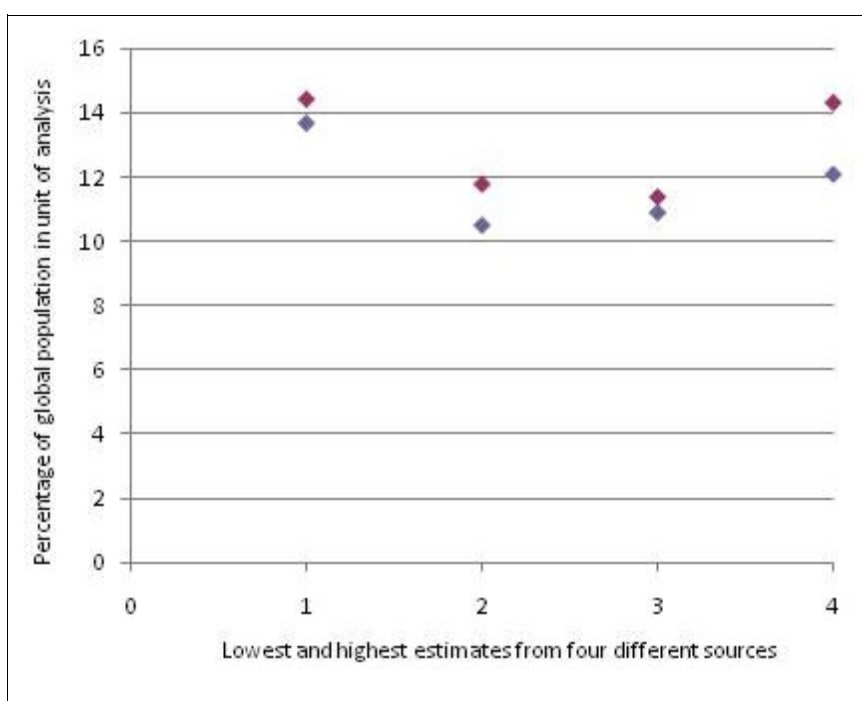


Figure 6. Estimates of the percentage of the global population of *Equus hemionus* in this unit of analysis, using four different methods/data sources

(1) using population estimates from Lhagvasuren (2007) in blue; (2) using population estimates from Kaczensky *et al.* (2011) in orange; (3) using density estimates from Reading *et al.* (2001) in green; (4) using population estimates from Lhagvasuren (2007), adjusted by recent unpublished government data, in red.

Less relevant, but supporting, information on the importance of its unit of analysis to the species comes from telemetry data collected by Kaczensky *et al.* (2011) from 2005-2007. Despite only two of seven monitored individuals being captured in this unit of analysis (these two were captured in Bayan-Ovoo soum, two others were in Khatanbulag soum – but outside of this unit of analysis – and three in Ulaanbadrakh soum), over 44% of telemetry locations were in this unit of analysis. These peaked in September-October, and were lowest in November-February, but the area retained a consistent importance throughout the seasons (P. Kaczensky unpubl. Data).

Furthermore, this species' nomadic movements in response to food availability lead to it having periodic high concentrations in unpredictable parts of its range, as is the case for Mongolian Gazelle (Olson *et al.* 2009). Thus the 'average population' calculations for the unit of analysis above could be much higher at

some times (A. Fine *in litt.* 2011; K. Olson *in litt.* 2011). Reading *et al.* (2001) report the depression of 'the Galbiin Gobi of southern Omnogobi and Dornogobi Aimags', i.e. in the south of the unit of analysis, to be an important foaling area for this species. Areas of particular importance during foaling (which occurs in Spring) are likely to be near water sources (Feh *et al.* 2001).

The three methods produce a range of estimates of the 'average' population of the species in its unit of analysis, ranging from 3,260 at the absolute lowest to 4,717 at maximum. This would comprise 10.9-14.4% of the global population of the species within its unit of analysis. Our confidence is highest around the first method's estimates, of 4,096-4,511 individuals in its unit of analysis. This would comprise 13.7-14.4% of the global population of the species⁴⁰. However, even the absolute minimum estimate is greater than 10% of the global population of this IUCN Red-listed Endangered species. This is not likely to be an unusual circumstance, as the species is known from telemetry data to regularly occur in its unit of analysis. Indeed, owing to the species' nomadism, this unit of analysis may be required habitat for a much greater proportion of its population at any given time. Consequently **the relevant unit of analysis qualifies as Tier 1 Critical Habitat for *Equus hemionus*.**

⁴⁰ If adjusted by recent unpublished government survey figures, this estimate would be 2,975 individuals in this unit of analysis, i.e. 10.7-11.9% of the global population of the species.

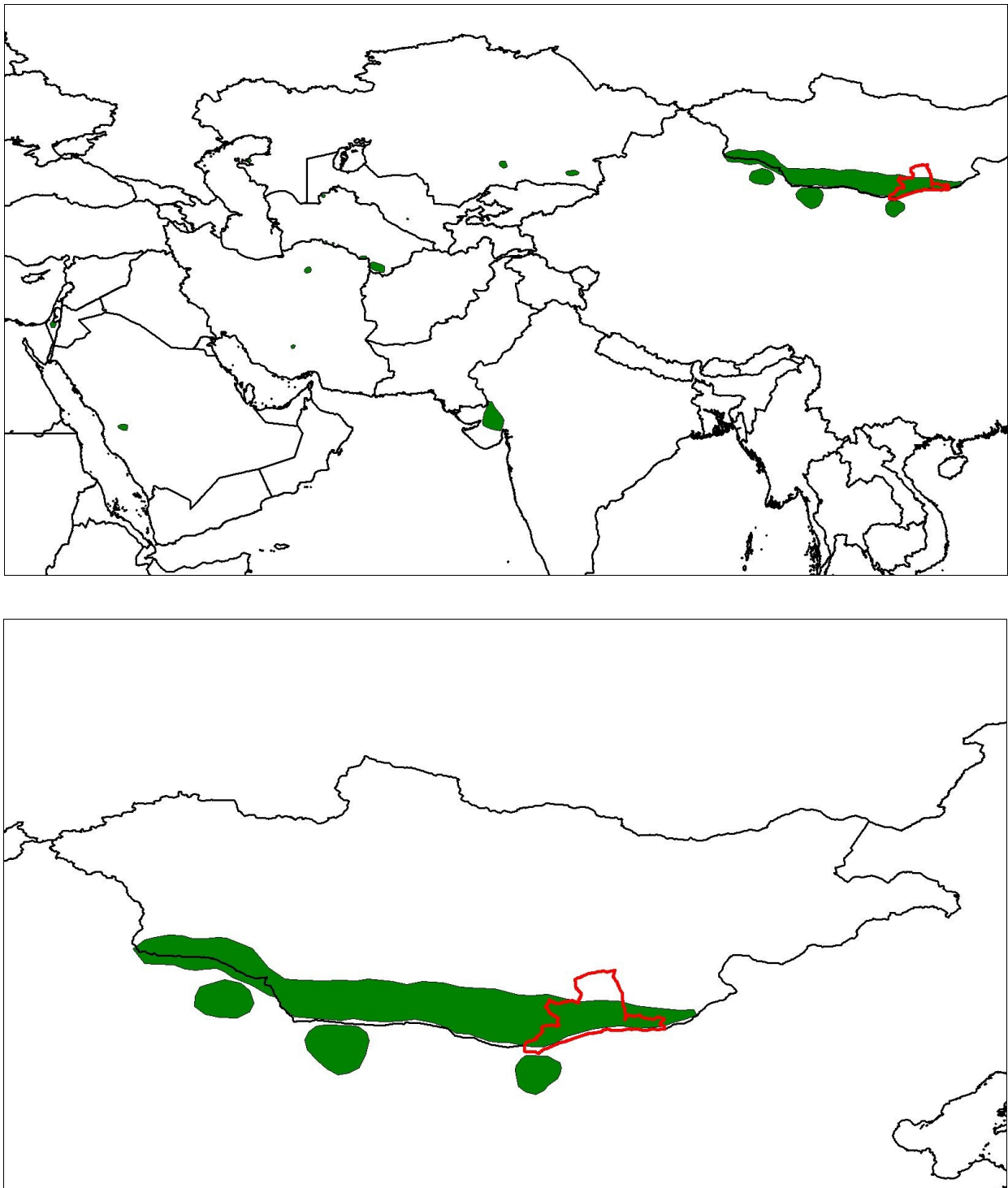


Figure 7. (a) Global and (b) national distribution of *Equus hemionus* in green (IUCN 2010; red outline shows the boundary of its unit of analysis).

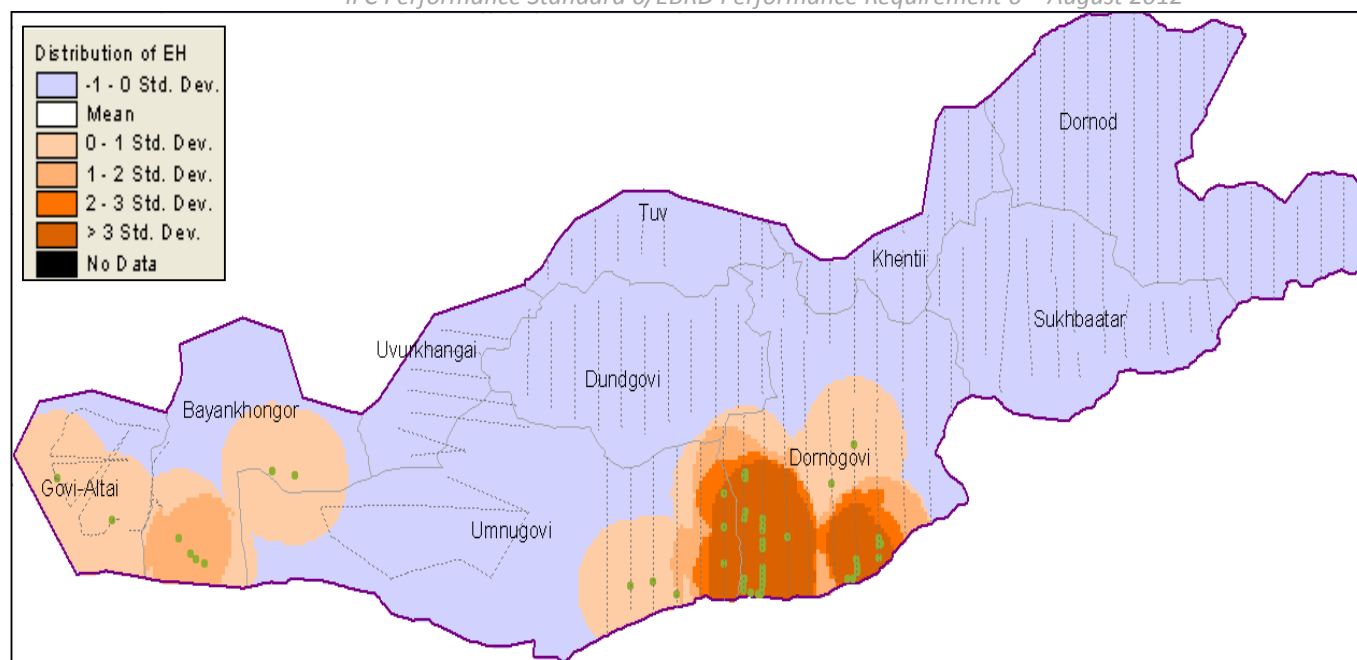


Figure 8. National density of *Equus hemionus* (Lkhagvasuren et al. 2010; darker colours indicating higher density).

5.1.2.2.3 *Ovis ammon* (Argali) – Critical Habitat Tier 2

Species name	<i>Ovis ammon</i>
Globally categorised as CR/EN?	No - Near Threatened
Regionally/nationally categorised as CR/EN?	EN
Endemic/restricted range?	
Congregatory/migratory?	
Area of unit of analysis (km ²)	51,415
Global population	
Global EOO (km ²)	c. 3,600,000
Global AOO (km ²)	
Regional/national population	13,000-15,000 individuals (national)
Regional/national EOO (km ²)	c. 530,000 (national)
Regional/national AOO (km ²)	

Argali *Ovis ammon* is listed as globally Near Threatened on the IUCN Red List of Threatened Species as it is close to qualifying due to population declines (Criterion A; IUCN 2010). In Mongolia, however, it is considered to be Endangered, under Criterion A at the regional level (Clark *et al.* 2006).

The species occupies open hilly and montane areas in the region bounded by the Himalaya, eastern Central Asia, southern Russia and south-east Mongolia. Populations are disjunct, restricted to areas of suitable topography, and are being increasingly fragmented by unsustainable hunting. Based on the total area of range polygons mapped by IUCN (2010), the global Extent Of Occurrence is c. 3.8 million km² and

the national Extent Of Occurrence is c. 530,000 km². The Mongolian population was estimated to be less than 20,000 individuals by 1994 (Luschekina 1994 in Reading *et al.* 1997) and 13,000-15,000 individuals by 2001 (Amgalanbaatar *et al.* 2002 in IUCN 2010). A 2009 government census, as yet unpublished, estimated there to be about 18,000 individuals (E. Naidansuren *in litt.* 2011).

Most Argali live on alpine grasslands at 3,000-5,500 m altitude, descending lower in winter, but in arid southern Mongolia they permanently live in lower elevation areas. A suitable 'discrete management unit' for Argali could range up to the whole South Gobi population of the species. However, for the purposes of this analysis a smaller management unit is more practical. The larger unit of analysis used in this assessment, comprising Khanbogd, Bayan-Ovoo and Manlai soums and the Small Gobi Strictly Protected Area (SPA), is most suitable, given potential secondary hunting impacts of mine development across this area and the degree to which Argali is hunted. Further, any practical conservation management of the species would likely occur at the scale of soums and protected areas.

Its unit of analysis holds c. 42,000 km² of the range of the species, which is just under 8% of the Mongolian range (IUCN 2010). Amgalanbaatar *et al.* (2002 in IUCN 2010) estimated there to be 10,000-12,000 Argali in the Gobi Region of Mongolia and 3,000-5,000 in the Altai Region. Given that the Gobi region actually comprises a smaller proportion of the Mongolian range of Argali than the Altai region, it can be seen that densities of the species are much higher in the Gobi. Indeed, this population is believed to actually be increasing, whereas the Altai population is declining (IUCN 2010). Thus, it is reasonable to assume that the population of Argali in its unit of analysis, comprising 8% of the national range and within the higher density Gobi population, comprises more than 10% of the national population of the species. Consequently **the relevant unit of analysis qualifies as Tier 2 Critical Habitat for *Ovis ammon*.**

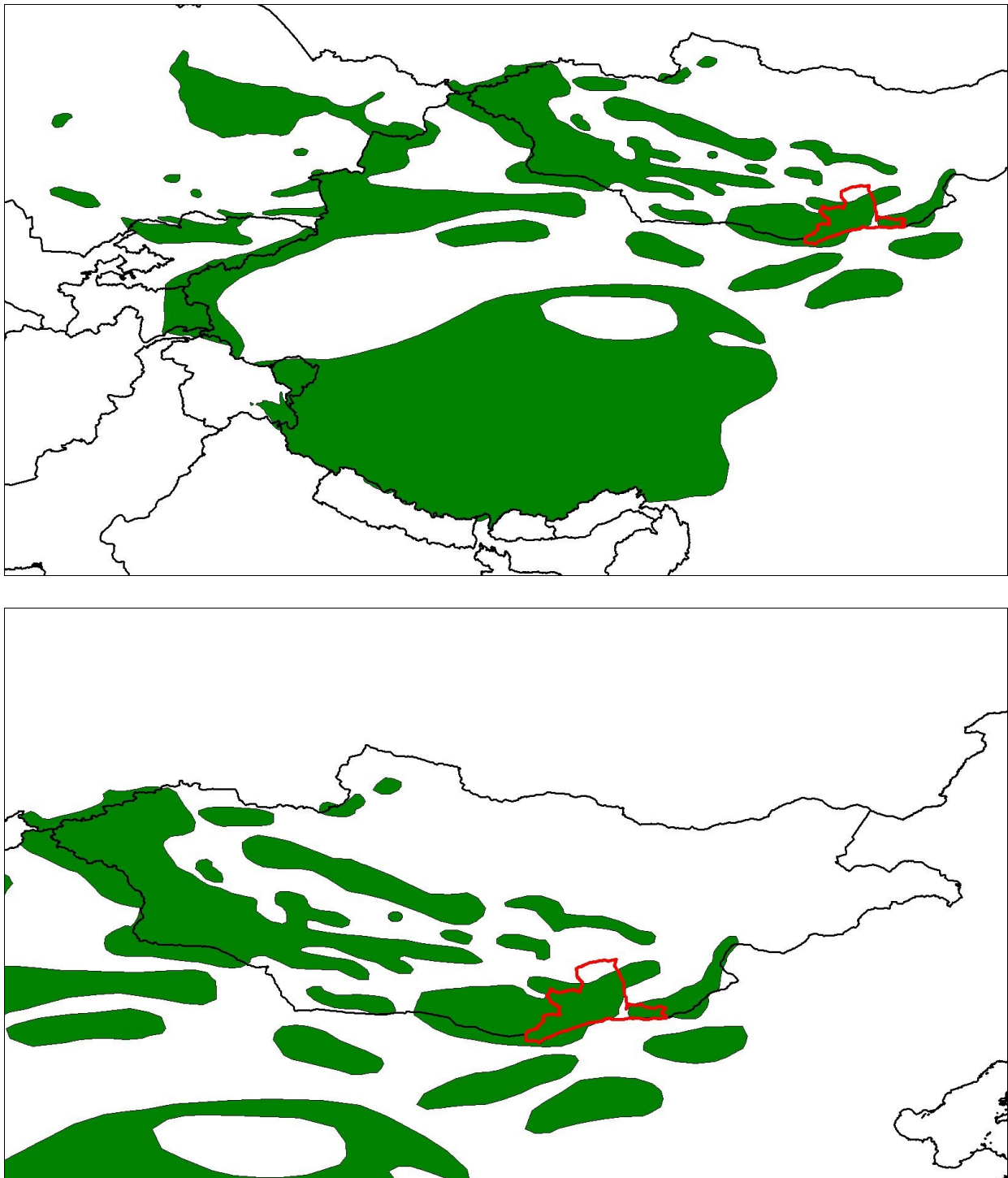


Figure 9. (a) Global and (b) national distribution of *Ovis ammon* (in green) (IUCN 2010). Red outline shows the boundary of its unit of analysis.

5.1.2.2.4 *Procapra gutturosa* (Mongolian Gazelle) – Not Triggered

Species name	<i>Procapra gutturosa</i>
Globally categorised as CR/EN?	No - Least Concern
Regionally/nationally categorised as CR/EN?	EN
Endemic/restricted range?	
Congregatory/migratory?	
Area of unit of analysis (km ²)	51,415
Global population	c. 1,300,000 individuals
Global EOO (km ²)	c. 710,000
Global AOO (km ²)	
Regional/national population	c. 1,200,000 individuals (national)
Regional/national EOO (km ²)	c. 620,000 (national)
Regional/national AOO (km ²)	

Mongolian Gazelle *Procapra gutturosa* is listed as globally Least Concern on the IUCN Red List of Threatened Species (IUCN 2010). In Mongolia, however, it is considered to be Endangered due to population declines (Criterion A) at the regional level (Clark *et al.* 2006).

This species is mainly distributed in eastern Mongolia and adjacent areas of Russia and north-eastern China, with smaller populations in western and central Mongolia. The global population and range of the species are believed to have declined by about 75% (Olson *et al.* 2011). Based on the total area of range polygons mapped by IUCN (2010), the current global Extent Of Occurrence is about 710,000 km², of which the Mongolian Extent Of Occurrence is about 620,000 km² (i.e. Mongolia holds c. 87% of the species' range). The species' population naturally fluctuates owing to disease and extreme weather events, but in Mongolia is believed to be about 1.2 million individuals, with 1.1 million individuals in the eastern steppe of Mongolia (Olson *et al.* 2011) and 75,000-125,000 to the west (K. Olson *in litt.* 2011). This gazelle is nomadic in response to food resources (Olson *et al.* 2010), and movements to the south naturally occurred in winter – swelling the resident Chinese population of the species, which numbers c. 80,000 (IUCN 2010). Such movements are now substantially, though not totally, restricted by barriers such as the Chinese border fence (Olson *et al.* 2011).

It is a species of rolling arid steppes and plains. Its nomadism means that the importance of any spatial unit to the species will vary from year to year (Mueller *et al.* 2011). A suitable 'discrete management unit' for such a wide-ranging and nomadic species is difficult to define, with larger management units being more suitable to the species persistence needs over the long-term. The larger unit of analysis used in this assessment, comprising Khanbogd, Bayan-Ovoo and Manlai soums and the Small Gobi Strictly Protected Area (SPA), is most suitable, given the wide-ranging nomadic nature of the species, potential secondary hunting impacts of mine development across this area and the degree to which Mongolian Gazelle is hunted. Further, any practical conservation management of the species would likely occur at the scale of soums and protected areas.

Its unit of analysis holds about 36,009 km² of the range of the species, which is just under 6% of the Mongolian range (IUCN 2010). Densities of the species in this unit of analysis are likely to be lower than in the core habitat of the eastern steppes (K. Olson *in litt.* 2011). However, this species' nomadic movements in response to food availability lead to it having periodic high concentrations in unpredictable parts of its range (Olson *et al.* 2009). Thus the 'average population' calculations for its unit of analysis above could be much higher at some times (A. Fine *in litt.* 2011; K. Olson *in litt.* 2011). Nonetheless, it is reasonable to assume that the 'average' population of Mongolian Gazelle in its unit of analysis comprises considerably less than 10% of the national population of the species. It is possible, but not likely, that periodic concentrations of the species in its unit of analysis would exceed 10% of its national population. Even the complete loss of habitat within its unit of analysis would not be expected to, *per se*, impact the long-term survivability of the species. Consequently **this unit of analysis does not qualify as Critical Habitat for *Procapra gutturosa*.**

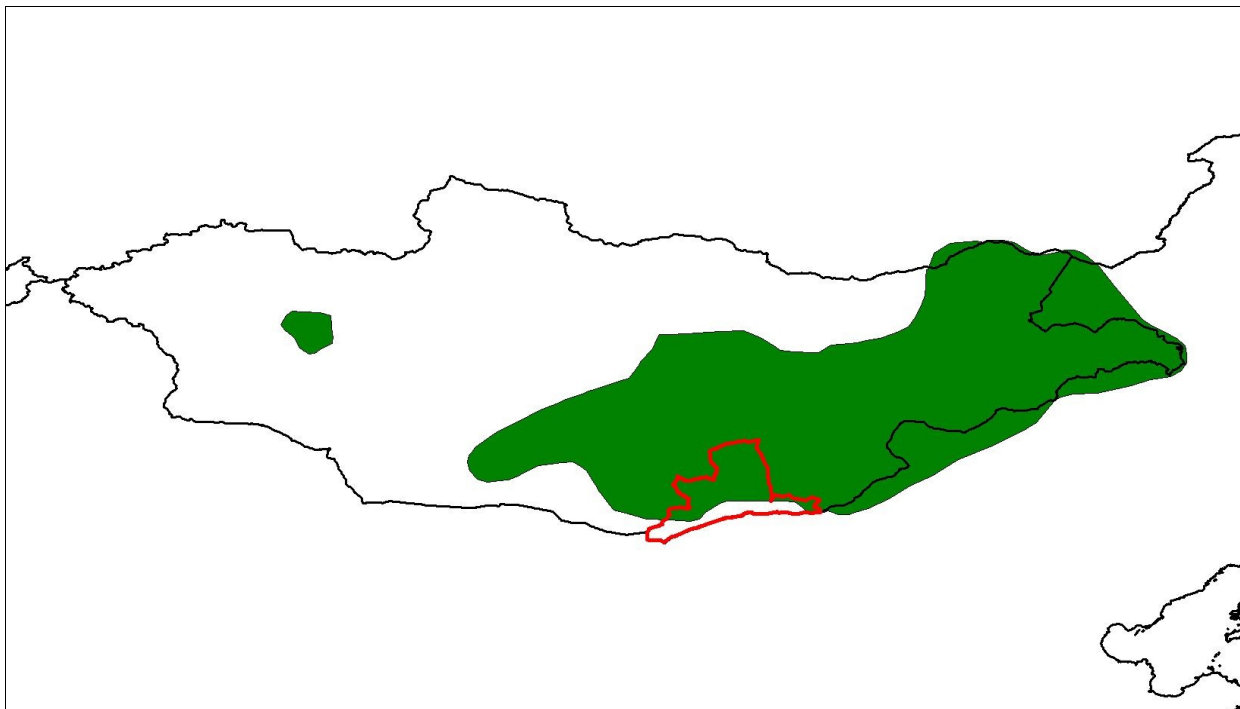


Figure 10. Global distribution of *Procapra gutturosa* (in green) (IUCN 2010). Red outline shows the boundary of its unit of analysis.

5.1.2.3 Birds

5.1.2.3.1 *Circaetus gallicus* (Short-toed Snake-eagle) – Critical Habitat Tier 2

Species name	<i>Circaetus gallicus</i>
Globally categorised as CR/EN?	No – Least Concern
Regionally/nationally categorised as CR/EN?	EN
Endemic/restricted range?	
Congregatory/migratory?	Migratory
Area of unit of analysis (km ²)	27,375
Global population	51,400-156,000 mature individuals
Global EOO (km ²)	c. 13,000,000 (breeding/resident)
Global AOO (km ²)	
Regional/national population	
Regional/national EOO (km ²)	
Regional/national AOO (km ²)	

Circaetus gallicus is classed as Least Concern on the IUCN Red List of Threatened Species (BirdLife International 2011) but in Mongolia, it is considered to be Endangered at the regional level in the draft national Red List (G. Sundev *in litt.* 2011).

The species is very widespread, breeding from the Mediterranean basin through the Middle East to Russia and parts of Asia. The global Extent Of Occurrence is about 13 million km² (BirdLife International 2011). The global population is estimated to be 51,000-156,000 mature individuals (BirdLife International 2011).

In Mongolia, the easternmost extent of the species' range, the species is essentially restricted to southern Mongolia, in Khanbogd, Nomgon, Bayan-Ovoo, and Khurmen soums (N. Batbayar *in litt.* 2011). The Mongolian range was only discovered recently (Stubbe *et al.* 2007) and is poorly known, but certainly comprises a tiny fraction, well under 1%, of the global range. There is no evidence of particularly large or high density populations of the species in southern Mongolia. However, because the range of Short-toed Snake-eagle in its unit of analysis comprises a large portion of its national range, likely to represent in excess of 10% of the national population of this nationally Endangered species, **this unit of analysis qualifies as Tier 2 Critical Habitat for *Circaetus gallicus*.**

5.1.2.3.2 *Neophron percnopterus* (Egyptian Vulture) – Not Triggered

Species name	<i>Neophron percnopterus</i>
Globally categorised as CR/EN?	EN
Regionally/nationally categorised as CR/EN?	No – Least Concern
Endemic/restricted range?	
Congregatory/migratory?	Migratory
Area of unit of analysis (km ²)	27,375
Global population	21,000-67,200 mature individuals
Global EOO (km ²)	c. 18,000,000
Global AOO (km ²)	
Regional/national population	
Regional/national EOO (km ²)	
Regional/national AOO (km ²)	

Neophron percnopterus is classed as Endangered on the IUCN Red List of Threatened Species due to population declines (Criterion A; BirdLife International 2011). In Mongolia, it is considered to be Least Concern at the regional level in the draft national Red List (G. Sundev *in litt.* 2011).

The species has isolated resident populations across southern Europe, Africa, the Middle East and South Asia to Mongolia. Based on the total area of range polygons mapped by IUCN (2010), the global Extent Of Occurrence is about 18 million km² (IUCN 2010). The global population is estimated to be 21,000-67,200 mature individuals (BirdLife International 2011).

The Mongolian range of the species is poorly known but certainly comprises a tiny fraction, well under 1%, of the global range. There is no evidence of particularly large or high density populations of the species in southern Mongolia. It is thus reasonable to infer that the population of Egyptian Vulture in its unit of analysis comprises considerably less than 1% of the global population of the species. Consequently **this unit of analysis does not qualify as Critical Habitat for *Neophron percnopterus*.**

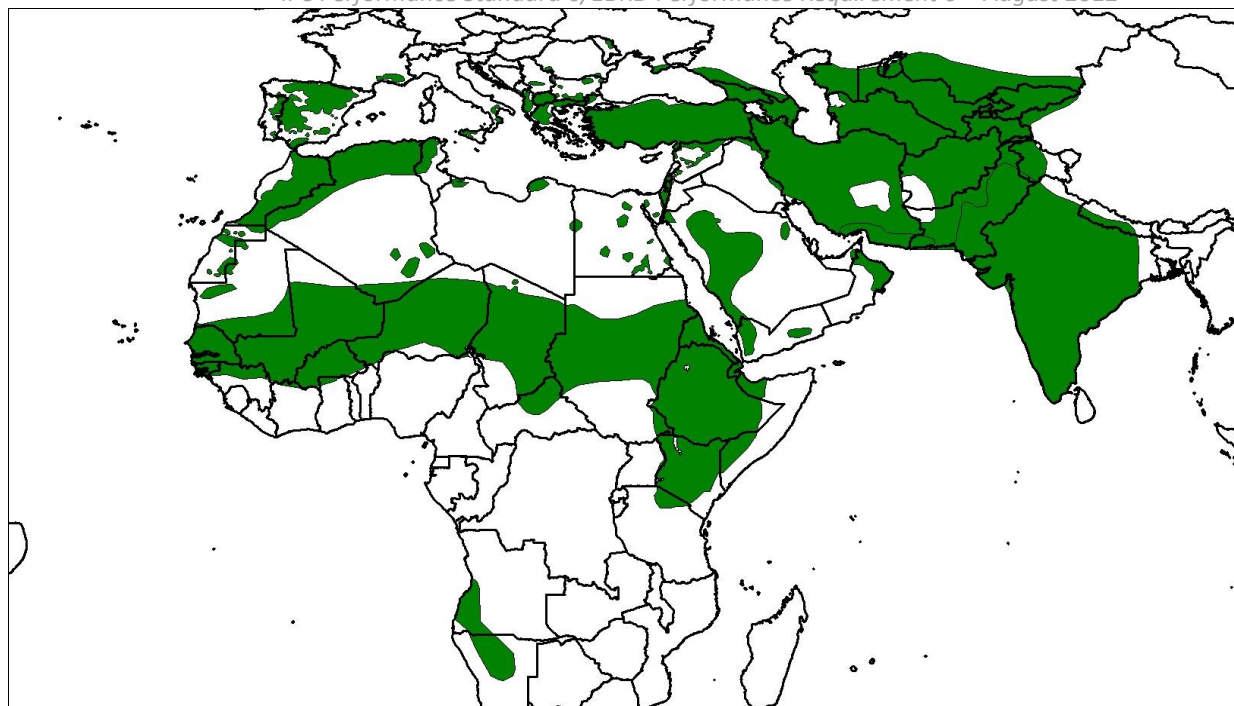


Figure 11. Global distribution of *Neophron percnopterus* (in green) (IUCN 2010). Red outline shows the boundary of its unit of analysis. Note that the IUCN map erroneously omits the Mongolian range.

5.1.2.3.3 *Larus relictus* (Relict Gull) – Not Triggered

Species name	<i>Larus relictus</i>
Globally categorised as CR/EN?	No – Vulnerable
Regionally/nationally categorised as CR/EN?	EN
Endemic/restricted range?	
Congregatory/migratory?	Migratory
Area of unit of analysis (km ²)	27,375
Global population	12,000 individuals
Global EOO (km ²)	c. 1,400,000 (breeding range)
Global AOO (km ²)	
Regional/national population	
Regional/national EOO (km ²)	
Regional/national AOO (km ²)	

Larus relictus is classed as Vulnerable on the IUCN Red List of Threatened Species due to its small breeding range (Criterion D; IUCN 2010) and Endangered due to its small and declining population (Criterion C) at the regional level in the draft national Red List (G. Sundev *in litt.* 2011).

This species primarily breeds in northern China, with colonies also at two localities in eastern Kazakhstan, one in Russia and several in Mongolia. Its non-breeding range is poorly understood, but

wintering birds have been seen in South Korea and eastern China. Based on the total area of range polygons mapped by IUCN (2010), the global breeding Extent Of Occurrence is about 1.4 million km² (IUCN 2010). The global population is estimated to be 12,000 individuals (BirdLife International 2011).

The only record of this species from its unit of analysis comes from May 2011 on a pond created on the Oyu Tolgoi site, found by project staff (P. Tsolomonjav *in litt.* 2011). Even for such a rare species, it is reasonable to infer that the population migrating through its unit of analysis (a largely arid region unsuitable for this species) comprises less than 1% of its global population. Consequently **this unit of analysis does not qualify as Critical Habitat for *Larus relictus*.**

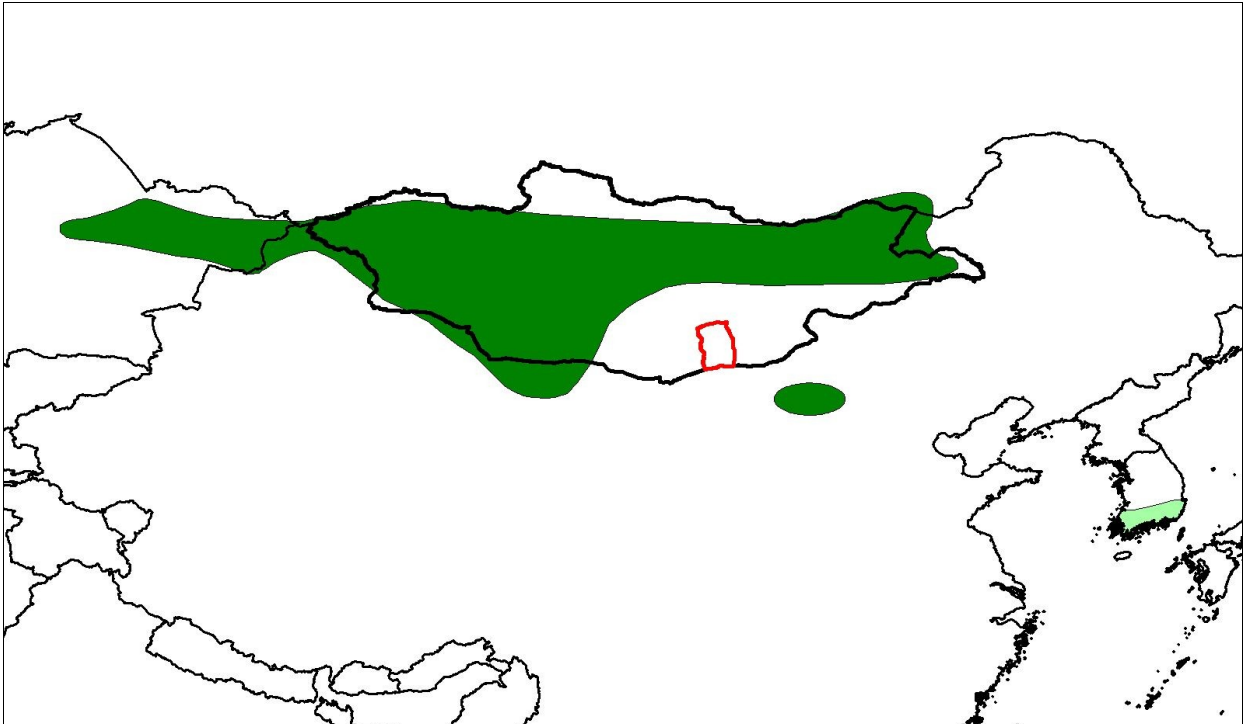


Figure 12. Global distribution of *Larus relictus* (breeding – including resident – range in dark green, non-breeding range in light green) (IUCN 2010). Red outline shows the boundary of its unit of analysis.

5.1.2.3.4 *Prunella koslowi* (Mongolian Accentor) – Not Triggered

Species name	<i>Prunella koslowi</i>
Globally categorised as CR/EN?	No – Least Concern
Regionally/nationally categorised as CR/EN?	No – Least Concern
Endemic/restricted range?	Restricted-range
Congregatory/migratory?	Migratory
Area of unit of analysis (km ²)	27,375
Global population	
Global EOO (km ²)	
Global AOO (km ²)	
Regional/national population	
Regional/national EOO (km ²)	240,000
Regional/national AOO (km ²)	

Prunella koslowi is classed as Least Concern on the IUCN Red List of Threatened Species (IUCN 2010) and in the draft national Red List (G. Sundev *in litt.* 2011). It is a restricted-range species with a breeding range of less than 50,000 km² (Stattersfield *et al.* 1998), almost entirely confined as a breeder to Mongolia but also found in adjoining China. It is migratory, occurring more widely in Mongolia and northern China in the non-breeding season, when it descends from its montane scrub breeding habitat to hillsides and valleys.

Although the range and population of the species are poorly known, the Mongolian range comprises the vast majority of its resident and breeding range. The species' population size is unknown but its range in Mongolia is about 240,000 km² according to the draft national Red List (G. Sundev *in litt.* 2011), of which about 115 km² (<0.1%) is in its unit of analysis (in western Manlai soum). It is thus likely that this unit of analysis holds considerably less than 1% of the global breeding range, and global population, of the species. **Consequently this unit of analysis does not qualify as Critical Habitat for *Prunella koslowi* as a restricted range species.**

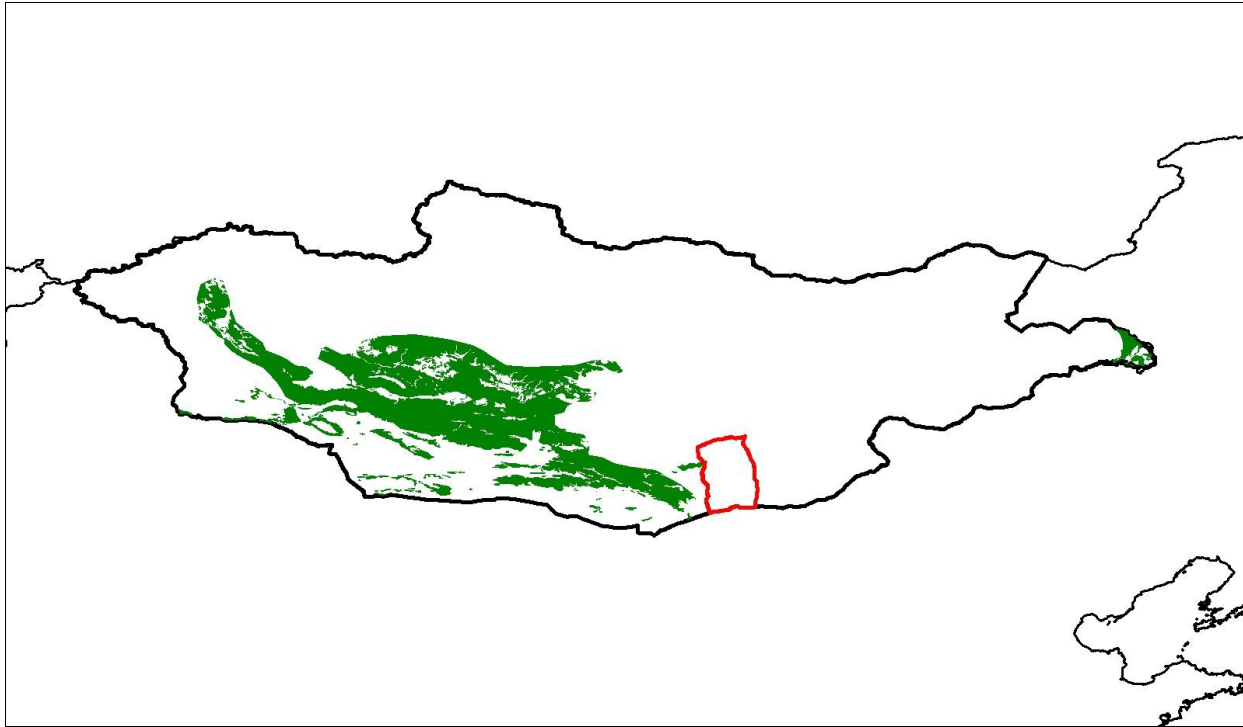


Figure 13. National distribution of *Prunella koslowi* (in green) (from draft national Red List for birds). Red outline shows the boundary of its unit of analysis.

5.2 Criterion 3: migratory and congregatory species

5.2.1 Criterion 3: Summary

Within the relevant units of analysis, 174 migratory bird species, one migratory ungulate species, one migratory hamster species and two migratory bat species are known or predicted to occur. The two bat species, and two others, also form nesting and/or roosting colonies, and so could be considered to be congregatory species. Only one of these migratory and congregatory species, Goitered Gazelle *Gazella subgutturosa*, exceeded the 1% threshold for Tier 2 Critical Habitat under Criterion 3. Consequently **Goitered Gazelle qualifies for Tier 2 Critical Habitat under Criterion 3.**

5.2.2 Birds

Mongolia has few resident bird species, owing to its northerly location and harsh winters. Of almost 200 bird species predicted or known from the relevant (smaller) unit of analysis, 174 are considered to be candidate – i.e. migratory – species, with some of these also congregatory (Table 10; G. Sundev *in litt.* 2011; P. Tsolmonjav *in litt.* 2011). However, despite the occurrence of these migrants within this unit of analysis, there is currently no indication that the project site constitutes a major flyway where migratory birds regularly concentrate in numbers exceeding the 1% threshold specified under Criterion 3 (e.g. Batbayar & Natsagdorg 2009), although occasional large shorebird concentrations have been noted at ephemeral lakes and pools in the area (H. von Wehrden *in litt.* 2011; Section 2.3.2). Similarly, this unit of analysis is very unlikely to support globally significant numbers of individuals of any migratory or congregatory bird species. Most such bird species in this area are widespread north Asian species and thus this unit of analysis comprises a small fraction of their global extent of occurrence. On a precautionary basis, however, five globally and nationally threatened bird species are considered in more detail below (another two nationally threatened species, Short-toed Snake-eagle and Relict Gull, have already been dealt with in Section 2.1.2.3). Two of these species (Saker Falcon and Houbara Bustard) breed in this unit of analysis, but three (Swan Goose, Great Bustard and Yellow-breasted

Bunting) are only passage migrants (thus maps of breeding and wintering range below do not show their occurrence in the area). Mongolian Accentor has already been assessed under Criterion 2 (Section 2.1.2.3.4) and demonstrated likely to have less than 1% of its global population in the unit of analysis, thus not qualifying for Critical Habitat under either Criteria 2 or 3. After assessment, **no candidate migratory or congregatory bird species were found to qualify for Critical Habitat under Criterion 3.**

Table 10. Migratory bird species known or predicted from the relevant (smaller) unit of analysis.

Scientific name	Common name	IUCN status	National status
<i>Podiceps auritus</i>	Horned Grebe	LC	LC
<i>Phalacrocorax carbo</i>	Great Cormorant	LC	LC
<i>Ardeola bacchus</i>	Chinese Pond-heron	LC	LC
<i>Casmerodius albus</i>	Great Egret	LC	LC
<i>Ardea cinerea</i>	Grey Heron	LC	LC
<i>Platalea leucorodia</i>	Eurasian Spoonbill	LC	LC
<i>Ciconia nigra</i>	Black Stork	LC	LC
<i>Anser anser</i>	Greylag Goose	LC	LC
<i>Anser fabilis</i>	Bean Goose	LC	LC
<i>Anser indicus</i>	Bar-headed Goose	LC	LC
<i>Anser cygnoides</i>	Swan Goose	VU	NT
<i>Cygnus cygnus</i>	Whooper Swan	LC	LC
<i>Tadorna tadorna</i>	Common Shelduck	LC	LC
<i>Tadorna ferruginea</i>	Ruddy Shelduck	LC	LC
<i>Anas platyrhynchos</i>	Mallard	LC	LC
<i>Anas zonorhyncha</i>	Eastern Spot-billed Duck	LC	LC
<i>Anas crecca</i>	Common Teal	LC	LC
<i>Anas strepera</i>	Gadwall	LC	LC
<i>Anas zonorhyncha</i>	Eurasian Wigeon	LC	LC
<i>Anas acuta</i>	Northern Pintail	LC	LC
<i>Anas querquedula</i>	Garganey	LC	LC
<i>Anas clypeata</i>	Northern Shoveler	LC	LC
<i>Aythya ferina</i>	Common Pochard	LC	LC
<i>Aythya nyroca</i>	Ferruginous Duck	NT	LC
<i>Aythya fuligula</i>	Tufted Duck	LC	LC
<i>Bucephala clangula</i>	Common Goldeneye	LC	LC
<i>Milvus migrans</i>	Black Kite	LC	LC
<i>Accipiter nisus</i>	Eurasian Sparrowhawk	LC	LC
<i>Buteo rufinus</i>	Long-legged Buzzard	LC	LC
<i>Circaetus gallicus</i>	Short-toed Snake-eagle	LC	EN
<i>Aquila nipalensis</i>	Steppe Eagle	LC	LC
<i>Haliaeetus albicilla</i>	White-tailed Eagle	LC	NT
<i>Gyps himalayensis</i>	Himalayan Vulture	LC	LC
<i>Falco cherrug</i>	Saker Falcon	VU	VU

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<i>Falco peregrinus</i>	Peregrine Falcon	LC	LC
<i>Falco subbuteo</i>	Eurasian Hobby	LC	LC
<i>Falco amurensis</i>	Amur Falcon	LC	LC
<i>Falco columbarius</i>	Merlin	LC	LC
<i>Falco naumanni</i>	Lesser Kestrel	LC	LC
<i>Falco tinnunculus</i>	Common Kestrel	LC	LC
<i>Coturnix japonica</i>	Japanese Quail	LC	LC
<i>Grus virgo</i>	Demoiselle Crane	LC	LC
<i>Fulica atra</i>	Common Coot	LC	LC
<i>Otis tarda</i>	Great Bustard	VU	VU
<i>Chlamydotis undulata</i>	Houbara Bustard	VU	VU
<i>Pluvialis squatarola</i>	Grey Plover	LC	LC
<i>Pluvialis fulva</i>	Pacific Golden Plover	LC	LC
<i>Charadrius dubius</i>	Little Ringed Plover	LC	LC
<i>Charadrius alexandrinus</i>	Kentish Plover	LC	LC
<i>Charadrius leschenaultii</i>	Greater Sand Plover	LC	LC
<i>Charadrius veredus</i>	Oriental Plover	LC	LC
<i>Vanellus vanellus</i>	Northern Lapwing	LC	LC
<i>Himantopus himantopus</i>	Black-winged Stilt	LC	LC
<i>Recurvirostra avosetta</i>	Pied Avocet	LC	LC
<i>Tringa ochropus</i>	Green Sandpiper	LC	LC
<i>Tringa glareola</i>	Wood Sandpiper	LC	LC
<i>Tringa nebularia</i>	Common Greenshank	LC	LC
<i>Tringa totanus</i>	Common Redshank	LC	LC
<i>Tringa erythropus</i>	Spotted Redshank	LC	LC
<i>Tringa stagnatilis</i>	Marsh Sandpiper	LC	LC
<i>Actitis hypoleucos</i>	Common Sandpiper	LC	LC
<i>Phalaropus lobatus</i>	Red-necked Phalarope	LC	LC
<i>Calidris minuta</i>	Little Stint	LC	LC
<i>Calidris subminuta</i>	Long-toed Stint	LC	LC
<i>Calidris ruficollis</i>	Red-necked Stint	LC	LC
<i>Calidris temminckii</i>	Temminck's Stint	LC	LC
<i>Calidris ferruginea</i>	Curlew Sandpiper	LC	LC
<i>Limicola falcinellus</i>	Broad-billed Sandpiper	LC	LC
<i>Gallinago gallinago</i>	Common Snipe	LC	LC
<i>Scolopax rusticola</i>	Eurasian Woodcock	LC	LC
<i>Limosa limosa</i>	Black-tailed Godwit	NT	LC
<i>Larus relictus</i>	Relict Gull	VU	EN
<i>Larus ridibundus</i>	Black-headed Gull	LC	LC
<i>Larus argentatus</i>	Herring Gull	LC	LC
<i>Syrrhaptes paradoxus</i>	Pallas's Sandgrouse	LC	LC

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<i>Streptopelia orientalis</i>	Oriental Turtle-dove	LC	LC
<i>Cuculus canorus</i>	Common Cuckoo	LC	LC
<i>Bubo bubo</i>	Eurasian Eagle-owl	LC	LC
<i>Asio otus</i>	Long-eared Owl	LC	LC
<i>Athene noctua</i>	Little Owl	LC	LC
<i>Caprimulgus europaeus</i>	Eurasian Nightjar	LC	LC
<i>Hirundapus caudacutus</i>	White-throated Needletail	LC	LC
<i>Apus apus</i>	Common Swift	LC	LC
<i>Apus pacificus</i>	Fork-tailed Swift	LC	LC
<i>Upupa epops</i>	Eurasian Hoopoe	LC	LC
<i>Dendrocopos major</i>	Great Spotted Woodpecker	LC	LC
<i>Jynx torquilla</i>	Eurasian Wryneck	LC	LC
<i>Riparia riparia</i>	Sand Martin	LC	LC
<i>Hirundo rupestris</i>	Eurasian Crag-martin	LC	LC
<i>Hirundo rustica</i>	Barn Swallow	LC	LC
<i>Delichon urbicum</i>	Northern House-martin	LC	LC
<i>Calandrella brachydactyla</i>	Greater Short-toed Lark	LC	LC
<i>Calandrella rufescens</i>	Lesser Short-toed Lark	LC	LC
<i>Calandrella cheelensis</i>	Asian Short-toed Lark	LC	LC
<i>Melanocorypha mongolica</i>	Mongolian Lark	LC	LC
<i>Eremophila alpestris</i>	Horned Lark	LC	LC
<i>Alauda arvensis</i>	Eurasian Skylark	LC	LC
<i>Anthus richardi</i>	Richard's Pipit	LC	LC
<i>Anthus godlewskii</i>	Blyth's Pipit	LC	LC
<i>Anthus campestris</i>	Tawny Pipit	LC	LC
<i>Anthus hodgsoni</i>	Olive-backed Pipit	LC	LC
<i>Anthus spinoletta</i>	Water Pipit	LC	LC
<i>Motacilla flava</i>	Yellow Wagtail	LC	LC
<i>Motacilla citreola</i>	Citrine Wagtail	LC	LC
<i>Motacilla cinerea</i>	Grey Wagtail	LC	LC
<i>Motacilla alba</i>	White Wagtail	LC	LC
<i>Lanius cristatus</i>	Brown Shrike	LC	LC
<i>Lanius isabellinus</i>	Rufous-tailed Shrike	LC	LC
<i>Lanius excubitor</i>	Great Grey Shrike	LC	LC
<i>Sturnus cineraceus</i>	White-cheeked Starling	LC	LC
<i>Sturnus roseus</i>	Rosy Starling	LC	LC
<i>Corvus dauuricus</i>	Daurian Jackdaw	LC	LC
<i>Corvus fugilegus</i>	Rook	LC	LC
<i>Prunella fulvescens</i>	Brown Accentor	LC	LC
<i>Prunella montanella</i>	Siberian Accentor	LC	LC
<i>Prunella koslowi</i>	Mongolian Accentor	LC	LC

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<i>Locustella certhiola</i>	Pallas's Grasshopper-warbler	LC	LC
<i>Locustella naevia</i>	Common Grasshopper-warbler	LC	LC
<i>Hippolais caligata</i>	Booted Warbler	LC	LC
<i>Sylvia nisoria</i>	Barred Warbler	LC	LC
<i>Sylvia communis</i>	Common Whitethroat	LC	LC
<i>Sylvia curruca</i>	Lesser Whitethroat	LC	LC
<i>Sylvia nana</i>	Desert Warbler	LC	LC
<i>Phylloscopus collybita</i>	Common Chiffchaff	LC	LC
<i>Phylloscopus borealis</i>	Arctic Warbler	LC	LC
<i>Phylloscopus trochiloides</i>	Greenish Warbler	LC	LC
<i>Phylloscopus inornatus</i>	Inornate Warbler	LC	LC
<i>Phylloscopus progregulus</i>	Lemon-rumped Warbler	LC	LC
<i>Phylloscopus fuscatus</i>	Dusky Warbler	LC	LC
<i>Phylloscopus griseolus</i>	Sulphur-bellied Warbler	LC	LC
<i>Ficedula albicilla</i>	Taiga Flycatcher	LC	LC
<i>Muscicapa striata</i>	Spotted Flycatcher	LC	LC
<i>Muscicapa sibirica</i>	Dark-sided Flycatcher	LC	LC
<i>Muscicapa dauurica</i>	Asian Brown Flycatcher	LC	LC
<i>Saxicola torquatus</i>	Common Stonechat	LC	LC
<i>Oenanthe oenanthe</i>	Northern Wheatear	LC	LC
<i>Oenanthe pleschanka</i>	Pied Wheatear	LC	LC
<i>Oenanthe deserti</i>	Desert Wheatear	LC	LC
<i>Oenanthe isabellina</i>	Isabelline Wheatear	LC	LC
<i>Monticola saxatilis</i>	Rufous-tailed Rock-thrush	LC	LC
<i>Phoenicurus erythronotus</i>	Rufous-backed Redstart	LC	LC
<i>Phoenicurus aureus</i>	Daurian Redstart	LC	LC
<i>Phoenicurus erythrogastrus</i>	White-winged Redstart	LC	LC
<i>Luscinia calliope</i>	Siberian Rubythroat	LC	LC
<i>Luscinia svecica</i>	Bluethroat	LC	LC
<i>Luscinia cyane</i>	Siberian Blue Robin	LC	LC
<i>Tarsiger cyanurus</i>	Orange-flanked Bush-robin	LC	LC
<i>Turdus obscurus</i>	Eyebrowed Thrush	LC	LC
<i>Turdus ruficollis</i>	Dark-throated Thrush	LC	LC
<i>Turdus naumanni</i>	Dusky Thrush	LC	LC
<i>Turdus pilaris</i>	Fieldfare	LC	LC
<i>Zoothera dauma</i>	Eurasian Scaly Thrush	LC	LC
<i>Remiz coronatus</i>	White-crowned Penduline-tit	LC	LC
<i>Tichodroma muraria</i>	Wallcreeper	LC	LC
<i>Fringilla coelebs</i>	Eurasian Chaffinch	LC	LC
<i>Fringilla montifringilla</i>	Brambling	LC	LC
<i>Carduelis flammea</i>	Common Redpoll	LC	LC

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<i>Carduelis flavirostris</i>	Twite	LC	LC
<i>Carpodacus erythrinus</i>	Common Rosefinch	LC	LC
<i>Carpodacus pulcherrimus</i>	Beautiful Rosefinch	LC	LC
<i>Carpodacus rubicilla</i>	Great Rosefinch	LC	LC
<i>Coccothraustes coccothraustes</i>	Hawfinch	LC	LC
<i>Emberiza leucocephalos</i>	Pine Bunting	LC	LC
<i>Emberiza godlewskii</i>	Godlewski's Bunting	LC	LC
<i>Emberiza cioides</i>	Meadow Bunting	LC	LC
<i>Emberiza fucata</i>	Chestnut-eared Bunting	LC	LC
<i>Emberiza schoeniclus</i>	Reed Bunting	LC	LC
<i>Emberiza pallasi</i>	Pallas's Bunting	LC	LC
<i>Emberiza rustica</i>	Rustic Bunting	LC	LC
<i>Emberiza pusilla</i>	Little Bunting	LC	LC
<i>Emberiza spodocephala</i>	Black-faced Bunting	LC	LC
<i>Emberiza aureola</i>	Yellow-breasted Bunting	VU	NT
<i>Emberiza buchanani</i>	Grey-necked Bunting	LC	LC
<i>Calcarius lapponicus</i>	Lapland Longspur	LC	LC

5.2.2.1 *Anser cygnoides* (Swan Goose) – Not Triggered

Species name	<i>Anser cygnoides</i>
Globally categorised as CR/EN?	No – Vulnerable
Regionally/nationally categorised as CR/EN?	No – Near Threatened
Endemic/restricted range?	
Congregatory/migratory?	Migratory
Area of unit of analysis (km ²)	27,375
Global population	60,000-80,000 mature individuals
Global EOO (km ²)	c. 2,900,000 (c. 1,600,000 breeding)
Global AOO (km ²)	
Regional/national population	
Regional/national EOO (km ²)	c. 630,000 (national – all breeding range)
Regional/national AOO (km ²)	

Anser cygnoides is classed as Vulnerable on the IUCN Red List of Threatened Species due to population declines (Criterion A; BirdLife International 2011). In Mongolia, it is considered to be Near Threatened at the regional level in the draft national Red List (G. Sundev *in litt.* 2011).

The species has its core breeding grounds on the border of Russia with Mongolia and China, wintering mainly in central China and the Korean Peninsula. Based on the total area of range polygons mapped by IUCN (2010), the global breeding Extent Of Occurrence is about 1.6 million km² (IUCN 2010). The national Extent Of Occurrence, all of which is (non-resident) breeding range, is about 630,000 km². The global population is estimated to be 60,000-80,000 mature individuals (BirdLife International 2011).

Within its unit of analysis, this species occurs as a passage migrant. The area is extremely unlikely to be an important staging ground for this species because of the lack of wetlands. It is reasonable to infer that this unit of analysis does not regularly hold more than 1% of the global population of the species. Consequently **this unit of analysis does not qualify as Critical Habitat for *Anser cygnoides*.**

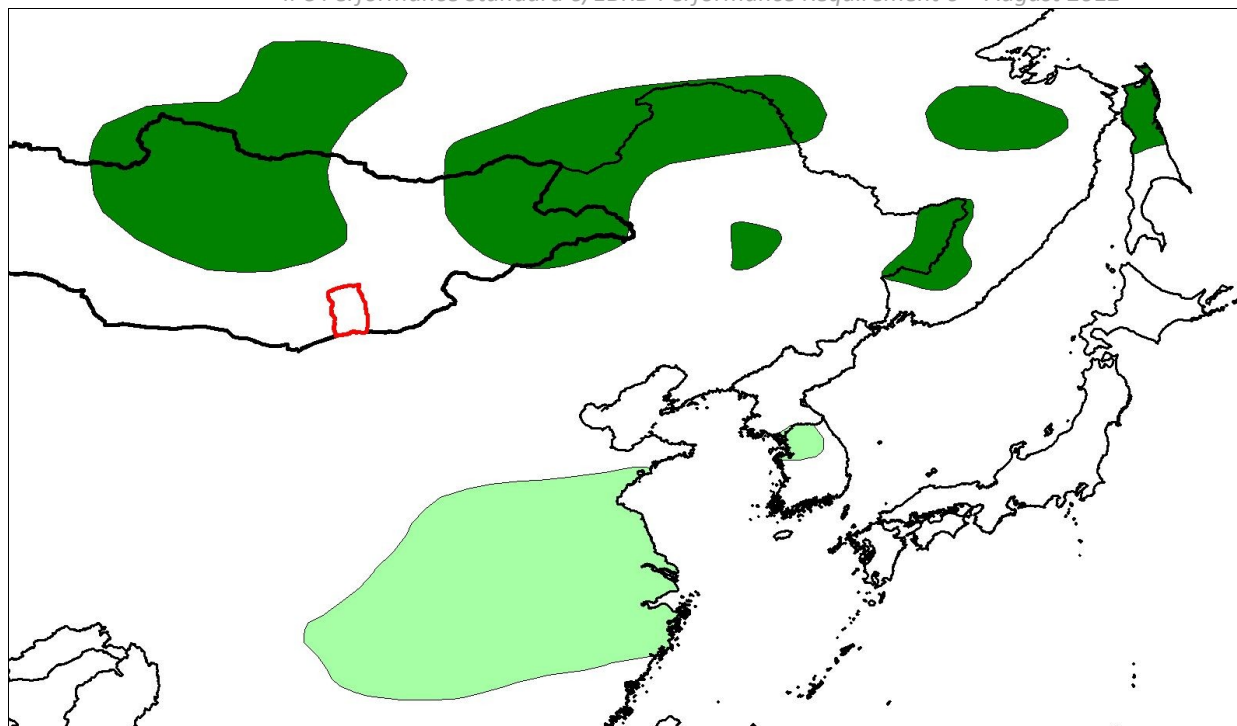


Figure 14. Global distribution of *Anser cygnoides* (breeding range in dark green, non-breeding range in light green) (IUCN 2010). Red outline shows the boundary of its unit of analysis.

5.2.2.2 *Falco cherrug* (Saker Falcon) – Not Triggered

Species name	<i>Falco cherrug</i>
Globally categorised as CR/EN?	No – Vulnerable
Regionally/nationally categorised as CR/EN?	No - Vulnerable
Endemic/restricted range?	
Congregatory/migratory?	Migratory
Area of unit of analysis (km ²)	27,375
Global population	9,600-17,000 breeding pairs
Global EOO (km ²)	c. 16,000,000 (c. 10,000,000 breeding)
Global AOO (km ²)	
Regional/national population	2,000-5,000 breeding pairs (national)
Regional/national EOO (km ²)	c. 1,400,000 (national – all breeding range)
Regional/national AOO (km ²)	

Falco cherrug is classified as Vulnerable on the IUCN Red List of Threatened Species due to population declines (Criterion A), having been downlisted from Endangered in 2010 when analysis of all available data suggested that declines had not been as severe as previously suspected (BirdLife International 2011). In Mongolia, it is also considered to be Vulnerable due to its small and declining population (Criterion C) at the regional level in the draft national Red List (G. Sundev *in litt.* 2011). The main threats

to the species globally are loss and degradation of habitat owing to agricultural intensification and offtake for falconry (BirdLife International 2011).

The species breeds across a wide range through the Palaearctic region from eastern Europe to north-eastern China, wintering to the south (to North Africa and the Horn of Africa in the west). Based on the total area of range polygons mapped by IUCN (2010), the global Extent Of Occurrence is about 16 million km², of which c. 10 million km² is breeding range (IUCN 2010). The national Extent Of Occurrence, all of which is (non-resident) breeding range, is about 1.4 million km². The global population was recently estimated at 9,600-17,000 breeding pairs, with an earlier estimate of 2,000-5,000 pairs in Mongolia in 1990 (BirdLife International 2011).

This is a species of open habitats at a range of altitudes. Populations which breed in northern latitudes and high altitudes, where food is difficult to find in winter, are migratory. This includes the whole Mongolian population. A suitable 'discrete management unit' for such a wide-ranging and migratory species is difficult to define, with larger management units being more suitable to the species' persistence needs over the long-term. However, impacts on this species (primarily collection for the falconry trade) occur more locally – and are less likely to be accelerated by increasing wealth and access to firearms – than hunting impacts on large mammals. Thus, for consistency with other migratory bird species, the smaller unit of analysis comprising Khanbogd and Manlai soums is used for this species.

The unit of analysis holds about 27,000 km² of the range of the species, which is less than 1% of the global breeding range and just under 2% of the national range (IUCN 2010). Even though the Mongolian population of the species is believed to comprise 15-19% of the global population in 1990, just under 2% of the Mongolian range equates to less than 1% of the global range⁴¹. While no data exist on the importance of the unit of analysis for this species during migration, it is reasonable to infer from these calculations that the breeding population of Saker Falcon in the unit of analysis comprises less than 1% of the global population of the species. Consequently **this unit of analysis does not qualify as Critical Habitat for *Falco cherrug*.**

41 Galba Gobi Important Bird Area (IBA), which is partly within this unit of analysis, was designated for its importance to globally threatened species (Lesser Kestrel, Saker Falcon and Houbara Bustard) and to biome-restricted assemblages. In general, the regular presence of a Critical or Endangered species, irrespective of population size, at a site may be sufficient for a site to qualify as an IBA. For Vulnerable species, the presence of more than threshold numbers at a site is necessary to trigger selection. Thresholds are set regionally, often on a species by species basis.

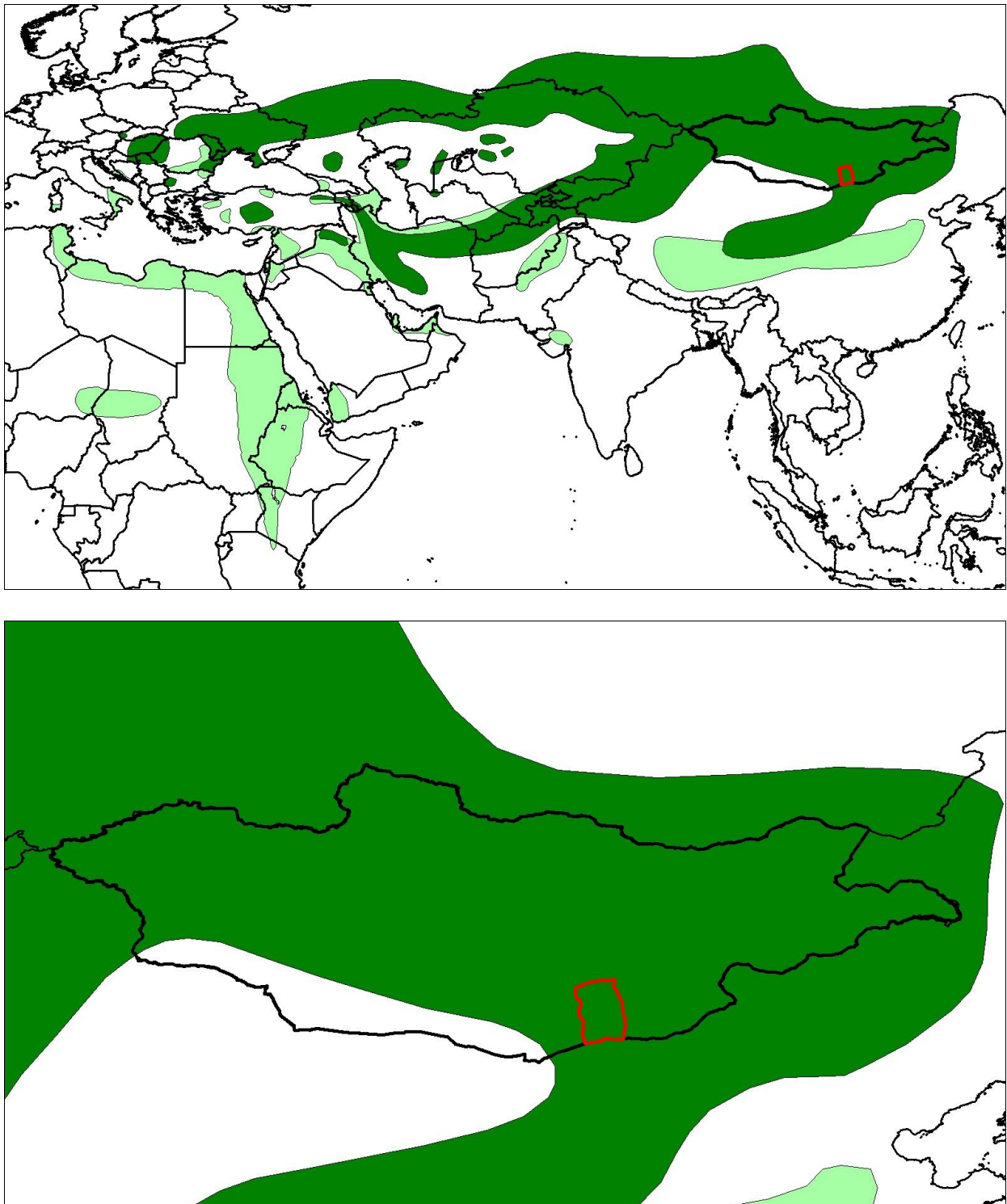


Figure 15. (a) Global and (b) national distribution of *Falco cherrug* (breeding – including resident – range in dark green, non-breeding range in light green) (IUCN 2010). Red outline shows the boundary of its unit of analysis.

5.2.2.3 *Otis tarda* (Great Bustard) – Not Triggered

Species name	<i>Otis tarda</i>
Globally categorised as CR/EN?	No – Vulnerable
Regionally/nationally categorised as CR/EN?	No - Vulnerable
Endemic/restricted range?	
Congregatory/migratory?	Migratory
Area of unit of analysis (km ²)	27,375
Global population	c. 45,000 mature individuals
Global EOO (km ²)	c. 2,700,000 (c. 2,400,000 breeding)
Global AOO (km ²)	
Regional/national population	1,000 individuals (national)
Regional/national EOO (km ²)	c. 290,000 (national – all breeding range)
Regional/national AOO (km ²)	

Otis tarda is classed as Vulnerable on the IUCN Red List of Threatened Species due to population declines (Criterion A; BirdLife International 2011). In Mongolia, it is also considered to be Vulnerable at the regional level in the draft national Red List (G. Sundev *in litt.* 2011).

The species breeds across a wide, but patchy, range from Morocco, through southern Europe and Central Asia to eastern Mongolia and north-eastern China. Most populations are at least partly migratory, including those which breed in Mongolia. Based on the total area of range polygons mapped by IUCN (2010), the global Extent Of Occurrence is about 2.7 million km², of which c. 2.4 million km² is breeding range (IUCN 2010). The national Extent Of Occurrence, all of which is (non-resident) breeding range, is about 290,000 km². The global population is estimated to be 45,000 breeding pairs, with 1,000 birds in Mongolia (BirdLife International 2011).

In its unit of analysis, this species solely occurs as a migrant. Mongolia as a whole only holds just over 2% of the global population of this species, so it is extremely unlikely that this unit of analysis regularly holds more than 1% of this species' global population during migration. Consequently **this unit of analysis does not qualify as Critical Habitat for *Otis tarda*.**

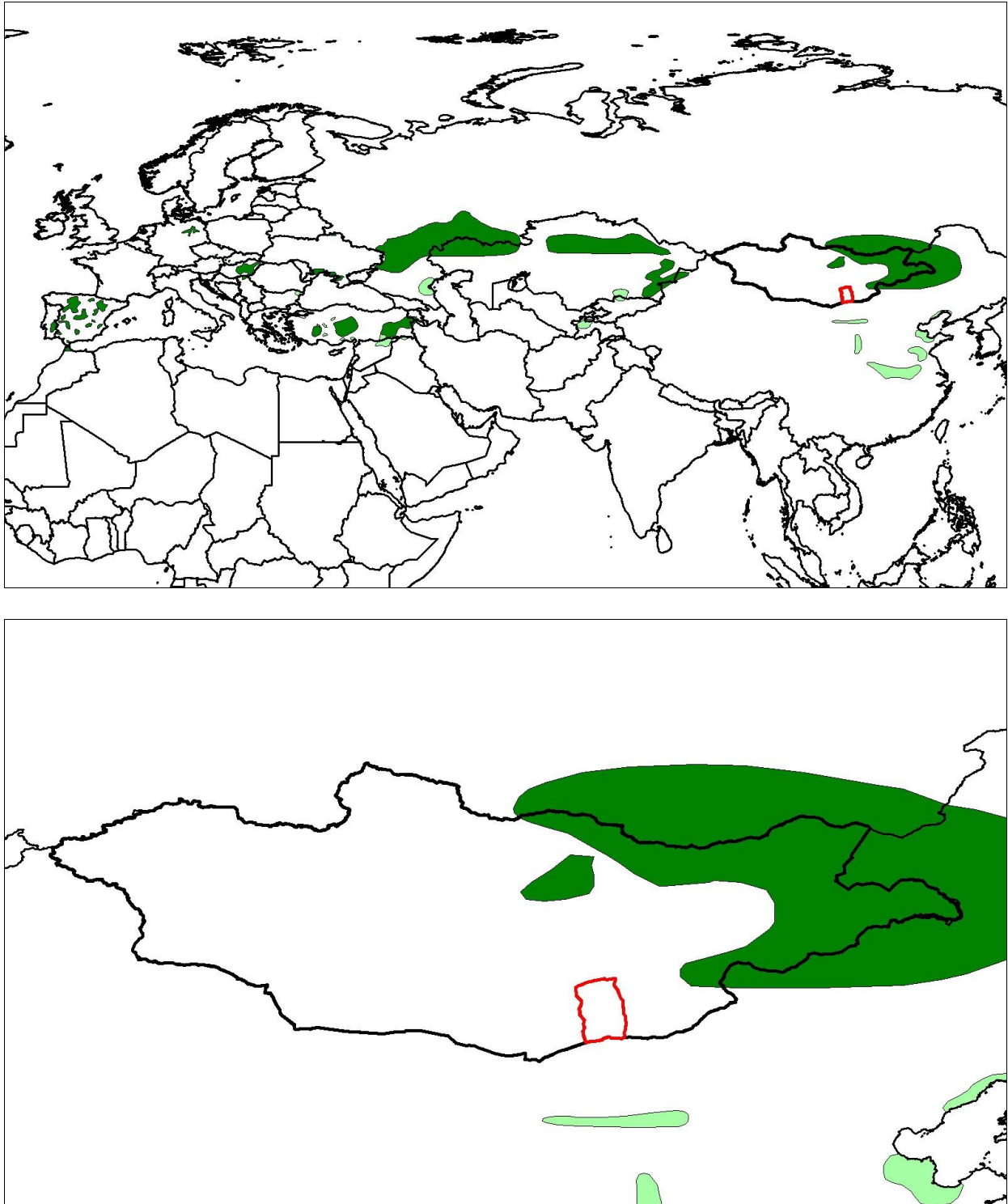


Figure 16. (a) Global and (b) national distribution of *Otis tarda* (breeding – including resident – range in dark green, non-breeding range in light green) (IUCN 2010). Red outline shows the boundary of its unit of analysis.

5.2.2.4 *Chlamydotis undulata* (Houbara Bustard) – Not Triggered

Species name	<i>Chlamydotis undulata</i>
Globally categorised as CR/EN?	No – Vulnerable
Regionally/nationally categorised as CR/EN?	No – Vulnerable
Endemic/restricted range?	
Congregatory/migratory?	
Area of unit of analysis (km ²)	27,375
Global population	49,000-62,000 mature individuals
Global EOO (km ²)	c. 14,000,000 (c. 12,000,000 breeding)
Global AOO (km ²)	
Regional/national population	
Regional/national EOO (km ²)	c. 1,100,000 (national)
Regional/national AOO (km ²)	

Chlamydotis undulata is classed as Vulnerable on the IUCN Red List of Threatened Species due to population declines (Criterion A; IUCN 2010) and Vulnerable due to its small and declining population (Criterion C) at the regional level in the draft national Red List (G. Sundev *in litt.* 2011). Race *macqueenii*, the race which occurs in Mongolia, has been split as a separate species by some authorities (e.g. Sangster 1996) but is still considered within *C. undulata* by BirdLife International as the global Red List authority for birds⁴². Race *macqueeni* has declined dramatically in recent years (e.g. population declines of 49-75% from 1998-2002 in China, Kazakhstan and Oman; Tourenq *et al.* 2005). If *macqueeni* was split as a separate species, it would likely lead to the listing of *macqueeni* as globally Critically Endangered against IUCN criteria. It is thus important that a precautionary assessment of *C. undulata* is made here.

The species breeds in sandy and stony semi-desert across a wide range in North Africa, the Middle East and northern Asia. While North African and Arabian populations are only partially migratory, populations from Turkmenistan east to China and Mongolia are migratory, wintering in India, Pakistan, Iran and parts of the Middle East. Based on the total area of range polygons mapped by IUCN (2010), the global breeding Extent Of Occurrence is about 12 million km² (IUCN 2010). The national Extent Of Occurrence, all of which is (non-resident) breeding range, is about 1.1 million km². The global population is estimated to be 49,000-62,000 mature individuals (BirdLife International 2011).

A suitable 'discrete management unit' for such a wide-ranging and migratory species is difficult to define, with larger management units being more suitable to the species persistence needs over the long-term. However, impacts on this species (primarily hunting by foreigners) occur more locally – and are less likely to be accelerated by increasing local wealth and access to firearms – than hunting impacts on large mammals. Thus, for consistency with other migratory bird species, the smaller unit of analysis comprising Khanbogd and Manlai soums is used for this species. Houbara Bustard both breeds in, and migrates east-west through, this area.

⁴² with the caveat that this decision may change with “more evidence on fully consistent ethological differences across the ranges of the two forms” (BirdLife International 2011)

According to distribution maps in IUCN (2010), this unit of analysis holds about 22,000 km² of the range of the species, which is less than 1% of the global breeding range and just under 2% of the national range⁴³. These maps are, however, quite inaccurate in depicting the Mongolian range - compared to, for example, the draft national Red List (G. Sundev *in litt.* 2011) – and probably underestimate the importance of its unit of analysis in a global context. Nonetheless, even if Houbara Bustard was assumed to occur across its whole unit of analysis, this would comprise less than 1% of its global breeding range and, indeed, less than 1% of the global breeding range of the subspecies *C. u. macqueeni*. Thus, it is reasonable to infer that the population of Houbara Bustard breeding in its unit of analysis comprises less than 1% of the global population of the species. Likewise, given that the area is almost at the eastern extent of the range of the species, it is not likely that the region is a significant migratory stopover area. Consequently **this unit of analysis does not qualify as Critical Habitat for *Chlamydotis undulata*.**

43 Galba Gobi Important Bird Area (IBA), which is partly within this unit of analysis, was designated for its importance to globally threatened species (Lesser Kestrel, Saker Falcon and Houbara Bustard) and to biome-restricted assemblages. In general, the regular presence of a Critical or Endangered species, irrespective of population size, at a site may be sufficient for a site to qualify as an IBA. For Vulnerable species, the presence of more than threshold numbers at a site is necessary to trigger selection. Thresholds are set regionally, often on a species by species basis.

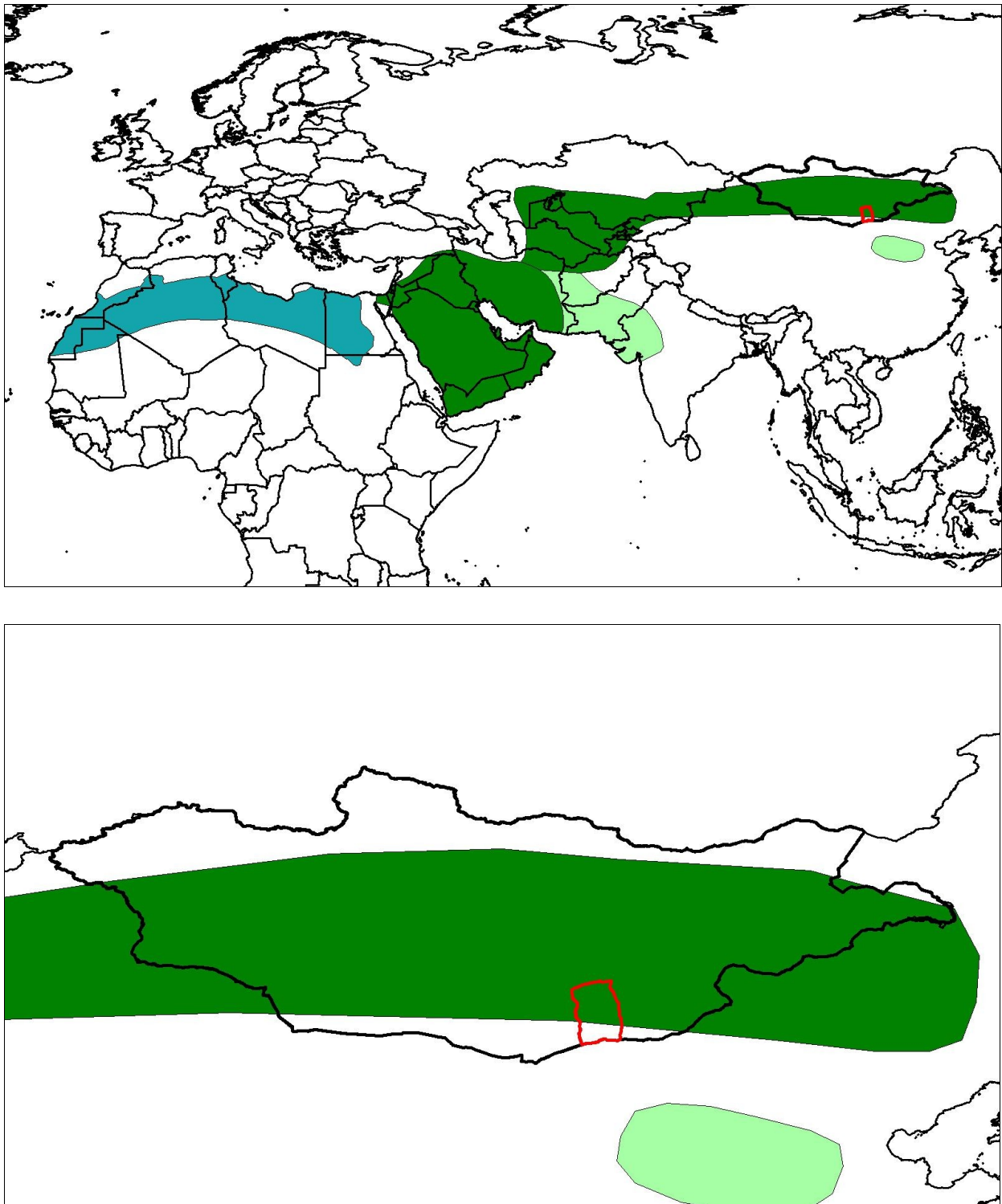


Figure 17. (a) Global and (b) national distribution of *Chlamydotis undulata* (*C. u. macqueeni* breeding – including resident – range in dark green, *C. u. macqueeni* non-breeding range in light green, *C. u. undulata* and *C. u. fuertaventurae* resident range in blue) (IUCN 2010). Red outline shows the boundary of its unit of analysis.

5.2.2.5 *Emberiza aureola* (Yellow-breasted Bunting) – Not Triggered

Species name	<i>Emberiza aureola</i>
Globally categorised as CR/EN?	No – Vulnerable
Regionally/nationally categorised as CR/EN?	No – Near Threatened
Endemic/restricted range?	
Congregatory/migratory?	Migratory
Area of unit of analysis (km ²)	27,375
Global population	120,000-1,000,000 individuals
Global EOO (km ²)	c. 16,000,000 (breeding range)
Global AOO (km ²)	
Regional/national population	
Regional/national EOO (km ²)	
Regional/national AOO (km ²)	

Emberiza aureola is classed as Vulnerable due to population declines (Criterion A) at the global level on the IUCN Red List of Threatened Species (IUCN 2010) and at the regional level in the draft national Red List (G. Sundev *in litt.* 2011).

This species breeds across the northern Palaearctic from Finland to northern Japan, including northern Mongolia. It mainly winters in Indoburma, but also southern China and northern South Asia. Based on the total area of range polygons mapped by IUCN (2010), the global breeding Extent Of Occurrence is about 16 million km² (IUCN 2010). The global population is estimated to be 120,000-1,000,000 individuals (BirdLife International 2011).

Within its unit of analysis, this species occurs as a passage migrant. There are few records of this species from the project area (P. Tsoomonjav *in litt.* 2011). Given this, and the widespread distribution of the species, it is reasonable to infer that the population migrating through its unit of analysis (a largely arid region unsuitable for this species) comprises less than 1% of its global population. Consequently **this unit of analysis does not qualify as Critical Habitat for *Emberiza aureola*.**

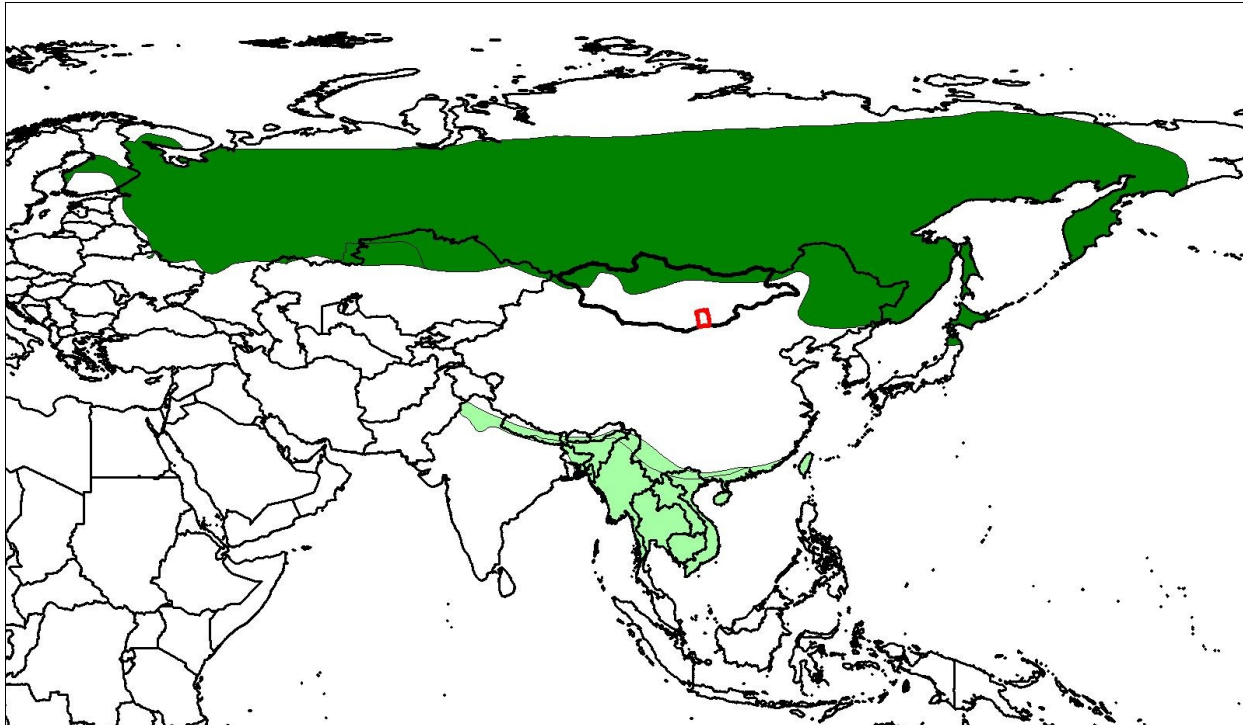


Figure 18. Global distribution of *Emberiza aureola* (breeding – including resident – range in dark green, non-breeding range in light green) (IUCN 2010). Red outline shows the boundary of its unit of analysis.

5.2.3 Mammals

Among mammals recorded or expected in the relevant units of analysis, four are migrants: Steppe Whiskered Bat *Myotis aurascens* (listed as *M. mystacinus* in Clark *et al.* 2006, but taxonomy updated by K. Tsytulina *in litt.* 2011), Particoloured Bat *Vespertilio murinus*, Grey Dwarf Hamster *Cricetulus migratorius* and Goitered Gazelle *Gazella subgutturosa*. The smaller unit of analysis – comprising solely Khanbogd and Manlai soums – is considered the most appropriate for all of these species except Goitered Gazelle, which is wide-ranging and hunted. The two bats and the hamster are not considered threatened by the IUCN Red List of Threatened Species or the national Red List (both list the bats as Least Concern; the hamster is listed as globally Least Concern and nationally Data Deficient) and have relatively large ranges and presumed large populations (Clark *et al.* 2006; IUCN 2010). There is no indication that the relevant (smaller) unit of analysis (or indeed the larger unit of analysis) is a particularly important part of the wide range of these species. **Therefore, there is no indication that either of these two bat species or the hamster species approach the 1% threshold for migratory species under Criterion 3 and this unit of analysis is not considered Critical Habitat for these species.** Goitered Gazelle is listed as Vulnerable by the IUCN Red List of Threatened Species and the national Red List (Clark *et al.* 2006; IUCN 2010) and so is assessed in more depth below.

Both above bat species form colonies at some times of year, and so can be considered congregatory. Two other congregatory bats are likely to occur in the relevant (smaller) unit of analysis: Alashanian Pipistrelle *Pipistrellus alaschanicus* and *Plecotus kozlovi* (listed as *P. austriacus* in Clark *et al.* 2006, but taxonomy updated by Spitzenberger *et al.* 2006; K. Tsytulina *in litt.* 2011). Neither of these species is listed as globally or nationally threatened, although *P. kozlovi* has not been assessed as a separate species (Clark *et al.* 2006; IUCN 2010). Spitzenberger *et al.* (2006) depict a large range for *P. kozlovi*, it's 'parent' species (Grey Long-eared Bat *P. austriacus*) is not considered to be under any significant threats (IUCN 2010) and so *P. kozlovi* would be unlikely to be considered threatened at present. The only one of these four bat species known to form sizeable colonies (i.e. >50 individuals) is *V. murinus*, which exceptionally forms maternity colonies of 200 females (IUCN 2010). Not only are such large colonies

exceptional, but they are likely to comprise a tiny fraction, certainly less than 1%, of the global population. In conclusion, **it is highly unlikely that any of these four bat species approach the 1% threshold for congregatory species under Criterion 3, and consequently the relevant unit of analysis is not considered Critical Habitat for these species.**

5.2.3.1 *Gazella subgutturosa* (Goitered Gazelle or Black-tailed Gazelle) – Critical Habitat Tier 2

Species name	<i>Gazella subgutturosa</i>
Globally categorised as CR/EN?	No - Vulnerable
Regionally/nationally categorised as CR/EN?	No - Vulnerable
Endemic/restricted range?	
Congregatory/migratory?	Migratory
Area of unit of analysis (km ²)	51,415
Global population	<120,000-140,000
Global EOO (km ²)	c. 9,800,000
Global AOO (km ²)	
Regional/national population	<60,000 (national)
Regional/national EOO (km ²)	610,000 (national)
Regional/national AOO (km ²)	

Goitered Gazelle *Gazella subgutturosa* is listed as globally Vulnerable on the IUCN Red List of Threatened Species due to population declines (Criterion A; IUCN 2010). In Mongolia, it is also considered to be Vulnerable at the regional level (Clark *et al.* 2006).

Although the historical range of this species has contracted greatly, and it is now extinct in Kuwait, Georgia, and perhaps Kyrgyzstan, it still occurs from the south of the Arabian Peninsula across the Middle East and Asia to Mongolia, China and Pakistan. Based on the total area of range polygons mapped by IUCN (2010), the global Extent Of Occurrence is about 9.8 million km² and the national Extent Of Occurrence is about 610,000 km². Numbers were estimated at 120,000-140,000 in Mallon and Kingswood (2001), but populations throughout the range have decreased since then (IUCN 2010).

This is a species of semi-desert and desert habitats, even to high altitudes in Central Asia and Mongolia. It migrates seasonally in search of pasture and water. A suitable 'discrete management unit' for such a wide-ranging and migratory species is difficult to define, with larger management units being more suitable to the species persistence needs over the long-term. The larger unit of analysis, comprising Khanbogd, Bayan-Ovoo and Manlai soums and the Small Gobi Strictly Protected Area (SPA), is most suitable, given potential secondary hunting impacts of mine development across this area and the degree to which Goitered Gazelle is hunted. Further, any practical conservation management of the species would likely occur at the scale of soums and protected areas.

Its unit of analysis holds about 51,000 km² of the range of the species, which is less than 1% of the global range and just over 8.4% of the Mongolian range (IUCN 2010). As the Mongolian population of the species is believed to comprise c. 50% of the global population, 8% of the Mongolian range equates to 4.2% of the global range. Thus, it is reasonable to infer that the 'average population' of Mongolian

Gazelle in its unit of analysis comprises more than 4% of the global population of the species. This species is migratory and also has a large, but clumped distribution. Nomadic movements in response to food availability lead to it having periodic high concentrations in unpredictable parts of its range, as is the case for Mongolian Gazelle (Olson *et al.* 2009). Thus the 'average population' calculations for this unit of analysis above could be much higher at some times (A. Fine *in litt.* 2011; K. Olson *in litt.* 2011), though it would not approach 95% (the threshold for Tier 1 Critical Habitat). Given that the relevant unit of analysis is believed to hold more than 1% of the global population of this migratory species, **this unit of analysis qualifies as Tier 2 Critical Habitat for *Gazella subgutturosa* under Criterion 3.**

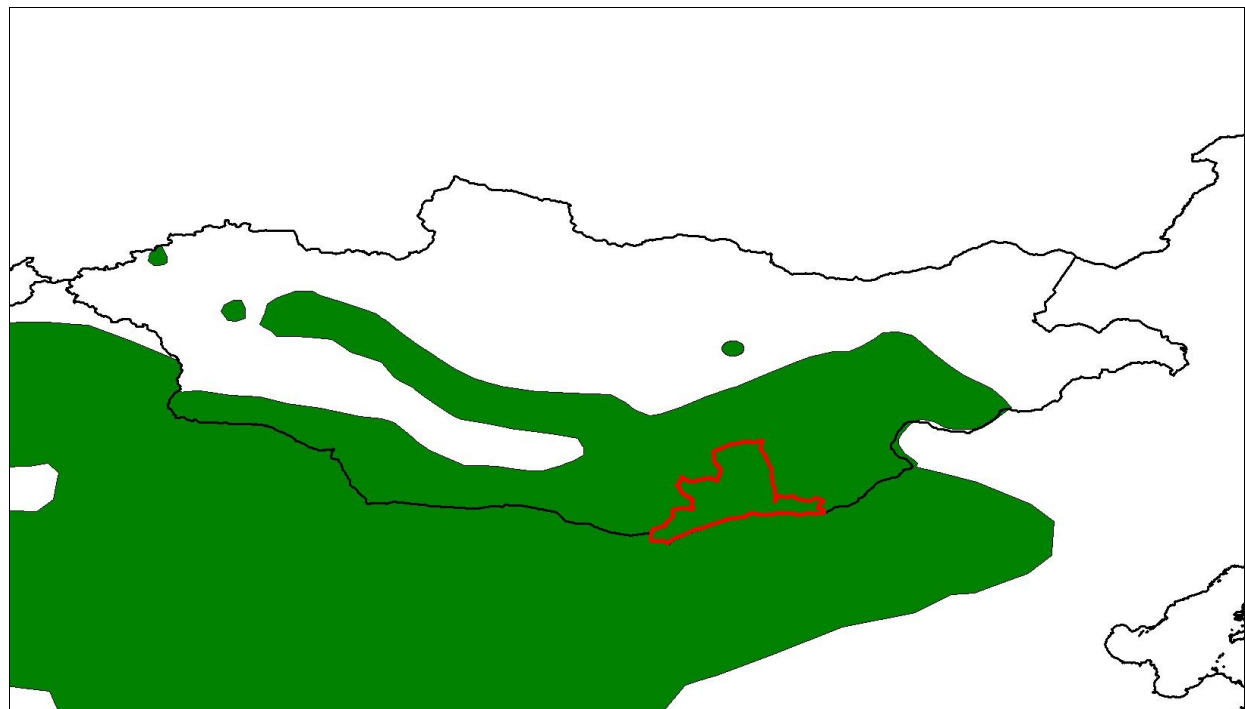
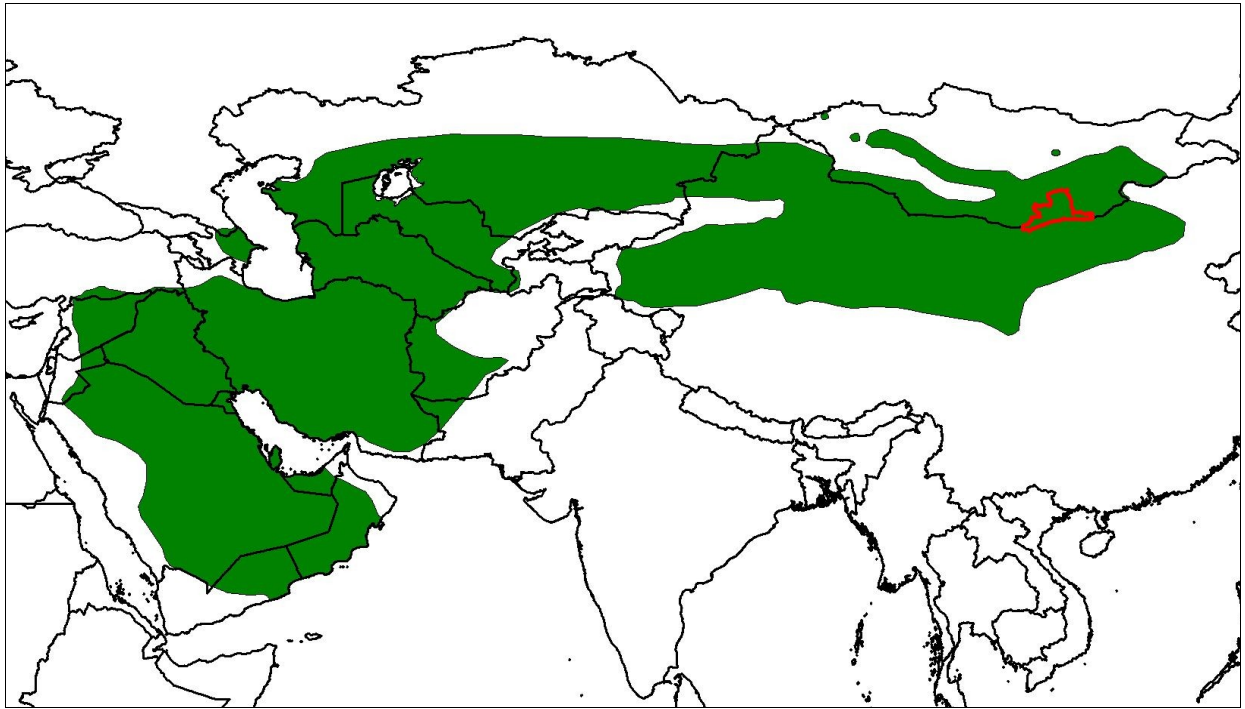


Figure 19. (a) Global and (b) national distribution of *Gazella subgutturosa* in green (IUCN 2010; red outline shows the boundary of its unit of analysis).

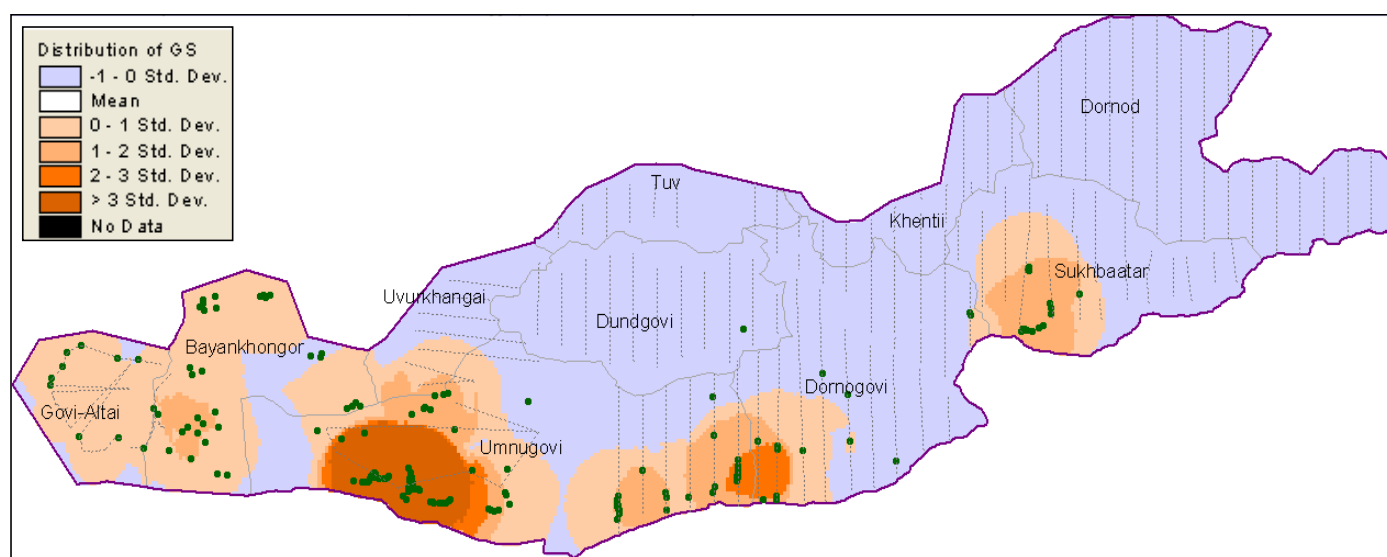


Figure 20. National density of *Gazella subgutturosa* (Lkhagvasuren et al. 2010; darker colours indicating higher density).

5.3 Criterion 4: unique assemblages of species

5.3.1 Criterion 4: Summary

This criterion refers to the uniqueness and rarity of a habitat, a habitat type and/or an associated species assemblage. In the sense of PS6, these are usually considered at a relatively fine scale (TBC 2010; L. Conzo pers. comm. 2011), and thus the most appropriate unit of analysis is that which may potentially experience direct, primary impacts from the mine project – i.e. the smaller unit of analysis comprising Khanbogd and Manlai soums. This area is representative of the two main ecoregions that it spans, namely the 'Eastern Gobi desert steppe' and the 'Alashan Plateau semi-desert' ecoregions. These ecoregions are large, relatively species-poor and very low in endemism, with the habitats and species that they contain generally widespread. The ecoregions are as yet little degraded, which is reflected in the important remaining populations of large ungulates. The unit of analysis is essential for maintaining this large ungulate community, and holds the majority of the Mongolian and regional extent of important habitats such as riverine Elm trees along seasonal watercourses, ephemeral lakes/ponds, and exceptionally high quality Saxaul forests. These habitats are important components of this unit of analysis that support its Critical Habitat status for species identified under Criteria 1-3, as well as providing important ecosystem services and having value to local communities (note, e.g., that saxaul is one component of the 'biomass fuel' which triggers Criterion 7 of Critical Habitat; Section 5.6.2.1.2). They are not, however, at the fine, site scale at which 'unique assemblages of species' are usually identified (TBC 2010; L. Conzo pers. comm. 2011). On the contrary, granite outcrops do occur at this scale in this unit of analysis and have distinct floral communities owing to the aridity of the surrounding region. Consequently, in the sense of Criterion 4 **the relevant unit of analysis can be considered as Critical Habitat for these particular granite outcrop floral communities.**

5.3.2 Detailed Assessment

According to the IFC Oyu Tolgoi Project Guidance Note on Critical Habitat, “the client will be expected to consult with a recognized biodiversity specialist with expertise in the particular region in question to determine the uniqueness of the assemblages associated with the project site with respect to the regional context” (IFC 2009). The Oyu Tolgoi project has contracted The Biodiversity Consultancy and Fauna & Flora International as the Rapid Biodiversity Assessment Team. In addition to available literature

on the subject, this team has in turn consulted Nyambayar Batbayar (Wildlife Science and Conservation Center of Mongolia), Chimed-Ochir Bazarsad (WWF Mongolia), Galbadrakh Davaa (TNC Mongolia), Amanda Fine (WCS Mongolia), Peter Gunin (Severtsov Institute of Ecology & Evolution), Tsogtbaatar Jamsran (Institute of Geoecology), Andrew Laurie (UNDP-China), Kate Oddie, Kirk Olson (University of Massachusetts), Sabine Schmidt (New Zealand Nature Institute), Jonathan Stacey (BirdLife International), Gombobaatar Sundeev (National University of Mongolia), and Henrik von Wehrden (Martin-Luther University). Comments were received from Nyambayar Batbayar, Amanda Fine, Andrew Laurie, Kirk Olson, Sabine Schmidt, Jonathan Stacey, and Henrik von Wehrden, and are collated below.

In the sense of PS6, the most appropriate unit of analysis for unique assemblages of species is that at which relatively fine-scale assemblages may potentially experience direct, primary impacts from the mine project – i.e. the smaller unit of analysis comprising Khanbogd and Manlai soums. This unit of analysis spans two ecoregions, namely the 'Eastern Gobi desert steppe' and the 'Alashan Plateau semi-desert' ecoregions (Olson *et al.* 2001). North-west Khanbogd soum, northern and western Manlai soum, and northern Bayan-Ovoo soum are all within the Eastern Gobi desert steppe ecoregion, while the rest of these soums, Small Gobi A and B Strictly Protected Areas, and most Oyu Tolgoi-related infrastructure are within the Alashan Plateau semi-desert ecoregion (Olson *et al.* 2001; Figure 21). This ecoregional separation in this unit of analysis broadly accords with zones identified in key earlier publications on the vegetation of Mongolia: the Alashan Plateau semi-desert ecoregion is referred to as a 'desert zone' (Lavrenko 1979; Gunin *et al.* 1999), while the Eastern Gobi desert steppe ecoregion is variously referred to as a 'desert steppe zone' (Lavrenko 1979) or 'zone of desertified steppes' (Gunin *et al.* 1999). Some biogeographical separation is also identified between the east and west of the unit of analysis, being split as the 'East Gobi' and 'Alashan-Gobi', respectively (Grubov 1982), or 'East Gobi' and 'Gashun Gobi' (Gunin *et al.* 1999). This may be partially linked to slightly higher monsoonal precipitation from the south-east into the east of this area (von Wehrden & Wesche 2007; von Wehrden *et al.* 2009).

The Eastern Gobi desert steppe represents a transitional ecotone between Mongolian-Manchurian grassland and Alashan Plateau semi-desert. As such it has very limited endemism, although relatively high diversity for a semi-desert region (Wikramanayake *et al.* 2001). The Alashan Plateau semi-desert ecoregion extends from the Tibetan Plateau to the project area. Despite being such a large biogeographic unit (> 670,000 km²), it has very low levels of endemism and species richness, owing to its northerly latitude and the harshness of the environment (very dry, with cold winters and hot summers) (Wikramanayake *et al.* 2001). Even the most restricted vertebrate species are shared at least with more Central Asian regions further west (Figure 22), such as the 'Taklimakan desert' ecoregion to the west (e.g. Long-eared Jerboa *Euchoreutes naso* and Koslov's Pygmy Jerboa *Salpingotus koslovi*) or the 'Gobi Lakes Valley desert steppe' and 'Great Lakes Basin desert steppe' ecoregions to the north-west (e.g. Gobi Jerboa *Allactaga bullata* and Mongolian Jerboa *Stylodipus andrewsi*). The only restricted-range bird in the region, Mongolian Accentor, *Prunella koslowi*, is found in dry montane scrub but is also distributed in similar habitats across southern and western Mongolia. The mountains in the unit of analysis represent the eastern extent of the Altai, are rather dry, and essentially contain a relatively impoverished version of the biological community representative of this mountain range, which stretches north-west beyond Mongolia (e.g. von Wehrden *et al.* 2009).

While the project area, and the relevant unit of analysis, are representative of the Alashan Plateau semi-desert and Eastern Gobi desert steppe, it is clear that these biogeographic areas and the species that they contain are widespread. Nonetheless, this unit of analysis does hold some habitats or species assemblages that are very rare elsewhere in Mongolia or globally.

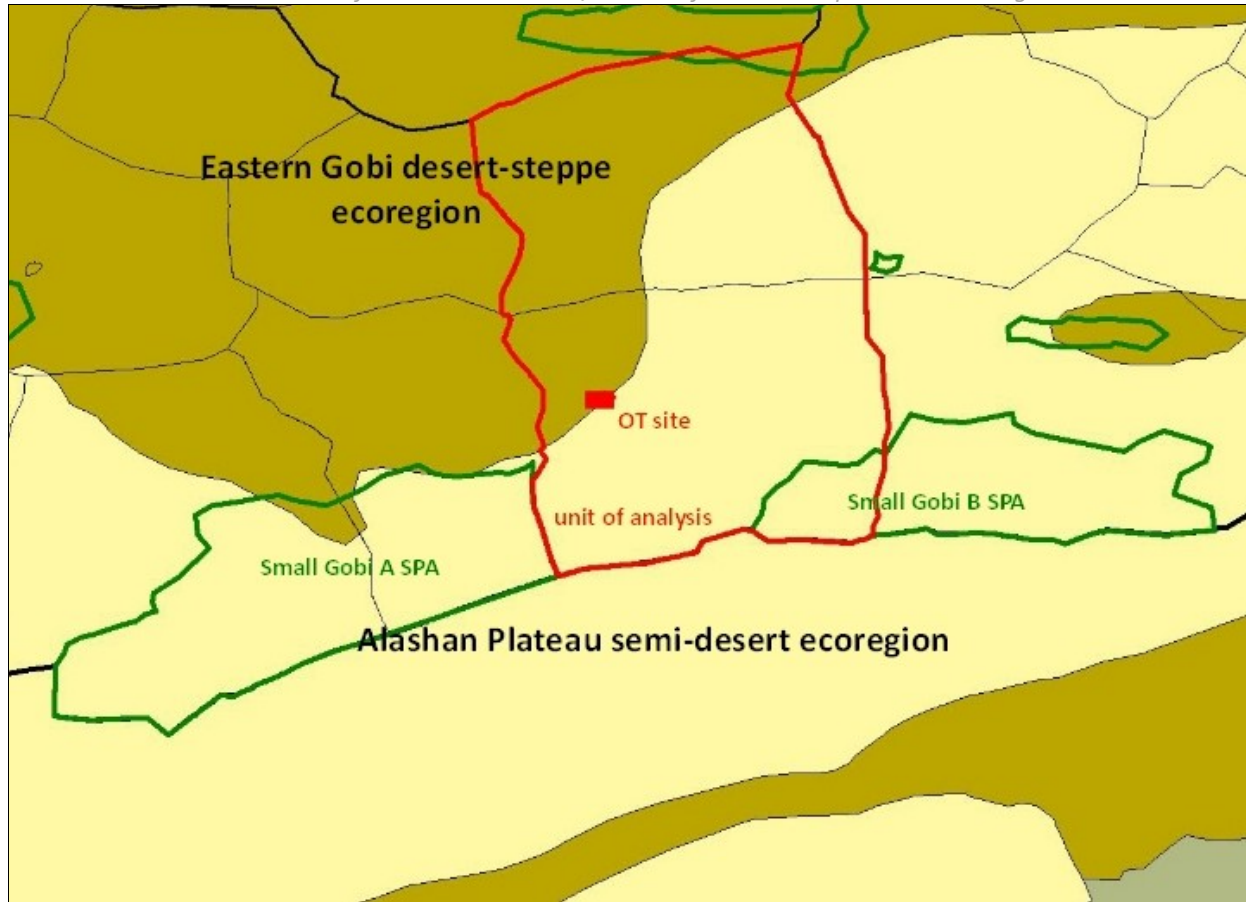


Figure 21. Ecoregions within the relevant unit of analysis

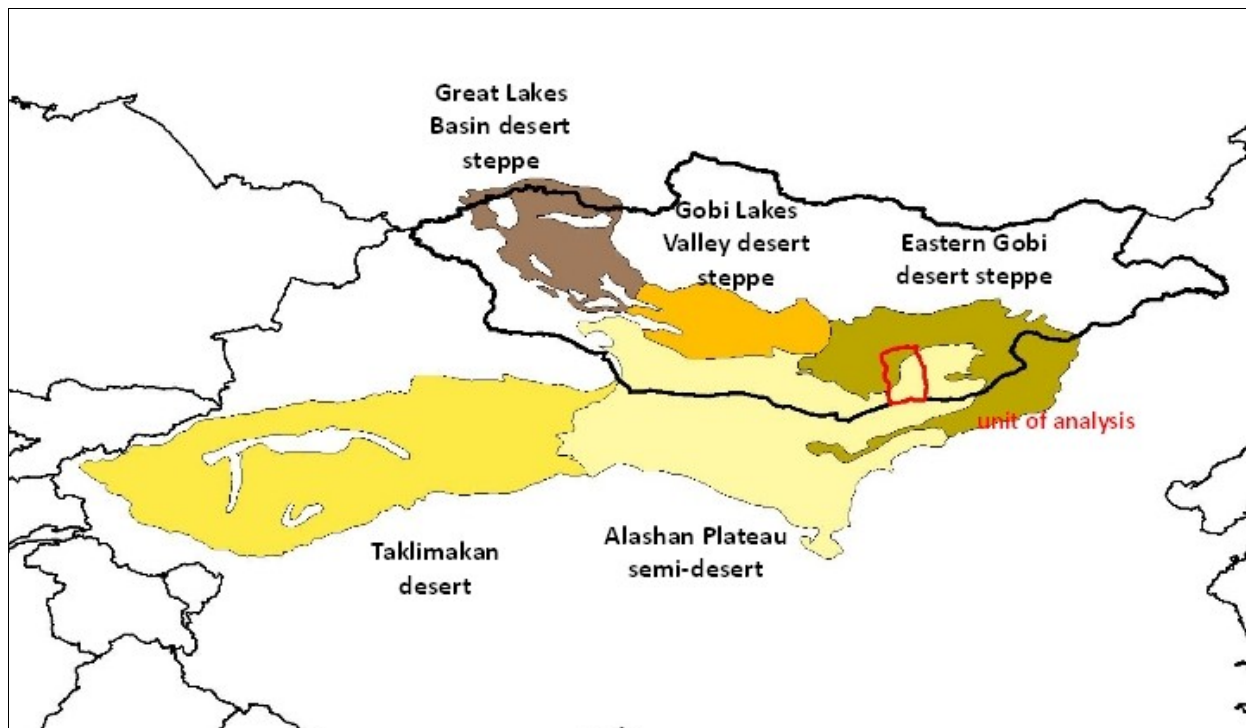


Figure 22. Ecoregions with strong biogeographic affinities to this unit of analysis

Perhaps the most important species assemblage of the southern Mongolian region in a global sense is the remaining populations of large ungulates, notably Asiatic Wild Ass *Equus hemionus*, Goitered Gazelle *Gazella subgutturosa* and Mongolian Gazelle *Procapra gutturosa*. These species have persisted in relatively high numbers in southern Mongolia owing to relatively limited human development, and thus relatively high ecosystem intactness (as elsewhere in Mongolia; e.g. Boone *et al.* 2007), there to date. This is one reason why the area is considered to be Natural Habitat. Owing to greater habitat loss and hunting elsewhere, these species have declined severely and extensively, leading to large proportions of their remaining global populations and ranges being now confined to southern Mongolia (e.g. Figure 23). Within Asia, the only comparable large ungulate communities that remain on a significant scale are on the Tibetan Plateau and the Kazakhstan steppes⁴⁴ (Harris *et al.* 2009; Mallon & Jiang 2009). Again, however, the large ungulate community found in this unit of analysis is not unique to this area, but occurs to the west and east in southern Mongolia. Nonetheless, this unit of analysis – in the core of the remaining range of this community – is considered essential for its maintenance (A. Fine *in litt.* 2011; P. Kaczensky *in litt.* 2011; K. Olson *in litt.* 2011). This importance has already been considered under Criteria 1 and 2.

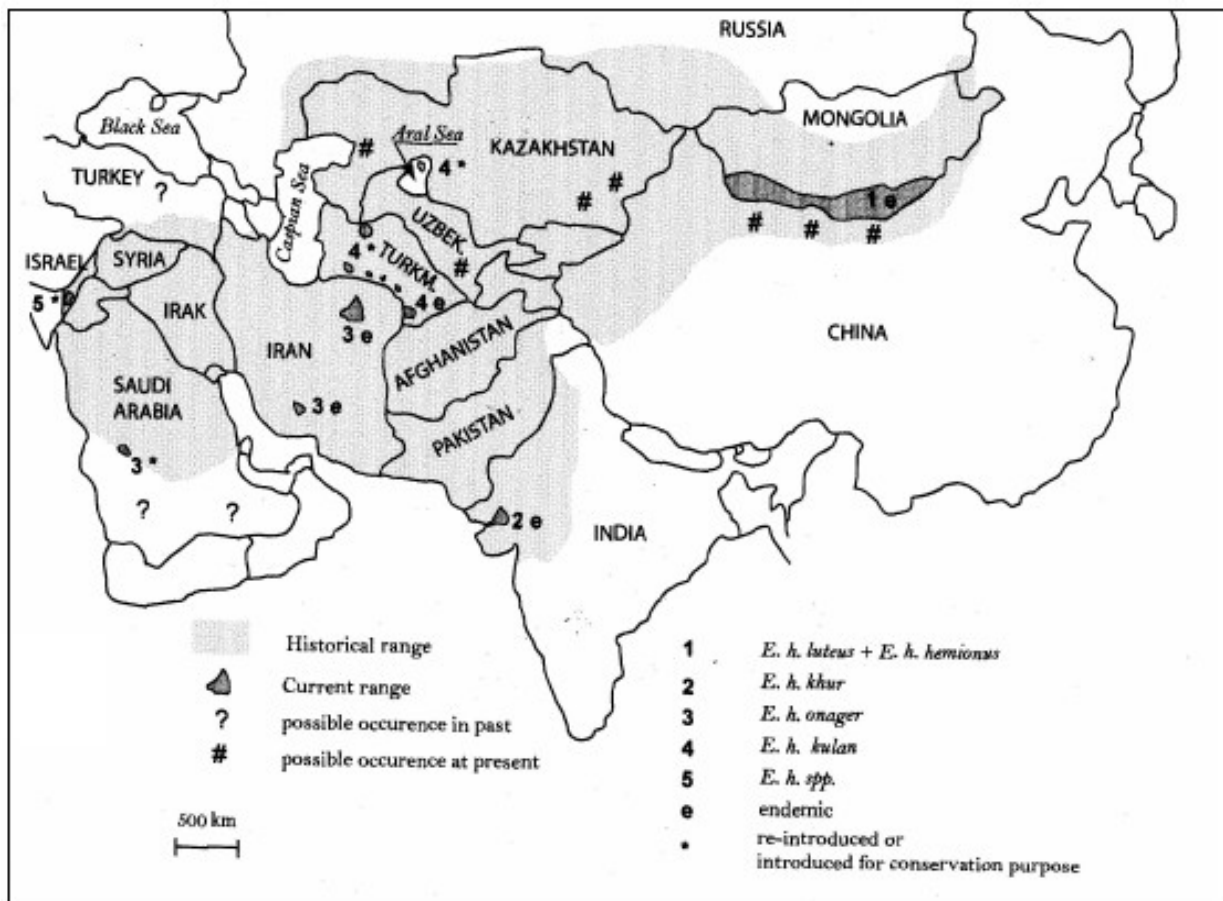


Figure 23. Historic and current global range of Asiatic Wild Ass *Equus hemionus* (from Feh *et al.* 2002)

A. Laurie (*in litt.* 2011) and J. Stacey (*in litt.* 2011) have highlighted the importance of the area for rodents, the former stating that “work on rodent diversity in Xinjiang China has shown extremely fine divisions of biogeographical regions if just rodents are considered - ie unique assemblages at a small

⁴⁴ Other areas, including the eastern steppes of Mongolia, once had comparable assemblages but have lost species over time and now usually retain just one dominant species in depleted numbers (in the eastern steppes this is Mongolian Gazelle).

geographic scale and not necessarily involving restricted range species”. However, while pointing out the importance of the area for rodent diversity and richness Batsaikhan Nyamsuren (pers. comm. 2011), one of the foremost rodent experts in Mongolia, has clarified that no specific rodent communities are confined to this unit of analysis.

H. von Wehrden (*in litt.* 2011) has highlighted a number of particularly key habitats in this unit of analysis⁴⁵, specifically riverine Elm (*Ulmus pumila*) trees, ephemeral lakes and pools, Saxaul forests, and granite outcrops:

“Associations of elm trees with river beds in an arid landscape, such as regularly seen in the unit of analysis, are now largely confined to this area. Their distribution to the west has always been limited (reaching only to around Gobi Gurvansaikhan), and the distribution to the east and south has now been much reduced by anthropogenic pressures (see Wesche et al. 2011). As such, the unit of analysis represents an extremely important area globally for this habitat type.”

“Water bodies are an extremely rare feature in the arid south of Mongolia, yet the unit of analysis contains (i) several large and important ephemeral lakes and pools, and (ii) a particularly high abundance of springs (such as those on the Umdai River). Little is known of the ephemeral lakes/pools, but they appear confined to particular depressions where surface aquifers are close to the ground surface and where nearby hills encourage drainage into the depressions. This situation most occurs in Small Gobi B, but also in Small Gobi A (and less frequently in Galbyn Gobi where there is limited relief). These 'aquifer oases' form in regular locations, but not every year (perhaps every 2-4 years at a guess). Even so, they have distinctly different vegetation communities around them. When they do form, they have been seen to host thousands of migrating waterbirds (shorebirds, cranes, etc.) These oases are thus a very important feature of the unit of analysis and largely unique in a Mongolian context.”

Saxaul *Haloxylon ammodendron* forests in the unit of analysis have been highlighted as providing “extremely important cover and nesting places for many birds and mammal species... the Saxaul forest contribution to the local ecosystem as habitat is matchless and crucial for biodiversity in the area” (Batbayar *et al.* 2011). The importance of Saxaul forests is akin to the importance of the Siberian Elm *Ulmus pumila* and poplar *Populus diversifolia* or *P. euphratica* trees (and to some extent the tamarisk *Tamarix ramosissima*). These trees are scattered along watercourses in the unit of analysis, although the poplars are at the eastern extent of their distribution here. All of these trees provide a rare level of structural heterogeneity in habitats that otherwise rarely extend above 50 cm above ground-level. Such structure provides shelter from sun, heat, wind and predation, nesting platforms for birds, and other habitat functions. Trees are thus a relatively rare and valuable part of dry habitats in southern Mongolia, yet have low regeneration rates. Saxaul is being heavily exploited for fuel for, e.g., road construction, but Elm, Poplar and Tamarisk are rarely used for fuel (Damdin 2011; S. Schmidt *in litt.* 2011). However, these habitats are widespread across southern Mongolia and thus those in this area cannot be considered unique. For example, about 2 million ha (20,000 km²) of Mongolia are covered with Saxaul (Neusel *et al.* 2005), with about 7% - 142,000 ha (1,420 km²) – in Khanbogd and Manlai soums (S. Schmidt *in litt.* 2011). However, H. von Wehrden (*in litt.* 2011) has pointed out that “some saxaul forests in the unit of analysis represent extreme and very unusual examples of the habitat type, with exceptionally high (>2 m) and broad trees.”

“The unit of analysis contains a number of granite outcrops. The unusual edaphic conditions that these provide, in such an arid area, mean that the vegetation on these outcrops is quite distinct. Such outcrops

45 von Wehrden's comments apply to the larger unit of analysis, identified for large mammals, but remain broadly relevant for the smaller unit of analysis (although in each case, the relative importance of the smaller unit of analysis for each habitat type is less than that of the larger unit of analysis).

are not widespread in southern Mongolia, and the unit of analysis thus comprises an important area for these habitat assemblages”

This unit of analysis thus appears to hold a large proportion⁴⁶ of the Mongolian and regional extent of important habitats such as riverine Elm trees along seasonal watercourses, ephemeral lakes/ponds, and exceptionally high quality Saxaul forests. These habitats are important components of this unit of analysis that support its Critical Habitat status for species identified under Criteria 1-3, as well as providing important ecosystem services and having value to local communities (note, e.g., that saxaul is one component of the 'biomass fuel' which triggers Criterion 7 of Critical Habitat; Section 5.6.2.1.2). They are not, however, at the fine, site scale at which 'unique assemblages of species' are usually identified under Criterion 4. Instead, these are ecological communities at a large scale, which are mainly restricted to this unit of analysis owing to the relatively large scale at which it has necessarily been identified for this project (even the smaller unit of analysis, under consideration here, is very large owing to the potential scale of direct impacts of the project). Such important ecological communities will be important for the Oyu Tolgoi project to consider during biodiversity mitigation and management planning, but are not unique assemblages as defined by Criterion 4. On the contrary, granite outcrops do occur at a fine, site scale in the unit of analysis and have distinct floral communities owing to the aridity of the surrounding region.

In conclusion, this unit of analysis and the species assemblages it contains are quite representative of the extensive desert and desert-steppe of southern Mongolia, but are relatively intact, contain an important large ungulate community, hold large proportions of several important habitats (riverine Elm trees, ephemeral lakes/ponds, and granite outcrops) that are found in few other locations in the region, and hold exceptional examples of Saxaul forest. In the sense of Criterion 4, **this unit of analysis can be considered to hold unique assemblages of species in the form of granite outcrop floral communities in arid regions.**

5.4 Criterion 5: key evolutionary processes

5.4.1 Criterion 5: Summary

Although key evolutionary processes may operate at various spatial scales, in the sense of PS6 these are usually considered at a relatively fine scale (TBC 2010), and thus the most appropriate unit of analysis is that which may potentially experience direct, primary impacts from the mine project – i.e. the smaller unit of analysis comprising Khanbogd and Manlai soums. This unit of analysis (and indeed the larger unit of analysis defined for large mammals) does not appear to have been the subject of the significant evolutionary processes required to meet this criterion. It is representative of a much broader and relatively homogenous landscape with low endemism. **It thus does not trigger Critical Habitat for key evolutionary processes.**

5.4.2 Detailed Assessment

There is considerable overlap between this criterion and Criterion 4 'Unique Assemblages of Species'. According to the IFC Oyu Tolgoi Project Guidance Note on Critical Habitat, “this criterion is principally defined by the physical features of a landscape that might be associated with particular ecological and evolutionary processes”.

Although key evolutionary processes may operate at various spatial scales, in the sense of PS6 these are usually considered at a relatively fine scale (TBC 2010), and thus the most appropriate unit of analysis is that which may potentially experience direct, primary impacts from the mine project – i.e. the smaller unit of analysis comprising Khanbogd and Manlai soums. This unit of analysis is not known to contain

⁴⁶ Though see previous footnote.

any endemic species or assemblages of species of unusual evolutionary provenance, and is representative of the two broad ecoregions within which it is embedded – namely the Eastern Gobi desert steppe and the Alashan Plateau semi-desert ecoregions. Even though they are large areas, these two ecoregions have little or no endemism, suggesting that evolutionary processes in this area have been limited. Indeed, even the most restricted vertebrate species in these ecoregions have sizeable ranges, extending to the Taklimakan desert to the west or the Gobi Lakes Valley desert steppe and Great Lakes Basin desert steppe to the north-west.

This unit of analysis has limited topographic variation (ranging from 800-1,800 m altitude), relatively continuous and homogenous vegetation (though small-scale heterogeneity is high; H. von Wehrden *in litt.* 2011), and is situated at high (41-44° N) latitudes. All of these factors would be expected to contribute to low levels of evolution and speciation. The hills that do exist in this unit of analysis are neither particularly high nor particularly isolated. The low hills that exist are eastern outliers of the Altai Mountains which extend north-west beyond the boundaries of Mongolia. There are also not known to be any unusual edaphic interfaces, or localised plant communities on particular soil types, in the unit of analysis. Examples of areas that might qualify under Criterion 5 can be found further south, in China (e.g. López-Pujol *et al.* 2011) – for example, the Three Gorges region and south-east Yunnan have been stable long-term refugia (promoting palaeoendemism) while the eastern edge of the Tibetan plateau (e.g. the western Sichuan mountains) has been subject to continuous uplift since the late Neogene⁴⁷ (promoting neoendemism).

The Eastern Gobi desert steppe ecoregion is an ecotone or transition between Mongolian-Manchurian grassland and Alashan Plateau semi-desert. The IFC Oyu Tolgoi Project Guidance Note on Critical Habitat notes that some transitional habitats have “been associated with the process of speciation”. In this case, however, the ecoregion is more likely a product of the retreat of drier conditions southwards in southern Mongolia after late Glacial times and the early Holocene (Gunin *et al.* 1999). It is not known to have any endemism, and cannot be considered to host key evolutionary processes.

On a precautionary basis, the larger unit of analysis was also screened for key evolutionary processes, with identical results to the smaller unit of analysis. Thus, in either case, **the unit of analysis cannot be considered to host key evolutionary processes.**

5.5 Criterion 6: key ecosystem services

5.5.1 Criterion 6: Summary

Although ecosystem services may operate at various spatial scales, in the sense of PS6 these are usually considered at a relatively fine scale (TBC 2010), and most impacts of relevance are relatively localised primary impacts rather than broader secondary impacts. Thus the most appropriate unit of analysis is the focused area which may potentially experience direct, primary impacts from the mine project – i.e. the smaller unit of analysis comprising Khanbogd and Manlai soums. One regulating service – water regulation – was deemed sufficiently important that **this unit of analysis qualifies as Critical Habitat for this ecosystem service.** No supporting services were deemed to be of sufficient importance to trigger Critical Habitat. Provisioning and cultural services are assessed in relation to Criterion 7, in Section 5.6.

⁴⁷ The Neogene started 23.03 ± 0.05 million years ago and ended 2.588 million years ago.

	Significance	Replaceability	Importance
Air quality regulation	Moderate	Many alternatives	Low
Global climate regulation	Moderate	Many alternatives	Low
Regional/local climate regulation	Moderate	Few alternatives	Moderate
Water regulation	Essential	Few alternatives	Critical Habitat
Erosion regulation	Essential	Many alternatives	High
Water purification and waste treatment	Moderate	Few alternatives	Moderate
Disease regulation	Low	Many alternatives	Low
Pest regulation	High	Many alternatives	Moderate
Pollination	High	Many alternatives	Moderate
Natural hazard regulation	Low	Many alternatives	Low
Nutrient capture and recycling	Essential	Many alternatives	High
Primary production	Essential	Many alternatives	High
Pathways for genetic exchange	Essential	Many alternatives	High

Ecosystem services – sometimes called 'environmental services' or 'ecological services' – are generally defined as the benefits that people obtain from ecosystems. The Millennium Ecosystem Assessment, and IFC Guidance Note 6, define four categories of ecosystem services:

- Regulating Services: climate & water regulating, etc.
- Supporting Services: nutrient cycling, primary production, etc.
- Provisioning Services: wild food, biomass fuel, etc.
- Cultural Services: cultural sites, historical sites, etc.

Regulating and supporting services are covered under Criterion 6, whereas provisioning and cultural services are covered under Criterion 7.

Regulating services are benefits obtained from the regulation of ecosystem processes, including: air quality regulation, climate regulation, water regulation, erosion regulation, water purification and waste treatment, disease regulation, pest regulation and natural hazard regulation.

Supporting services are those necessary for the production of all other ecosystem services. They form the base of support for ecosystems to function. They differ from provisioning, regulating, and cultural services in that their impacts on people are often indirect or occur over a very long time, whereas changes in the other categories have relatively direct and short-term impacts on people.

5.5.2 Regulating services

5.5.2.1 Critical Habitat

5.5.2.1.1 Water regulation: Critical Habitat

This regulating ecosystem service refers to the influence ecosystems have on the timing and magnitude of water runoff (particularly in terms of the water storage potential of the ecosystem or landscape - such as the 'sponge' effect of vegetation in capturing and slowly releasing run-off of precipitation) and determining the rate of aquifer recharge.

Water is one of the most limiting resources for both biodiversity and humans in the Gobi region (see Section 5.6.2.1.3). Its availability is influenced by unpredictable rainfall patterns, relief, geological conditions and broad-scale climate change more than any local biodiversity feature. The sparse vegetation that grows throughout much of the arid climate of this unit of analysis provides a relatively limited contribution to water regulation. However, the vegetation that grows within and adjacent to ephemeral rivers, streams and washes has a greater influence on regulating the recharge to subterranean water resources. The roots and organic soil structure associated with these plants regulate both horizontal and vertical water movement and help to regulate the soil moisture content by slowing

water runoff and promoting water recharge to subsurface shallow aquifers, and by reducing evaporation rates through water absorption, ground cover and shade.

Deep and shallow aquifer systems are relatively extensive in this unit of analysis, but shallow aquifers are already under considerable human exploitation (both from local herder wells and town/industrial boreholes) and a number of deep aquifers are being considered for exploitation. Recharge to shallow systems by rainfall and snow melt maintains sustainable water supply to alluvial aquifers, and potentially to bedrock aquifers (though connections between alluvial and bedrock aquifers are unclear in the unit of analysis). This, in turn, supports the potential for water to flow in ephemeral streams and associated springs. The low gradient and geology of the area effect a slow flow rate that ensures the limited local precipitation both percolates to subsurface geohydrology and is then held underground for long periods. Groundwater within the shallow aquifers supports some key habitats on which herders and wildlife depend – in particular those comprising deep-rooted species such as Saxaul, Elm and *Nitraria sibirica*. Springs within the water courses are expressed where impermeable rock forces the water to the surface. These springs – such as the Bor Ovoo permanent spring near the project site – are a key resource for people, livestock and wild animals. Groundwater and springs provide provisioning services (see Section 5.6.2.1.3), but their availability throughout the year in this arid climate is determined by water regulation services of the ecosystem. Water regulation is thus believed to be of essential significance in the relevant unit of analysis and – because of current exploitation levels (of at least shallow aquifers) – to have relatively few spatial alternatives. Following the significance x irreplaceability matrix, **water regulation as an ecosystem service is considered Critical Habitat under Paragraph 9.**

5.5.2.2 High importance

5.5.2.2.1 Erosion regulation: High importance

This regulating ecosystem service refers to the role vegetative and algal cover plays in preventing loss of soil and subsoil, with consequences for ecological issues such as soil function and downstream water quality.

The benefits of this ecosystem service predominantly accrue locally. Vegetation cover protects soil from erosion by reducing the velocity at which rain drops impact the soil as well as having root systems that bind soil together and prevent soil movement. In the arid climate of this unit of analysis, the sparse vegetation and cryptobiotic crust play a key role in ensuring that thin surface soils are not eroded by wind and rain. This role is likely to be most important in higher, steeper areas that experience more rainfall and greater run-off rates – those areas which are elsewhere identified as playing the most important role in regional/local climate regulation. However, **erosion regulation does not trigger Critical Habitat** as a key ecosystem service because, although this role is believed to be of essential significance in the relevant unit of analysis, many spatial alternatives exist throughout this unit of analysis and beyond (i.e. the sparse vegetation and cryptobiotic crust occur throughout the South Gobi). Following the significance x irreplaceability matrix, this ecosystem service is regarded as being of high importance and does not trigger Critical Habitat.

5.5.2.3 Moderate importance

5.5.2.3.1 Regional/local climate regulation: Moderate importance

This regulating ecosystem service refers to the influence ecosystems have on regional/local climate, such as orographic precipitation or transpiration affecting local humidity.

The sparse vegetation that grows in the arid climate of this unit of analysis conserves its limited water, transpires little, and so only provides a small contribution to regional/local climate regulation. The relief of this unit of analysis is also limited, ranging from c. 800-1,800 m altitude, and is thus not believed to

play a significant role in regional/local climate regulation. Higher altitudes nearby in South Gobi are known to receive more precipitation and thus act as a refuge for livestock during periods of drought (Retzer *et al.* 2006). However, **regional/local climate change regulation does not trigger Critical Habitat** as a key ecosystem service because this refuge effect is believed to be of only moderate significance in this unit of analysis (during serious droughts, herders need to move entirely outside of South Gobi to find sufficient pasture; Tsogoo Damdin pers. comm. 2011) and a few spatial alternatives exist (including the area studied by Retzer *et al.* 2006). Following the significance x irreplaceability matrix, this ecosystem service is regarded as being of moderate importance and does not trigger Critical Habitat.

5.5.2.3.2 *Pest regulation: Moderate importance*

This regulating ecosystem service refers to the influence ecosystems have on the prevalence of livestock and crop pests.

Predators in this unit of analysis (such as birds, bats and reptiles) may control pests attacking crops, pastureland and livestock. For example, birds of prey and foxes feed on rodents which may adversely affect pasture quality if not kept in balance. It is assumed that, as with most ecosystems, numbers of insect pests are regulated by predation, but this is poorly-known. However, **pest regulation does not trigger Critical Habitat** as a key ecosystem service because, although this role may be of high significance in this unit of analysis, many spatial alternatives exist throughout the unit of analysis (because predators are widespread across the area). Following the significance x irreplaceability matrix, this ecosystem service is regarded as being of moderate importance and does not trigger Critical Habitat.

5.5.2.3.3 *Pollination: Moderate importance*

This regulating ecosystem service refers to the role ecosystems and their components play in transferring pollen from male to female flower parts.

The sparse, low vegetation that grows in the arid climate of this unit of analysis is likely to be both insect- and wind-pollinated. Small areas of crops are likely to require insect pollination. However, **pollination does not trigger Critical Habitat** as a key ecosystem service because, although this role is believed to be of high significance in this unit of analysis, many spatial alternatives exist throughout the unit of analysis. Following the significance x irreplaceability matrix, this ecosystem service is regarded as being of moderate importance and does not trigger Critical Habitat.

5.5.2.4 *Low importance*

5.5.2.4.1 *Air quality regulation: Low importance*

This regulating ecosystem service refers to the influence ecosystems have on air quality by emitting gases and particles to the atmosphere (i.e. serving as a 'source') or extracting gases and particles from the atmosphere (i.e. serving as a 'sink').

The benefits of this service principally accrue locally and regionally. Growing vegetation captures and stores carbon dioxide, and produces oxygen. Much vegetation in the arid south of Mongolia also has extensive shallow root systems, intended to capture dew and occasional light precipitation, which – in conjunction with the barrier effect of the vegetation itself – act to reduce wind erosion of soils, which would otherwise lead to abrasive dusty winds.

Air quality regulation is clearly an ecosystem service provided by vegetation communities in this unit of analysis. However, the sparse vegetation that grows in the arid climate of the area currently provides a relatively limited contribution to air quality regulation (as indicated by the frequent dust storms across

the region) and is thus considered to be of only moderate significance to beneficiaries. The vegetation community in the unit of analysis is widespread both within this unit of analysis and more widely in southern Mongolia, and so there are many spatial alternatives on both a local and regional scale. **Air quality regulation does not trigger Critical Habitat** as a key ecosystem service due to its moderate significance as a service in this region and the widespread occurrence of similar vegetation within the region. Following the significance x irreplaceability matrix, this ecosystem service is regarded as being of low importance and does not trigger Critical Habitat.

5.5.2.4.2 Global climate regulation: Low importance

This regulating ecosystem service refers to the influence ecosystems have on global climate by emitting greenhouse gases or aerosols to the atmosphere or by absorbing greenhouse gases or aerosols from the atmosphere.

The benefits of this service accrue globally through their impact on global climate change. Vegetation captures and stores carbon dioxide. Wild grazing animals and livestock emit methane but at a very low level given their overall low densities and the extensive nomadic system of pastoralism practised in this unit of analysis.

Global climate change regulation is a minor ecosystem service in this region. The sparse vegetation that grows in the arid climate of the area provides a relatively limited contribution to global climate regulation and is thus of moderate significance to beneficiaries. **Global climate change regulation does not trigger Critical Habitat** as a key ecosystem service because the influence of this unit of analysis is very small within the global system, and because there are also many spatial alternatives, both within this unit of analysis and within southern Mongolia more widely. Following the significance x irreplaceability matrix, this ecosystem service is regarded as being of low importance and does not trigger Critical Habitat.

5.5.2.4.3 Water purification and waste treatment: Low importance

This regulating ecosystem service refers to the role that ecosystems (vegetation – rather than underlying aquifers) play in the filtration and decomposition of organic wastes, pollutants and particulate matter, and in the assimilation and detoxification of compounds.

Water purification has not been a particularly key service in this unit of analysis owing to the low level of anthropogenic or natural organic waste in the area, very low levels of precipitation and very limited surface water flows (only for a few days each year). Rain rapidly flows down into underground aquifers, with relatively little taken up by the sparse vegetation of the area. Thus, **water purification and waste treatment does not trigger Paragraph 9** as a key ecosystem service because this service is believed to be of only moderate significance in this unit of analysis and at least a few spatial alternatives exist for any effects that may occur. Following the significance x irreplaceability matrix, this ecosystem service is regarded as being of moderate importance and does not trigger Critical Habitat.

5.5.2.4.4 Disease regulation: Low importance

This regulating ecosystem service refers to the influence ecosystems have on the prevalence of human, livestock and crop diseases.

Disease prevalence and the interaction with ecosystems are poorly-known. However, the climatic extremes within the region, particularly the very cold winters, ensure that diseases spread by arthropod or animal vectors are relatively uncommon (unlike, for example, tropical regions where mosquito-borne diseases such as malaria or dengue fever are prevalent). Infectious diseases do occur among livestock in the region, and are often treated with veterinary medicines. Thus, **disease regulation does not trigger Critical Habitat** as a key ecosystem service because this service is believed to be of only low significance

in this unit of analysis and many spatial alternatives exist for any effects that may occur. Following the significance x irreplaceability matrix, this ecosystem service is regarded as being of low importance and does not trigger Critical Habitat.

5.5.2.4.5 Natural hazard regulation: Low importance

This regulating ecosystem service refers to the capacity for ecosystems to reduce the damage caused by natural disasters, for example where dense vegetation acts as a flood barrier.

The most significant natural disasters which occur in the region are droughts and dzuds (extreme winters). No significant ecosystem services are known to exist in the south Gobi to mitigate these natural disasters, other than the limited mitigation effects of local climate regulation (see Section 5.5.2.3.1). Thus, **natural hazard regulation does not trigger Critical Habitat** as a key ecosystem service because this service is believed to be of only low significance in this unit of analysis and many spatial alternatives exist for any effects that may occur. Following the significance x irreplaceability matrix, this ecosystem service is regarded as being of low importance and does not trigger Critical Habitat.

5.5.3 Supporting services

5.5.3.1 Critical Habitat

No supporting services qualify for this category.

5.5.3.2 High importance

5.5.3.2.1 Nutrient capture and recycling: High importance

This supporting ecosystem service refers to the capacity for ecosystems to capture nutrients from the atmosphere, soils and water, and to recycle these nutrients through biotic or abiotic pathways.

The sparse vegetation that grows in the arid climate of the area provides a relatively limited contribution to nutrient capture and recycling on a global scale. On a local scale, however, local communities consider this nutrient capture and recycling very valuable in producing pastureland because local livelihoods are largely dependent on traditional pastoral grazing. However, **nutrient capture and recycling does not trigger Critical Habitat** as a key ecosystem service because, although this role is believed to be of essential significance in this unit of analysis, many spatial alternatives exist throughout the unit of analysis. Following the significance x irreplaceability matrix, this ecosystem service is regarded as being of high importance and does not trigger Critical Habitat. If the unit of analysis was to trigger Critical Habitat for this criterion it could be argued that virtually all vegetated land on earth was also Critical Habitat.

5.5.3.2.2 Primary production: High importance

This supporting ecosystem service refers to the capacity for ecosystems to convert atmospheric or aquatic carbon dioxide, primarily through photosynthesis, to organic compounds.

The sparse vegetation that grows in the arid climate of the area provides a relatively limited contribution to primary production on a global scale. On a local scale, however, local communities consider this primary production very valuable in producing pastureland because local livelihoods are largely dependent on traditional pastoral grazing. However, **primary production does not trigger Critical Habitat** as a key ecosystem service because, although this service is believed to be of essential significance in this unit of analysis, many spatial alternatives exist throughout the unit of analysis. Following the significance x irreplaceability matrix, this ecosystem service is regarded as being of high importance and does not trigger Critical Habitat. If the unit of analysis was to trigger Critical Habitat for this criterion it could be argued that virtually all vegetated land on earth was also Critical Habitat.

5.5.3.2.3 Pathways for genetic exchange: High importance

This supporting ecosystem service refers to the capacity for ecosystems to facilitate genetic exchange 'vertically' through generations of a species and 'horizontally' among different species.

Pathways for genetic exchange does not trigger Critical Habitat as a key ecosystem service because, although this service is believed to be of essential significance in this unit of analysis, many spatial alternatives exist throughout the unit of analysis. Following the significance x irreplaceability matrix, this ecosystem service is regarded as being of high importance and does not trigger Critical Habitat.

5.5.3.3 Moderate importance

No supporting services qualify for this category.

5.5.3.4 Low importance

No supporting services qualify for this category.

5.6 Criterion 7: Biodiversity of significant social, economic or cultural importance to local communities

'Ecosystem services' as defined by the Millenium Ecosystem Assessment are effectively covered in Criteria 6 and 7 of Paragraph 9. Regulating and supporting services have already been discussed under Criterion 6 above, and provisioning and cultural services are considered under Criterion 7. The key difference between these two classes is the spatial scale of the benefits provided – Criterion 6 (regulating and supporting services) benefits primarily (though not always) accrue at a large spatial scale (regional, national or global), whereas Criterion 7 (provisioning and cultural services) benefits primarily (though not always) accrue at a smaller (local) spatial scale. Provisioning services are goods or services obtained from ecosystems, such as food, freshwater, timber, fibre and others for household consumption or economic purposes; whereas cultural services are non-material benefits obtained from an ecosystem or its products, such as spiritual enrichment, intellectual development, religious experience and recreation.

5.6.1 Criterion 7: Summary

Although ecosystem services may operate at various spatial scales, in the sense of Criterion 7 of PS6 these are usually considered at a relatively fine scale (TBC 2010), and most impacts of relevance are relatively localised primary impacts rather than broader secondary impacts. Thus the most appropriate unit of analysis is the focused area which may potentially experience direct, primary impacts from the mine project – i.e. the smaller unit of analysis comprising Khanbogd and Manlai soums. Three provisioning services – related to livestock, biomass fuel and freshwater – were deemed sufficiently important that **this unit of analysis qualifies as Critical Habitat for these three ecosystem services**. No cultural services were assessed to be of sufficient importance to trigger Critical Habitat. Regulating and supporting services are assessed in relation to Criterion 6, in Section 5.5.

A total of eight major classes of 11 provisioning services and five cultural services were assessed for Criterion 7. Several services not directly based on biodiversity – such as freshwater, soil fertility, agricultural crops and livestock – were assessed under this Criterion even though they may be more suited for assessment under other Performance Standards.

	Significance	Replaceability	Importance
Crops	Moderate	Few alternatives	Moderate
Livestock	Essential	Few alternatives	Critical Habitat
Capture fisheries	Low	Few alternatives	Low
Aquaculture	Low	Few alternatives	Low
Wild foods	High	Many alternatives	Low
Timber and other wood fiber	Low	Few alternatives	Low
Other fibers (e.g., cotton, hemp, silk)	Low	Many alternatives	Low
Biomass fuel	Essential	Few alternatives	Critical Habitat
Freshwater	Essential	Few alternatives	Critical Habitat
Genetic resources	Moderate	Many alternatives	Low
Biochemicals, natural medicines, and pharmaceuticals	Moderate	Few alternatives	Moderate
Sacred or spiritual sites	Low	N/a	Low
Areas used for religious purposes	Low	N/a	Low
Recreational value	Moderate	Few alternatives	Moderate
Ecotourism areas	Moderate	Few alternatives	Moderate
Aesthetic value	High	Few alternatives	High

Provisioning services are some of the most widely-known ecosystem services because they include direct and important benefits to support human life, such as food, water, fuel and shelter. Less direct benefits come from other provisioning services such as genetic resources or biochemicals.

Biodiversity has cultural values for local communities. 'Cultural services' is a category of ecosystem services defined as non-material benefits obtained from an ecosystem, such as spiritual enrichment, intellectual development, reflection, religious experience and recreation. It comprises knowledge systems, social relations, aesthetic values and appreciation of nature. Also included in this category are sites within the landscape of particular cultural importance, such as sacred hills, when – and only when – they have clear linkages to biodiversity. When not linked to biodiversity, sites of cultural importance are best assessed under Performance Standard 8.

5.6.2 Provisioning services ('biodiversity-based livelihoods')

5.6.2.1 Critical Habitat Services

5.6.2.1.1 Livestock: Critical Habitat

This provisioning ecosystem service refers to the role natural pastures play in supporting livestock production.

The benefits of this ecosystem service predominantly accrue locally. Livestock grazing is a major source of income in this unit of analysis, with most herders in Omnogovi Aimag owning 100-500 animals (Oyu Tolgoi LLC in prep.). In Khanbogd soum alone, there were 876 herders (in 494 families), and a total of 116,246 individual livestock, in 2009 (MSRM 2010). Livestock provide a number of non-monetary services to people such as dung for fuel and milk. Given the climate, and thus the available pasture, the predominant livestock are goats (54%; MSRM 2010). Camels (14%; MSRM 2010) and sheep (26%; MSRM 2010) are also common, but horses and cows are not common in this area. Overall, the agricultural sector (mainly livestock-related) employs about 45% of workers in Omnogovi Aimag and a very high proportion of people living away from towns (Oyu Tolgoi LLC in prep.). This situation is changing with increasing economic opportunities in the region, with the number of herders steadily decreasing – possibly because they are finding employment in the mining sector. Nonetheless, livestock numbers are increasing. Currently, livestock, and the pasture that supports them, remain of essential significance in this unit of analysis. However, owing to the arid climate, there are relatively few good spatial alternatives for livestock grazing in this unit of analysis (c. 48% of pasture is not used because of water

shortages; MSRM 2010). For example, in Khanbogd soum, about 18 % of pasture is suitable for smaller animals and 34% is suitable for large animals (Damdin 2011). Spatial options may be increasing at present, owing to herders moving into other economic sectors such as mining (C. MacDonald *in litt.* 2011). Following the significance x irreplaceability matrix, the **pasture that supports livestock is an ecosystem service that qualifies as Critical Habitat under Criterion 7 of PS6 Paragraph 9/Criterion 6 of PR6 Paragraph 13.**

5.6.2.1.2 *Biomass fuel: Critical Habitat*

This provisioning ecosystem service refers to renewable fuels derived from living organisms or the by-products of living organisms, which serve as a source of energy.

Fuel needs of local people in this unit of analysis are primarily fed by dried livestock dung and, in winter when heating needs are high, woody plants (e.g. *Salsola laricifolia*, *Zygophyllum xanthoxylon*, *Amygdalus pedunculata* and saxaul *Haloxylon ammodendrum*). Elm, Poplar and Tamarisk species are not commonly used for fuel in the area (Damdin 2011). The majority (93%) of local households used wood, charcoal and dung in unknown proportions (Center for Policy Research 2009, in Environ 2011). Availability of trucks has enabled recent over-harvesting of woody plants, notably *Haloxylon ammodendrum* (Damdin 2011; Environ 2011; K. Olson pers. comm. 2011; S. Schmidt *in litt.* 2011). Owing to very cold winters in this unit of analysis, this ecosystem service is believed to be of essential significance. Areas of sizeable woody plants are limited, and few spatial alternatives exist in this unit of analysis. Following the significance x irreplaceability matrix **biomass fuel, specifically woody plants, is an ecosystem service that qualifies as Critical Habitat under Criterion 7 of PS6 Paragraph 9/Criterion 6 of PR6 Paragraph 13.**

5.6.2.1.3 *Freshwater: Critical Habitat*

This provisioning ecosystem service refers to freshwater for drinking and washing, and for provisioning livestock.

The benefits of this ecosystem service predominantly accrue locally. Freshwater needs in this unit of analysis are largely provided by underground aquifers (via hand-dug wells and a few Russian era machine-bored wells) throughout the year, since there are very few, limited permanent surface waterbodies and watercourses only have surface flow for a few days each year. In Khanbogd soum, there are 314 wells (79% shallow) for 494 herding families, with only four of these wells being disused (MSRM 2010). There are no other sources of water in the area, such as adequate rainfall or piped water. This ecosystem service is thus of essential significance and few spatial alternatives exist in this unit of analysis. Following the significance x irreplaceability matrix **freshwater is an ecosystem service that qualifies as Critical Habitat under Criterion 7 of PS6 Paragraph 9/Criterion 6 of PR6 Paragraph 13.** All natural springs in the area are thus considered to be Critical Habitat (including Bor Ovoo spring).

5.6.2.2 *High Importance*

No provisioning services qualify for this category.

5.6.2.3 *Moderate importance*

5.6.2.3.1 *Crops: Moderate importance*

This provisioning ecosystem service refers to the role ecosystems, particularly soils, play in supporting crop production.

The benefits of this ecosystem service predominantly accrue locally. In this unit of analysis, climatic conditions do not favour crop production and so it is of substantially lower socio-economic importance than livestock production. However, local production of potatoes and vegetables is important to a few families (Damdin 2011; Oyu Tolgoi LLC in prep.). Overall, suitable areas for crop production are very

limited in this unit of analysis, with few alternative locations, and crops are of moderate significance. Following the significance x irreplaceability matrix, this ecosystem service is regarded as being of moderate importance and **does not trigger Paragraph 9 Critical Habitat under Criterion 7 of PS6 Paragraph 9/Criterion 6 of PR6 Paragraph 13.**

5.6.2.3.2 Biochemicals, natural medicines, and pharmaceuticals: Moderate importance

This provisioning ecosystem service refers to medicines, biocides, food additives, and other biological materials derived from ecosystems for commercial, traditional or domestic use.

The benefits of this ecosystem service predominantly accrue locally. Although more than 50 species of medicinal plants are known to be used in this unit of analysis (Urtnasan 2011), many young people now regularly purchase medicines instead (Ligaa Urtnasan pers. comm. 2011) owing to increasing availability and affordability. Medicinal plants are generally used to treat less serious illnesses, although such illnesses may become serious if not treated. In general, this ecosystem service is believed to now be of only moderate significance in this unit of analysis, with few spatial alternatives now that resources have been somewhat depleted. Following the significance x irreplaceability matrix, this ecosystem service is regarded as being of moderate importance and **does not trigger Paragraph 9 Critical Habitat under Criterion 7 of PS6 Paragraph 9/Criterion 6 of PR6 Paragraph 13.**

5.6.2.4 Low importance

5.6.2.4.1 Capture fisheries: Low importance

This provisioning ecosystem service refers to wild fish captured through fishing and other non farming methods.

There are very few permanent waterbodies in this unit of analysis, and these do not support significant capture fisheries. Thus, even though few alternative waterbodies exist, capture fisheries are of low significance in this unit of analysis. Following the significance x irreplaceability matrix, this ecosystem service is regarded as being of low importance and **does not trigger Paragraph 9 Critical Habitat under Criterion 7 of PS6 Paragraph 9/Criterion 6 of PR6 Paragraph 13.**

5.6.2.4.2 Aquaculture: Low importance

This provisioning ecosystem service refers to fish reared through farming methods.

There are very few permanent waterbodies in this unit of analysis, and these do not support aquaculture (nor, indeed, do they have capacity to support aquaculture). Thus, even though few alternative waterbodies exist, aquaculture is of low significance in this unit of analysis. Following the significance x irreplaceability matrix, this ecosystem service is regarded as being of low importance and **does not trigger Paragraph 9 Critical Habitat under Criterion 7 of PS6 Paragraph 9/Criterion 6 of PR6 Paragraph 13.**

5.6.2.4.3 Wild foods: Low importance

This provisioning ecosystem service refers to edible animal species captured in the wild and edible plant species harvested in the wild.

The benefits of this ecosystem service predominantly accrue locally. In this unit of analysis, subsistence hunting levels are believed to be generally low, although hunting for trade and 'sport' apparently remains at unsustainable levels (A. Fine pers. comm. 2011; K. Olson pers. comm. 2011; H. von Wehrden pers. comm. 2011). A small number of households identified the use of wild animals, but it is not clear whether this was for meat or for fibre (Center for Policy Research 2009, in Environ 2011) – in general it is very difficult to assess the importance of wild meat to local communities owing to a reluctance to admit to illegal hunting. Likewise, the arid vegetation of the area includes few edible plants of significance (though *Agriophyllum pungens* was previously commonly used for flour preparation; Gunchinsuren *et al.* 2011). Only 6% of local households often make use of natural plants, although another 59% sometimes use natural plants (Center for Policy Research 2009 in Environ 2011). Thus, wild foods are considered to be at most of moderate significance in this unit of analysis. Wild foods are widely, if patchily, distributed across this unit of analysis and so have many spatial alternatives. Following the significance x irreplaceability matrix, this ecosystem service is regarded as being of low importance and **does not trigger Paragraph 9 Critical Habitat under Criterion 7 of PS6 Paragraph 9/Criterion 6 of PR6 Paragraph 13.**

5.6.2.4.4 Timber and other wood fiber: Low importance

This provisioning ecosystem service refers to products made from trees harvested from natural forest ecosystems, plantations, or non-forested lands.

This unit of analysis has very few trees: It is at the eastern extent of poplar *Populus diversifolia* or *P. euphratica* distribution, meaning that Siberian Elm *Ulmus pumila* is dominant. In this unit of analysis, some small stands of Elm exist in wetter, more sheltered upland areas, but Elms predominantly occur at a very low density along ephemeral watercourses (e.g. Umdai River). Elms are not generally harvested for construction, but poplars are sometimes used to construct winter camps (Environ 2011). Saxaul *Haloxylon ammodendron* and Tamarisk *Tamarix ramosissima* do not reach tree-like size in this unit of analysis and so are not commonly used for making any products. Even though few alternative sources exist in this unit of analysis, timber and other wood fibre from the area is little-used, and thus of low significance. Most of the limited timber and wood requirements are fulfilled from outside this unit of analysis. Following the significance x irreplaceability matrix, this ecosystem service is regarded as being of low importance and **does not trigger Paragraph 9 Critical Habitat under Criterion 7 of PS6 Paragraph 9/Criterion 6 of PR6 Paragraph 13.**

5.6.2.4.5 Other fibers (e.g., cotton, hemp, silk): Low importance

This provisioning ecosystem service refers to non-wood and non-fuel fibres extracted from the natural environment for a variety of uses.

The benefits of this ecosystem service predominantly accrue locally. No natural fibres are known to be of significant importance in this unit of analysis. Thus, this ecosystem service is believed to be of only low significance in this unit of analysis and many spatial alternatives exist for any services that may be provided. Following the significance x irreplaceability matrix, this ecosystem service is regarded as being of low importance and **does not trigger Paragraph 9 Critical Habitat under Criterion 7 of PS6 Paragraph 9/Criterion 6 of PR6 Paragraph 13.**

5.6.2.4.6 Genetic resources: Low importance

This provisioning ecosystem service refers to the genetic variability present in biodiversity. This may be valuable to humans for reasons such as breeding drought- or disease-resistance into crops.

The benefits of this ecosystem service predominantly accrue globally, and are usually potential future benefits. Potential future benefits are difficult to quantify. This ecosystem service is believed to be of moderate significance in this unit of analysis, with many spatial alternatives for any services that may be provided. Following the significance x irreplaceability matrix, this ecosystem service is regarded as being of low importance and **does not trigger Paragraph 9 Critical Habitat under Criterion 7 of PS6 Paragraph 9/Criterion 6 of PR6 Paragraph 13.**

5.6.3 Cultural services

Cultural services are also covered under IFC PS8. The overlap with PS6 includes cultural and religious practices and sites linked to biodiversity or wild nature in some way.

5.6.3.1 Critical Habitat Services

No cultural services qualify for this category.

5.6.3.2 High importance

5.6.3.2.1 Aesthetic value: High importance

This cultural ecosystem service refers to the aesthetic, non-spiritual, values which create feelings of well-being. These can include 'sense of place' and 'landscape-level biodiversity values'.

The Umdai is considered an area of significant natural beauty by local people (Oyu Tolgoi LLC in prep.). This unit of analysis is generally of high aesthetic value owing to its low degree of anthropogenic modification. The significance of aesthetic value as an ecosystem service in this unit of analysis is assessed to be high, with a few spatial alternatives across the area. Following the significance x irreplaceability matrix, this ecosystem service is regarded as being of high importance and **does not trigger Paragraph 9 Critical Habitat under Criterion 7 of PS6 Paragraph 9/Criterion 6 of PR6 Paragraph 13.**

5.6.3.3 Moderate importance

5.6.3.3.1 Recreational value: Moderate importance

This cultural ecosystem service refers to the role ecosystems play in providing recreational benefits to people.

There is limited information available about the recreational values of ecosystems in this unit of analysis. It is believed that this ecosystem service is of moderate significance but to have a few spatial alternatives. Following the significance x irreplaceability matrix, this ecosystem service is regarded as being of moderate importance and **does not trigger Paragraph 9 Critical Habitat under Criterion 7 of PS6 Paragraph 9/Criterion 6 of PR6 Paragraph 13.**

5.6.3.3.1 Ecotourism areas: Moderate importance

This cultural ecosystem service refers to areas that are used for ecotourism.

Ecotourism has been relatively limited in this unit of analysis to date, although Gobi Gurvan Sukhait (to the west of the unit of analysis) is a relatively popular ecotourism area. It is likely that neighbouring regions (such as Gobi Gurvan Sukhait) with more visually appealing topography and higher human interest (higher densities of livestock and herders) will be more attractive to ecotourists. However, there is a tourist camp near Khanbogd town, and Gunchinsuren *et al.* (2011) highlight wildlife, paleontological remains and monasteries as key potential tourist attractions of the area. Given limited ecotourism to date in this unit of analysis, it is believed that this ecosystem service has a moderate significance. A few spatial alternatives exist within this unit of analysis. Following the significance x irreplaceability matrix, this ecosystem service is regarded as being of moderate importance and **does not trigger Paragraph 9 Critical Habitat under Criterion 7 of PS6 Paragraph 9/Criterion 6 of PR6 Paragraph 13.**

5.6.3.4 Low importance

5.6.3.4.1 Sacred or spiritual sites: Low importance

This cultural ecosystem service refers to areas that have intrinsic sacred or spiritual value to people.

Although traditional Mongolian beliefs were suppressed in socialist times (until 1990), there has been some recent revival of traditional 'ovoo' rituals in recent years, dedicated to such natural features as mountain spirits, sacred trees, lakes, or springs (Oyu Tolgoi LLC in prep.). Most sacred natural sites, including the Umdai River and sacred trees, are “key environmental points for herder survival” (Sampildondov & Purevjay 2011). Oyu Tolgoi LLC (2009) identified 14 sacred mountains and ovoo (sacred piles of stones for nature spirits) in Khanbogd soum, with Khanbogd Khaikhan Mountain identified as of particular importance (about 56% of respondents worshipping this site). In general, people have many spiritual sites available to them and it is possible to establish new spiritual sites as sacred if ceremony is followed (C. MacDonald *in litt.* 2011). None of the sites identified to date appear to be linked to biodiversity, rather than to individual trees, landscape features or anthropogenic features. For example, the 30 sites identified in the impact zone of the road/power line corridor to Gashuun Sukhait comprise hills, mountains, ridges, rocks, caves, springs, burial grounds, birth places, winter camps, cairns and standing stones – none apparently linked to biodiversity (Gunchinsuren *et al.* 2011). An additional 115 'sacred and inherited' sites are identified over a larger area by Sampildondov & Purevjay 2011, with about eight linked to individual sacred trees, a couple in which “grass grown this area has treatment power”, but no sites apparently linked to biodiversity more generally – although a number of sacred sites have restrictions on removal of trees.

A large number of sacred sites have already been identified, and it is believed that many remain to be identified (Gunchinsuren *et al.* 2011). It is thus not possible to discount the potential that some sacred sites may be linked to biodiversity. However, no evidence exists for this to date. As such, this ecosystem service (in terms of biodiversity, as considered under PS6) is regarded as being of low significance and **does not trigger Paragraph 9 Critical Habitat under Criterion 7 of PS6 Paragraph 9/Criterion 6 of PR6 Paragraph 13.**

5.6.3.4.2 Areas used for religious purposes: Low importance

This cultural ecosystem service refers to areas that are used for religious purposes but that do not have any other intrinsic sacred or spiritual value.

Examples of potential areas fitting within this ecosystem service are apparent animal sacrifice sites associated with religious ceremonies which were identified by Oyu Tolgoi surveys (Oyu Tolgoi LLC in prep.). The benefits of this ecosystem service predominantly accrue locally. As with sacred sites, it is believed that all of these sites are linked to landscape or anthropogenic features rather than to biodiversity per se. As such, this ecosystem service (in terms of biodiversity, as considered under PS6) is

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regarded as being of low significance and **does not trigger Paragraph 9 Critical Habitat under Criterion 7 of PS6 Paragraph 9/Criterion 6 of PR6 Paragraph 13.**

6 Conclusions, implications and recommendations

6.1 Conclusions

Following the criteria of Paragraph 9 within the 2006 version of the International Finance Corporation's Performance Standard 6 (Biodiversity and Natural Resources), the IFC Oyu Tolgoi Project Guidance Note on Critical Habitat, and the criteria of Paragraph 10 of the European Bank for Reconstruction and Development's Performance Requirement 6 (Biodiversity and Natural Resources) **this report finds that the entirety⁴⁸ of both units of analysis defined for Oyu Tolgoi are Critical Habitat.**

The larger unit of analysis (identified as the spatial unit of analysis for large mammals) – comprising Khanbogd, Manlai and Bayan-Ovoo soums and Small Gobi SPA sectors A and B – qualifies as Critical Habitat under criteria 1 and 3 of the 2006 version of PS6 Paragraph 9. The boundary of this Critical Habitat is therefore the boundary of this unit of analysis, encompassing Khanbogd, Bayan-Ovoo and Manlai soums and both A and B sectors of Small Gobi Strictly Protected Area, a total area of 51,415 km². This unit of analysis triggers **Critical Habitat under two PS6 Paragraph 9 criteria: Criterion 1 - its significance for globally and nationally Endangered species (two species) and Criterion 3 - its significance for migratory and congregatory species (one species).** Therefore this unit of analysis does not qualify for Critical Habitat under Criterion 2 - restricted range and endemic species; Criterion 4 - unique assemblages; Criterion 5 – evolutionary processes; Criterion 6 - ecosystem services; and Criterion 7 – biodiversity of social, economic or cultural importance.

Within this larger unit of analysis there are several grades of Critical Habitat. The most important of these in terms of irreplaceability and vulnerability are defined as IFC Tier 1. **The range of Asiatic Wild Ass *Equus hemionus* in this unit of analysis is currently defined as Tier 1, and covers the majority of the unit of analysis. This is due to this unit of analysis representing more than 10% of this globally Endangered species.** All other habitats within the unit of analysis are currently classified as Tier 2 due to other relevant criteria (see Methods).

The smaller unit of analysis (identified as the spatial unit of analysis for all species other than large mammals, and for unique assemblages, evolutionary processes, and ecosystem services) – comprising Khanbogd and Manlai soums – qualifies as Critical Habitat under criteria 1, 4, 6 and 7 of the 2006 version of PS6 Paragraph 9. The boundary of this Critical Habitat is therefore the boundary of this unit of analysis, encompassing Khanbogd and Manlai soums, a total area of 27,375 km². This unit of analysis triggers **Critical Habitat under four PS6 Paragraph 9 criteria: Criterion 1 - its significance for globally and nationally Endangered species (two species); Criterion 4 – its significance for unique assemblages of species (one assemblage); Criterion 6 – its significance for key ecosystem services (one ecosystem service); and Criterion 7 – its significance for biodiversity of social, economic or cultural importance to local communities (three ecosystem services).** Therefore this unit of analysis does not qualify for Critical Habitat under Criterion 2 - restricted range and endemic species; Criterion 3 – migratory and congregatory species; and Criterion 5 – evolutionary processes. The entirety of this smaller unit of analysis is Tier 2 Critical Habitat.

6.2 Implications

The implications of these conclusions for the Oyu Tolgoi project are that development will be subject to the requirements of Paragraph 10 of the 2006 version of the IFC Performance Standard 6 and its interpretation as set out in the Oyu Tolgoi Project Guidance Note (IFC 2009). Requirements of Paragraph 14 of EBRD Performance Requirement 6 are very similar. These requirements and implications, covered in the forthcoming Biodiversity Management Plan, can be summarised as:

48 See Section 3.5.1

IFC Requirement 1: *“In areas of critical habitat, the client will not implement any project activities unless... There are no **measurable**⁴⁹ **adverse impacts**⁵⁰ on the ability of the critical habitat to support the established **population**⁵¹ of species described in paragraph 9 or the **functions**⁵² of the critical habitat described in paragraph 9”*

Project Implications of Requirement 1: Detailed study of the meaning of terms within the Paragraph 10 section of the Oyu Tolgoi Project Guidance Note is required to ensure the requirements are met in the Fully Biodiversity Management Plan. The terms highlighted in bold above have specific definitions within the Guidance Note, which in turn have significant implications for the scope and type of mitigation options deemed acceptable. In effect, this requirement means that there should be no measurable adverse impacts on Paragraph 9-qualifying biodiversity values over the long term at the broader regional scale (TBC 2010). It is accepted that there may be some measurable negative impacts at the project site scale (particularly in the short term), although these should be avoided, minimized and mitigated as far as possible, following the mitigation hierarchy. Particular attention should be given to managing long-term indirect (including third-party) impacts (especially habitat fragmentation, the spread of invasive species, immigration and consequent induced access) (IFC 2009). Indirect impacts of the Oyu Tolgoi project have not yet been quantified but feature significantly in planning processes such as regional development, immigration planning and agricultural programmes. A biodiversity monitoring and evaluation programme is also required to be put in place to measure losses and gains to Critical Habitat-triggering biodiversity values.

IFC Requirement 2: *“In areas of critical habitat, the client will not implement any project activities unless... There is no **reduction**⁵³ in the **population**⁵⁴ of any recognized critically endangered or endangered species⁵⁵”*

Project Implications of Requirement 2: The impact of potential losses at the project site on species populations should be considered at the global level (or at the national/regional level, where appropriate). This should be interpreted as any significant effect on the ability of the species to persist into the long-term (such as a change in a species' regional [e.g. South-east Gobi], national or global conservation status). A combination of on-site and offset mitigation measures should be used to further the conservation of Critically Endangered and Endangered species qualifying for Paragraph 9. Monitoring and evaluation of all project impacts on these species is required. This does not necessarily imply that species-specific population monitoring is required for all of these species.

49 “Measurable: Identified using a quantitative biodiversity monitoring program throughout the project’s lifecycle. Acceptable ranges of variability must be established for identified biodiversity attributes, which may be the habitat features themselves that render the habitat critical (e.g., threatened species, migratory species) or proxies of those features (e.g., land cover)” (IFC 2009).

50 “Adverse impacts: Project-related direct or indirect impacts that alter identified biodiversity attributes in such a way that the critical habitat cannot withstand or fully recover from the disturbance and therefore cannot persist in the long-term” (IFC 2009).

51 “Population: The global population and/or, in certain instances, the national or regional population that is located in a landscape or seascape unit of sufficient size to ensure its persistence over a long period of time or for many generations” (IFC 2009).

52 “Functions: Ecological and biophysical processes (e.g., hydrologic regimes, climatic regimes, soil chemistry/nutrient cycling, fire, flood and other disturbance regimes, grazing, herbivory, predation) necessary for the critical habitat to persist in the landscape or seascape for the long-term. Note that ecological / biophysical processes are not to be confused with ‘ecosystem services’ unless an identifiable group of persons is directly benefiting from that process as well.” (IFC 2009).

53 “Reduction: A singular or cumulative loss of individuals that will result in a significant population-level effect” (IFC 2009).

54 “Population: The global population of the CR or EN species/subspecies in question and/or the national or regional population of the CR and EN species/subspecies when those species are listed as CR and EN (or the equivalent) on the relevant national or regional threatened species lists” (IFC 2009).

55 As defined by the IUCN Red List of Threatened Species or as defined in any national legislation.

IFC Requirement 3: *“In areas of critical habitat, the client will not implement any project activities unless... Any **lesser impacts**⁵⁶ are mitigated in accordance with paragraph 8”*

Project Implications of Requirement 3: Residual impacts on Critical Habitat (e.g. those that are impossible or not cost effective in terms of benefits to biodiversity to mitigate through avoidance, minimization or rehabilitation) can be mitigated as for Natural Habitat under PS6 Paragraph 8. This mitigation can include the implementation of biodiversity offsets (IFC 2009). Biodiversity offsets are concrete on-the-ground conservation actions which compensate for residual biodiversity losses to achieve no net loss or a net positive impact on biodiversity. Offsets must result in measurable gains – normally in terms of habitat area, quality or species abundances – to qualify for no net loss. The residual impact is the unavoidable impact remaining after mitigation has been exercised to the optimal degree; here, optimal means cost-effective, from the perspective of biodiversity. The regional scale is question is likely to be the South Gobi region (but may be larger or smaller than this, depending on the outcomes of stakeholder engagement on this issue). The ‘gains’ in biodiversity offsets can be derived either from reducing the current rate of loss (such as the deforestation rate at a site); or through increasing the rate of improvement (such as through enhanced habitat restoration).

Tier 1 Critical Habitat is generally not considered to be ‘offsetable’, although there are some situations (for example due to the degree of impact, the client’s capacity and the quality of their biodiversity programme) in which such offsets would be acceptable; this needs to be determined on a case-by-case basis with input from appropriate experts and stakeholders. Some Critical Habitat as per Criteria 4 through 7 (which do not distinguish between Tier 1 and Tier 2) may also be very difficult, or impossible, to offset (IFC 2009).

6.2.1 Further requirements of the Oyu Tolgoi Project Guidance Note on Critical Habitat

Two further important points are made in the Oyu Tolgoi Project Guidance Note (IFC 2009) that apply to all three requirements. First, a biodiversity monitoring programme is essential to ensure that Requirements 1-3 are being met. A set of biodiversity indicators should be developed that specify thresholds for acceptable and unacceptable levels of loss at the site scale for both species and habitats, and these indicators should be incorporated into the broader Social and Environmental Management System (IFC 2009). Second, all three requirements allow for the use of biodiversity offsets to compensate for residual impacts on Critical Habitat biodiversity values, while acknowledging that offsets are not appropriate in all cases (some biodiversity values are not offsetable) (IFC 2009).

The IFC Paragraph 10 requirements do not substantially differ from the requirements set out within the Rio Tinto Biodiversity Strategy with the aim of a Net Positive Impact on biodiversity (Rio Tinto 2004; Rio Tinto 2008). Although it is not a formal requirement of PS6 at present, IFC (2009) also recommend that developers should endeavour to have a net positive impact on Critical Habitat. The similarity between IFC PS6/EBRD PR6 policy and guidance and the Rio Tinto Biodiversity Strategy will allow these PS6 Paragraph 10/PR6 Paragraph 14 requirements to be managed within the Rio Tinto Biodiversity Action Plan process being initiated at the Oyu Tolgoi Project.

6.2.1.1 Biodiversity monitoring and indicators for Oyu Tolgoi

In order to measure the biodiversity losses caused by mining and the gains provided by mitigation and offsets, a carefully designed framework and set of biodiversity metrics and indicators will be required. These should be designed with the characteristics of the Critical Habitat in mind and the triggering values in particular. In the case of this project, a single monitoring system that meets the needs of the Rio Tinto Net Positive Impact system, the 2006 version of the IFC Performance Standard 6 and EBRD Performance Requirement 6 will be required. The monitoring system should have the following characteristics (IFC 2009; TBC 2010):

- Biodiversity monitoring and indicators should be integrated into the broader Social and Environmental Management System (SEMS)

⁵⁶ “Lesser impacts: The residual, remaining impacts (or potential impacts) on biodiversity that are either impossible or not cost effective (in terms of benefits to biodiversity) to mitigate through avoidance, minimization or rehabilitation” (IFC 2009).

- Biodiversity indicators should have quantitative thresholds associated with them⁵⁷, and exceeding those thresholds should trigger a concrete management response.
- Repeated transgression of thresholds will represent non-compliance with Performance Standard 6/Performance Requirement 6.
- Biodiversity indicators are needed to monitor all species for which the units of analysis are Critical Habitat – however monitoring the population of each individual species is not required; for many species it will be sufficient to use proxy indicators (e.g. extent and quality of the species' habitat).
- Participation of local stakeholders and communities is essential.

The monitoring and evaluation programme needs to answer three key questions:

- Are the on-site mitigation measures detailed in the Full Biodiversity Management Plan (incorporating the requirements of PS6 Paragraph 10/PR6 Paragraph 14) being properly implemented?
- What are the pre-mitigation and post-mitigation biodiversity impacts on-site, and do these exceed set quantitative thresholds?
- Are the off-site biodiversity offsets (see Section 6.2.1.2) providing real gains in extent and/or quality of priority habitats (and species populations), such that the project will ultimately have a net positive impact at the regional level?

6.2.1.2 Biodiversity offsets

Further details on Oyu Tolgoi Critical Habitat related Biodiversity Offsets can be found in the dedicated Offsets Strategy and Net Positive Impact Forecast.

6.3 Recommendations

These results and conclusions suggest a number of important next steps for the Oyu Tolgoi project, a number of which are partially underway and will be detailed in the Full Biodiversity Management Plan encompassing PS6 Paragraph 10/PR6 Paragraph 14 requirements and in the Biodiversity Offsets Strategy.

The following research is necessary to understand the options available for the Oyu Tolgoi project with respect to the Critical Habitat determinations made in this report and the requirements of PS6 Paragraph 10/PR6 Paragraph 14. It is not an exhaustive list and it is expected that the research requirements will become clear as impact assessment continues.

This section repeats much of the text found in the Recommendations section of the Executive Summary.

6.3.1 What are the likely impacts? Residual Impact Assessment

- Carry out a risk assessment to understand the potential magnitude and likelihood of impacts upon the biodiversity values identified and prioritised through the baseline reports, Critical Habitat assessment and other studies. This will soon be completed by the Rapid Biodiversity Assessment team in the 'Biodiversity Management Plan options papers'.
- Calculate the total residual impact by measuring (i) the area, and (ii) the quality or condition of habitat of biodiversity value likely to be lost after the mitigation hierarchy has been followed. Start this with overlays of biodiversity maps with mine plan maps to derive a preliminary spatial impact assessment. This will be completed by the Rapid Biodiversity Assessment team in the 'Net Positive Impact forecast'.
- Monitor actual residual impacts including avoidance distances of priority species, and surveys of collisions of such species with powerlines and vehicles. Requirements for this will be developed by the Rapid Biodiversity Assessment team as the 'PS6 Monitoring and Evaluation Requirements'.

⁵⁷ In the same way that levels of chemical pollutants in water are measured with reference to specific thresholds (e.g. parts per million) that should not be exceeded.

6.3.2 What mitigation measures are possible?

- Investigate avoidance, minimisation and restoration options to mitigate impacts caused by proposed infrastructure on the biodiversity values for which Critical Habitat has been defined according to this report. This will soon be completed by the Rapid Biodiversity Assessment team in the 'Biodiversity Management Plan options papers'.
- Involve appropriate project staff and stakeholders in a workshop to explore mitigation options.

6.3.3 Where is the biodiversity and how does it live? Ecology and Distributions

- Create maps of habitat use and preference by all Critical Habitat species (major habitats and also microhabitats where appropriate). This will be completed at a coarse scale by the Rapid Biodiversity Assessment team in the 'Net Positive Impact forecast'.
- Complete further surveys on the distribution of large ungulates in space and time, including surveys of potential road avoidance.
- Research the distribution, ecology, and conservation status of, threats to, the species of plant (*Chesneya/Chesniella mongolica*) which appears to trigger Critical Habitat in the smaller unit of analysis (parallel research on the borderline Critical Habitat species *Caragana gobica* and *Potaninia mongolica* would also be advisable).
- Complete surveys of other key species as per the appropriate Biodiversity Management Plans.

6.3.4 Which sites in the region are possible biodiversity offsets?

A Biodiversity Offsets Strategy and Biodiversity Offsets Plan is currently under preparation. The key steps which are being following in accord with the requirements of PS6 / PR6 include:

- Screen possible offset sites for their potential by assessing their biodiversity assets (e.g. species and habitat in terms of area, abundance and quality) and the potential to conserve or improve them.
- Assess each offset site for social, economic and political factors such as land cost and tenure, local community requirements and the political implications of the different offsets.
- Investigate the conservation interventions required to conserve biodiversity at the different offset sites, such as prevention of habitat loss or eradication of invasive species.
- Ensure additionality of biodiversity gains is possible.
- Combine these assessment into a biodiversity offset options evaluation which meets Rio Tinto Net Positive Impact, IFC Performance Standard 6 and EBRD Performance Requirement 6 requirements simultaneously.

6.3.5 Involvement of project biodiversity stakeholders

- Compile all documentation and distribute in a transparent manner.
- Hold workshops to provide forums for both national and international partners to comment on, and evaluate, all Oyu Tolgoi biodiversity work completed to date.

END OF TECHNICAL REPORT

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Appendix 1. Full list of species screened for Criteria 1-3

No.	⁵⁸ Species	Common name ⁵⁹	CRITERION 1 CR and EN candidate species?	CRITERION 2 Restricted-range and Endemic candidate species?	CRITERION 3 Migratory and congregatory candidate species?
	PLANTS				
1	<i>Arnica iljinii</i>	Iljin's Arnica	Potentially nationally EN	-	-
2	<i>Zigadenus sibiricus</i> (<i>Zygadenus sibiricus</i>)	Siberian Zygadenus	Potentially nationally EN	-	-
3	<i>Biebersteinia odora</i> (<i>Biebersteinia odora</i>)	Fragrant Biebersteinia	Potentially nationally EN	-	-
4	<i>Dictamnus dasycarpus</i>	Feather-fetal Dictamny	Potentially nationally EN	-	-
5	<i>Tofieldia coccinea</i> (<i>Tofieldia coccinea</i>)	Red Tofieldia	Potentially nationally EN	-	-
6	<i>Tulipa uniflora</i>	Single-flowered Tulip	Potentially nationally EN	-	-
7	<i>Cistanche deserticola</i>	Desert Cistanche	Potentially nationally EN	-	-
8	<i>Juniperus sabina</i>	Creeping Juniper	Potentially nationally EN	-	-
9	<i>Anabasis aphylla</i>	Aphyllous Anabasis	Potentially nationally EN	-	-
10	<i>Anabasis eriopoda</i>	Lanose Anabasis	Potentially nationally EN	-	-
11	<i>Valeriana saichanensis</i>	Saikhan Valerian	Potentially nationally EN	-	-
12	<i>Saussurea involucrata</i>	Wraped Saussurea	Potentially nationally EN	-	-
13	<i>Lancea tibetica</i>	Tibetan Lancea	Potentially nationally EN	-	-
14	<i>Horkelia laxiflora?</i> (<i>Dasiphora lactiflora</i>)	White-flowered Dasiphora	Potentially nationally EN	-	-
15	<i>Nymphaea candida</i>	White Water-lily	Potentially nationally EN	-	-
16	<i>Iljinia regelii</i>	Regelian Iljinia	Potentially nationally EN	-	-
17	<i>Chesneya/Chesniella mongolica</i>	Mongolian Chesney	Potentially nationally EN	-	-
18	<i>Viburnum mongolicum</i>	Mongolian Arrow-wood	Potentially nationally EN	-	-
19	<i>Viburnum sargentii</i>	Sargent's White Rod	Potentially nationally EN	-	-
20	<i>Limonium aureum</i>	Golden Limonium	Potentially nationally EN	-	-
21	<i>Arnebia guttata</i>	Yellow Arnebia	Potentially nationally EN	-	-
22	<i>Sambucus manshurica</i>	Manjurian Elder	Potentially nationally EN	-	-
23	<i>Vicia tsydenii</i>	Tseden's Vetch	Potentially nationally EN	-	-
24	<i>Rheum uninerve</i>	Rhubarb	Potentially nationally EN	-	-
25	<i>Acorus calamus</i>	Sedgerush	Potentially nationally EN	-	-
26	<i>Androsace longifolia</i>	Longleafed Androsace	Potentially nationally EN	-	-
27	<i>Gentiana macrophylla</i>	Macrophyllous Gentian	Potentially nationally EN	-	-
28	<i>Gentiana pulmonaria</i>	Swelt Gentian	Potentially nationally EN	-	-
29	<i>Typha minima</i>	Smaller Cat's Tail	Potentially nationally EN	-	-

58 Many scientific names in the Mongolian Law on Natural Plants are misspelled or out of date. Where this is the case, names in the law are listed in parentheses after correct names.

59 Most common names for plants are taken from the Mongolian Law on Natural Plants and are rarely used elsewhere (most of these species are only regularly referred to by their scientific names).

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30	<i>Malva sylvestris (Malva mauritiana)</i>	Mauritanian Mallow	Potentially nationally EN	-	-
31	<i>Trollius sajanensis (Trollius sajanense)</i>	Syanian Trollflower	Potentially nationally EN	-	-
32	<i>Elaeagnus moorcroftii</i>	Moorcroft's Eleagnus	Potentially nationally EN	-	-
33	<i>Abies sibirica</i>	Siberian Fir	Potentially nationally EN	-	-
34	<i>Clematis glauca (Clematis glauca)</i>	Glaucous Leatherflower	Potentially nationally EN	-	-
35	<i>Maianthemum dilatatum (Majanthemum dilatatum)</i>	Wide Beadruby	Potentially nationally EN	-	-
36	<i>Cardamine parviflora</i>	Small-flowered Bitter-cress	Potentially nationally EN	-	-
37	<i>Swertia banzragczii (Sertia banzaragczii)</i>	Banzgrach's Swertia	Potentially nationally EN	-	-
38	<i>Ephedra equisetina</i>	Horsetailed Ephedra	Potentially nationally EN	-	-
39	<i>Ephedra fedtschenkoae</i>	Fedchencko Ephedra	Potentially nationally EN	-	-
40	<i>Solidago dahurica</i>	Dahurian Solidago	Potentially nationally EN	-	-
41	<i>Asterothamnus centrali-asiaticus (Asterthamnus centrali-asiaticus)</i>	Central Asian Asterthemny	Potentially nationally EN	-	-
42	<i>Sophora flavescens</i>	Yellow Sophora	Potentially nationally EN	-	-
43	<i>Sedum pallescens</i>	Plume Stonecrop	Potentially nationally EN	-	-
44	<i>Helichrysum arenarium</i>	Sand Strawflower	Potentially nationally EN	-	-
45	<i>Ammopiptanthus mongolicus</i>	Mongolian Ammopipthanth	Potentially nationally EN	-	-
46	<i>Polygonatum humile</i>	Solomon's Seal	Potentially nationally EN	-	-
47	<i>Salvia deserta</i>	Desert Sage	Potentially nationally EN	-	-
48	<i>Rhodiola rosea</i>	Roseroot Stonecrop	Potentially nationally EN	-	-
49	<i>Scheuchzeria palustris</i>	Paludal Scheuchzeria	Potentially nationally EN	-	-
50	<i>Viola brachyceras (Viola brachychera)</i>	Brachycerous Violet	Potentially nationally EN	-	-
51	<i>Platanthera bifolia (Plantanthera bifolia)</i>	Lesser Butterfly-orchid	Potentially nationally EN	-	-
52	<i>Anemarrhena asphodeloides (Anenarrhena asphodeloides)</i>		Potentially nationally EN	-	-
53	<i>Gymnocarpus przewalskii</i>	Przewalski's Gymnocarpus	Potentially nationally EN	-	-
54	<i>Vaccinium myrtillus</i>	Bilberry	Potentially nationally EN	-	-
55	<i>Dryopteris dilatata</i>	Wide Dryopteria	Potentially nationally EN	-	-
56	<i>Epipogium aphyllum (Epipogium ephyllum)</i>	Aphyllous Epipogium	Potentially nationally EN	-	-
57	<i>Oxytropis acanthacea</i>	Acicular Oxytrope	Potentially nationally EN	-	-
58	<i>Oxytropis fragilifolia</i>	Fragile-leaved Oxytrope	Potentially nationally EN	-	-
59	<i>Oxytropis grubovii</i>	Grubov's Oxytrope	Potentially nationally EN	-	-
60	<i>Peganum harmala</i>	Common Pegania	Potentially nationally EN	-	-
61	<i>Cypripedium macranthum (Cypripedium macranthum)</i>	Grand Lady's-slipper Orchid	Potentially nationally EN	-	-
62	<i>Cypripedium calceolus (Cypripedium calceolus)</i>	Yellow Lady's-slipper Orchid	Potentially nationally EN	-	-
63	<i>Nuphar pumila</i>	Small Candock	Potentially nationally EN	-	-
64	<i>Gueldenstaedtia monophylla (Gueldenstaedtia monophylla)</i>	Monophyllous Gueldenstaedtia	Potentially nationally EN	-	-
65	<i>Lilium martagon</i>	Common Turksdap Lily	Potentially nationally EN	-	-

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66	<i>Lilium pensylvanicum/dauricum</i>	Candlestick Lily	Potentially nationally EN	-	-
67	<i>Rosa kokanica</i>	Kokand Rose	Potentially nationally EN	-	-
68	<i>Rosa laxa</i>	Friable Rose	Potentially nationally EN	-	-
69	<i>Allium macrostemon (Allium macrosternon)</i>	Macrandrous Onion	Potentially nationally EN	-	-
70	<i>Allium obliquum</i>	Wild Garlic Onion	Potentially nationally EN	-	-
71	<i>Sanguisorba alpina</i>	Alpian Sanguisorbia	Potentially nationally EN	-	-
72	<i>Sagittaria natans</i>	Floating Arrow Head	Potentially nationally EN	-	-
73	<i>Saxifraga hirculus</i>	Yellow Marsh Saxifrage	Potentially nationally EN	-	-
74	<i>Mitella nuda</i>	Naked Mitrewort	Potentially nationally EN	-	-
75	<i>Dendranthemum sinuatum (Chrysanthemum sinuatum)</i>	Emarginate Chrysanthemia	Potentially nationally EN	-	-
76	<i>Brachanthemum gobicum</i>	Gobi Brachanthemia	Potentially nationally EN	-	-
77	<i>Brachanthemum mongolorum</i>	Mongolian Brachanthemia	Potentially nationally EN	-	-
78	<i>Phlomoides oreophila (Phlomis oreophila)</i>	Mountain Phlomy	Potentially nationally EN	-	-
79	<i>Zizania latifolia</i>	Platyphyllous Rice	Potentially nationally EN	-	-
80	<i>Calypso bulbosa</i>	Clovy Calypso	Potentially nationally EN	-	-
81	<i>Vincetoxicum sibiricum</i>	Siberian Vincetoxic	Potentially nationally EN	-	-
82	<i>Rhododendron aureum</i>	Golden Rhododendron	Potentially nationally EN	-	-
83	<i>Rhododendron adamsii</i>	Adams' Rhododendron	Potentially nationally EN	-	-
84	<i>Rhododendron dauuricum (Rhododendron dahuricum)</i>	Dahurian Rhododendron	Potentially nationally EN	-	-
85	<i>Rhododendron ledebourii</i>	Ledebour's Rhododendron	Potentially nationally EN	-	-
86	<i>Rhododendron parvifolium (Rhododendron pravifolium)</i>	Microphyllous Rhododendron	Potentially nationally EN	-	-
87	<i>Sorbaria sorbifolia</i>	Sorbiphyllous Sorbaria	Potentially nationally EN	-	-
88	<i>Aquilegia ganboldii</i>	Ganbold's Columbian	Potentially nationally EN	-	-
89	<i>Incarvillea potaninii</i>	Potanin's Incarvillea	Potentially nationally EN	-	-
90	<i>Populus diversifolia</i>	Swamp Cottonwood	Potentially nationally EN	-	-
91	<i>Drosera rotundifolia (Drosera rotundifolia)</i>	Round-leaved Sundew	Potentially nationally EN	-	-
92	<i>Drosera anglica</i>	English Sundew	Potentially nationally EN	-	-
93	<i>Ferula ferulaeodes (Ferula ferulaeoides)</i>		Potentially nationally EN	-	-
94	<i>Caragana gobica (Carragana gobica)</i>	Gobi Pea Shrub	Potentially nationally EN	-	-
95	<i>Caragana brachypoda (Carragana brachypoda)</i>	Brachypodous Pea Shrub	Potentially nationally EN	-	-
96	<i>Caragana tibetica (Carragana tibetica)</i>	Tibetan Pea Shrub	Potentially nationally EN	-	-
97	<i>Nematonostoc flagelliforme</i>		Potentially nationally EN	-	-
98	<i>Olgaea leucophylla</i>	White-leaved Olgaea	Potentially nationally EN	-	-
99	<i>Potaninia mongolica (Potatinia mongolica)</i>	Mongolian Potaninia	Potentially nationally EN	-	-
100	<i>Hyalea pulchella (Centaurea pulchella)</i>	Beautiful Knapweed			
101	<i>Rhaponticum carthamoides (Rhaponticum carthamnoides)</i>	Maral Root	Potentially nationally EN	-	-

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102	<i>Convallaria keiskei</i>	Keiski's Lily-of-the-valley	Potentially nationally EN	-	-
103	<i>Codonopsis clematidea</i>	Asian Bell Flower	Potentially nationally EN	-	-
104	<i>Halimodendron halodendron</i>	Common Salttree	Potentially nationally EN	-	-
105	<i>Aconitum kusnezoffii</i> (<i>Aconitum kusnezoffii</i>)	Kuznetsov's Monkshood	Potentially nationally EN	-	-
106	<i>Zygophyllum potaninii</i>	Potanin's Zygophyllia	Potentially nationally EN	-	-
107	<i>Pedicularis altaica</i>	Altai Lousewort	Potentially nationally EN	-	-
108	<i>Pedicularis abrotanifolia</i>	Wornwood-leafed Lousewort	Potentially nationally EN	-	-
109	<i>Adonis mongolica</i>	Mongolian Adonis	Potentially nationally EN	-	-
110	<i>Physochlaina albiflora</i>	White-flowered Physochlaina	Potentially nationally EN	-	-
111	<i>Oxycoccus microcarpus</i>	Bog Cranberry	Potentially nationally EN	-	-
112	<i>Orchis militaris</i>	Military Orchid	Potentially nationally EN	-	-
113	<i>Dactylorhiza fuchsii</i> (<i>Orchis fuchsii</i>)	Common Spotted Orchid	Potentially nationally EN	-	-
114	<i>Neottianthe cucullata</i>	Cucullated Neottianthe	Potentially nationally EN	-	-
115	<i>Neottia camtschatea</i>	Kamchatka Neottia	Potentially nationally EN	-	-
116	<i>Paeonia lactiflora</i>	White-flowered Peony	Potentially nationally EN	-	-
117	<i>Paris verticillata</i>	Whorled Paris	Potentially nationally EN	-	-
118	<i>Glycyrrhiza squamulosa</i>	Barunkhurain Licorice	Potentially nationally EN	-	-
119	<i>Jurinea mongolica</i>	Mongolian Jurinea	Potentially nationally EN	-	-
120	<i>Gagea hiensis</i> (<i>Gagea heensis</i>)	Heensi Gagea	Potentially nationally EN	-	-
121	<i>Tugarinovia mongolica</i>	Mongolian Tugarinovy	Potentially nationally EN	-	-
122	<i>Artemisia lagocephala</i> (<i>Artemisia lithophilica</i>)	Quarred Wormwood	Potentially nationally EN	-	-
123	<i>Artemisia tomentella</i>	Fine-filamented Wormwood	Potentially nationally EN	-	-
124	<i>Artemisia xanthochroa</i>	Yellow Wormwood	Potentially nationally EN	-	-
125	<i>Aspicilia osculenta</i> (<i>Aspicilia osculenta</i>)	Manna Lichen	Potentially nationally EN	-	-
126	<i>Hedysarum fruticosum</i>	Friticose Tick Trefoil	Potentially nationally EN	-	-
127	<i>Hedysarum sangilense</i> (<i>Hedysarum sanilense</i>)	Tsengel's Tick Trefoil	Potentially nationally EN	-	-
128	<i>Botrychium lanceolatum</i>	Lanceolated Botrychium	Potentially nationally EN	-	-
129	<i>Corallorhiza trifida</i> (<i>Corrallorhiza trifida</i>)	Trifid Coralroot	Potentially nationally EN	-	-
130	<i>Lycopodium clavatum</i>	Clavated Club-moss	Potentially nationally EN	-	-
131	<i>Lycopodium alpinum</i>	Alpine Club-moss	Potentially nationally EN	-	-
132	<i>Rhamnus parvifolia</i>	Microphyllous Buckthorn	Potentially nationally EN	-	-
133	<i>Rhamnus ussuriensis</i> (<i>Rhamnus ussuriensis</i>)	Ussurian Buckthorn	Potentially nationally EN	-	-
	MAMMALS				
134	<i>Spermophilus erythrogenys</i>	Red-cheeked Ground Squirrel	-		
135	<i>Spermophilus pallidicauda</i>	Pallid Ground Squirrel	-		
136	<i>Allactaga balikunica</i>	Balikul Jerboa	-	-	-

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137	<i>Allactaga bullata</i>	Gobi Jerboa	-	-	-
138	<i>Allactaga sibirica</i>	Siberian Jerboa/Mongolian Five-toed Jerboa	-	-	-
139	<i>Cardiocranius paradoxus</i>	Five-toed Pygmy Jerboa	-	-	-
140	<i>Cricetulus barabensis</i>	Striped Dwarf Hamster	-	-	-
141	<i>Dipus sagitta</i>	Northern Three-toed Jerboa/Hairy-footed Jerboa	-	-	-
142	<i>Euchoreutes naso</i>	Long-eared Jerboa	-	-	-
143	<i>Pygeretmus pumilio</i>	Dwarf Fat-tailed Jerboa	-	-	-
144	<i>Salpingotus crassicauda</i>	Thick-tailed Pygmy Jerboa	-	-	-
145	<i>Salpingotus kozlovi</i>	Koslov's Pygmy Jerboa	-	-	-
146	<i>Stylodipus andrewsi</i>	Andrews's Three-toed Jerboa/Mongolian Jerboa	-	-	-
147	<i>Allocricetulus curtatus</i>	Mongolian Hamster	-	-	-
148	<i>Cricetulus longicaudatus</i>	Long-tailed Dwarf Hamster	-	-	-
149	<i>Cricetulus migratorius</i>	Grey Hamster/Grey Dwarf Hamster	-	-	migratory
150	<i>Cricetulus sokolovi</i>	Sokolov's Dwarf Hamster	-	-	-
151	<i>Phodopus campbelli</i>	Campbell's Hamster	-	-	-
152	<i>Phodopus roborovskii</i>	Desert Hamster/Roborowski's Hamster	-	-	-
153	<i>Alticola semicanus</i>	Mongolian Silver Vole/Royle's Mountain Vole	-	-	-
154	<i>Ellobius tancrei</i>	Zaisan Mole Vole	-	-	-
155	<i>Eolagurus przewalskii</i>	Przewalski's Steppe Lemming	-	-	-
156	<i>Meriones meridianus</i>	Mid-day Gerbil/Mid-day Jerd	-	-	-
157	<i>Meriones unguiculatus</i>	Mongolian Gerbil/Mongolian Jerd	-	-	-
158	<i>Rhombomys opimus</i>	Great Gerbil	-	-	-
159	<i>Myospalax psilurus</i>	Manchurian Zokor/Transbaikal Zokor	-	-	-
160	<i>Ochotona dauurica</i>	Daurian Pika	-	-	-
161	<i>Ochotona pallasii</i>	Pallas's Pika	-	-	-
162	<i>Lepus tolai</i>	Tolai Hare	-	-	-
163	<i>Hemiechinus auritus</i>	Long-eared Hedgehog	-	-	-
164	<i>Mesechinus dauuricus</i>	Daurian Hedgehog	-	-	-
165	<i>Crocidura sibirica</i>	Siberian Shrew	-	-	-
166	<i>Crocidura suaveolens</i>	Lesser Shrew	-	-	-
167	<i>Eptesicus gobiensis</i>	Gobi Big Brown Bat	-	-	-
168	<i>Pipistrellus alaschanicus</i>	Alashanian Pipistrelle	-	-	congregatory
169	<i>Myotis aurascens</i>	Steppe Whiskered Bat	-	-	migratory/congregatory
170	<i>Plecotus kozlovi</i>		-	-	congregatory
171	<i>Vespertilio murinus</i>	Particoloured Bat	-	-	migratory/congregatory
172	<i>Felis silvestris</i>	Wild Cat	-	-	-

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173	<i>Lynx lynx</i>	Eurasian Lynx	-	-	-
174	<i>Otocolobus manul</i>	Pallas's Cat	-	-	-
175	<i>Panthera uncia</i>	Snow Leopard	EN	-	-
176	<i>Canis lupus</i>	Grey Wolf/Timber Wolf	-	-	-
177	<i>Vulpes corsac</i>	Corsac Fox	-	-	-
178	<i>Vulpes vulpes</i>	Red Fox	-	-	-
179	<i>Martes foina</i>	Beech Marten	-	-	-
180	<i>Meles leucurus</i>	Asian Badger	-	-	-
181	<i>Mustela erminea</i>	Stoat	-	-	-
182	<i>Mustela eversmanni</i>	Steppe Polecat	-	-	-
183	<i>Vormela peregusna</i>	Marbled Polecat	-	-	-
184	<i>Equus hemionus</i>	Asiatic Wild Ass or 'Khulan'	EN	-	-
185	<i>Capra sibirica</i>	Siberian Ibex/Asiatic Ibex	-	-	-
186	<i>Ovis ammon</i>	Argali	EN (nationally)	-	-
187	<i>Gazella subgutturosa</i>	Goitered Gazelle	-	-	migratory
188	<i>Procapra gutturosa</i>	Mongolian Gazelle	EN (nationally)	-	-
189	<i>Moschus moschiferus</i>	Siberian Musk Deer	-	-	-
	BIRDS				
190	<i>Podiceps auritus</i>	Horned Grebe	-	-	migratory
191	<i>Phalacrocorax carbo</i>	Great Cormorant	-	-	migratory
192	<i>Ardeola bacchus</i>	Chinese Pond-heron	-	-	migratory
193	<i>Casmerodius albus</i>	Great Egret	-	-	migratory
194	<i>Ardea cinerea</i>	Grey Heron	-	-	migratory
195	<i>Platalea leucoridia</i>	Eurasian Spoonbill	-	-	migratory
196	<i>Ciconia nigra</i>	Black Stork	-	-	migratory
197	<i>Anser anser</i>	Greylag Goose	-	-	migratory
198	<i>Anser fabilis</i>	Bean Goose	-	-	migratory
199	<i>Anser indicus</i>	Bar-headed Goose	-	-	migratory
200	<i>Anser cygnoides</i>	Swan Goose	-	-	migratory
201	<i>Cygnus cygnus</i>	Whooper Swan	-	-	migratory
202	<i>Tadorna tadorna</i>	Common Shelduck	-	-	migratory
203	<i>Tadorna ferruginea</i>	Ruddy Shelduck	-	-	migratory
204	<i>Anas platyrhynchos</i>	Mallard	-	-	migratory
205	<i>Anas zonorhyncha</i>	Eastern Spot-billed Duck	-	-	migratory
206	<i>Anas crecca</i>	Common Teal	-	-	migratory
207	<i>Anas strepera</i>	Gadwall	-	-	migratory

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208	<i>Anas zonorhyncha</i>	Eurasian Wigeon	-	-	migratory
209	<i>Anas acuta</i>	Northern Pintail	-	-	migratory
210	<i>Anas querquedula</i>	Garganey	-	-	migratory
211	<i>Anas clypeata</i>	Northern Shoveler	-	-	migratory
212	<i>Aythya ferina</i>	Common Pochard	-	-	migratory
213	<i>Aythya nyroca</i>	Ferruginous Duck	-	-	migratory
214	<i>Aythya fuligula</i>	Tufted Duck	-	-	migratory
215	<i>Bucephala clangula</i>	Common Goldeneye	-	-	migratory
216	<i>Milvus migrans</i>	Black Kite	-	-	migratory
217	<i>Accipiter nisus</i>	Eurasian Sparrowhawk	-	-	migratory
218	<i>Buteo hemilasius</i>	Upland Buzzard	-	-	
219	<i>Buteo rufinus</i>	Long-legged Buzzard	-	-	migratory
220	<i>Circaetus gallicus</i>	Short-toed Snake-eagle	EN (nationally)	-	migratory
221	<i>Aquila nipalensis</i>	Steppe Eagle	-	-	migratory
222	<i>Aquila chrysaetos</i>	Golden Eagle	-	-	
223	<i>Haliaeetus albicilla</i>	White-tailed Eagle	-	-	migratory
224	<i>Gypaetus barbatus</i>	Lammergeier	-	-	
225	<i>Neophron percnopterus</i>	Egyptian Vulture	EN	-	
226	<i>Aegypius monachus</i>	Cinereous Vulture	-	-	
227	<i>Gyps himalayensis</i>	Himalayan Vulture	-	-	migratory
228	<i>Falco cherrug</i>	Saker Falcon	-	-	migratory
229	<i>Falco peregrinus</i>	Peregrine Falcon	-	-	migratory
230	<i>Falco subbuteo</i>	Eurasian Hobby	-	-	migratory
231	<i>Falco amurensis</i>	Amur Falcon	-	-	migratory
232	<i>Falco columbarius</i>	Merlin	-	-	migratory
233	<i>Falco naumanni</i>	Lesser Kestrel	-	-	migratory
234	<i>Falco tinnunculus</i>	Common Kestrel	-	-	migratory
235	<i>Alectoris chukar</i>	Chukar	-	-	
236	<i>Perdix dauurica</i>	Daurian Partridge	-	-	
237	<i>Coturnix japonica</i>	Japanese Quail	-	-	migratory
238	<i>Grus virgo</i>	Demoiselle Crane	-	-	migratory
239	<i>Fulica atra</i>	Common Coot	-	-	migratory
240	<i>Otis tarda</i>	Great Bustard	-	-	migratory
241	<i>Chlamydotis undulata</i>	Houbara Bustard	-	-	migratory
242	<i>Pluvialis squatarola</i>	Grey Plover	-	-	migratory
243	<i>Pluvialis fulva</i>	Pacific Golden Plover	-	-	migratory

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244	<i>Charadrius dubius</i>	Little Ringed Plover	-	-	migratory
245	<i>Charadrius alexandrinus</i>	Kentish Plover	-	-	migratory
246	<i>Charadrius leschenaultii</i>	Greater Sand Plover	-	-	migratory
247	<i>Charadrius veredus</i>	Oriental Plover	-	-	migratory
248	<i>Vanellus vanellus</i>	Northern Lapwing	-	-	migratory
249	<i>Himantopus himantopus</i>	Black-winged Stilt	-	-	migratory
250	<i>Recurvirostra avosetta</i>	Pied Avocet	-	-	migratory
251	<i>Tringa ochropus</i>	Green Sandpiper	-	-	migratory
252	<i>Tringa glareola</i>	Wood Sandpiper	-	-	migratory
253	<i>Tringa nebularia</i>	Common Greenshank	-	-	migratory
254	<i>Tringa totanus</i>	Common Redshank	-	-	migratory
255	<i>Tringa erythropus</i>	Spotted Redshank	-	-	migratory
256	<i>Tringa stagnatilis</i>	Marsh Sandpiper	-	-	migratory
257	<i>Actitis hypoleucos</i>	Common Sandpiper	-	-	migratory
258	<i>Phalaropus lobatus</i>	Red-necked Phalarope	-	-	migratory
259	<i>Calidris minuta</i>	Little Stint	-	-	migratory
260	<i>Calidris subminuta</i>	Long-toed Stint	-	-	migratory
261	<i>Calidris ruficollis</i>	Red-necked Stint	-	-	migratory
262	<i>Calidris temminckii</i>	Temminck's Stint	-	-	migratory
263	<i>Calidris ferruginea</i>	Curlew Sandpiper	-	-	migratory
264	<i>Limicola falcinellus</i>	Broad-billed Sandpiper	-	-	migratory
265	<i>Gallinago gallinago</i>	Common Snipe	-	-	migratory
266	<i>Scolopax rusticola</i>	Eurasian Woodcock	-	-	migratory
267	<i>Limosa limosa</i>	Black-tailed Godwit	-	-	migratory
268	<i>Larus relictus</i>	Relict Gull	EN (nationally)	-	migratory
269	<i>Larus ridibundus</i>	Black-headed Gull	-	-	migratory
270	<i>Larus argentatus</i>	Herring Gull	-	-	migratory
271	<i>Syrrhaptes paradoxus</i>	Pallas's Sandgrouse	-	-	migratory/ congregatory
272	<i>Columba livia</i>	Rock Pigeon	-	-	
273	<i>Columba rupestris</i>	Hill Pigeon	-	-	
274	<i>Streptopelia decaocto</i>	Eurasian Collared-dove	-	-	
275	<i>Streptopelia orientalis</i>	Oriental Turtle-dove	-	-	migratory
276	<i>Cuculus canorus</i>	Common Cuckoo	-	-	migratory
277	<i>Bubo bubo</i>	Eurasian Eagle-owl	-	-	migratory
278	<i>Asio otus</i>	Long-eared Owl	-	-	migratory
279	<i>Athene noctua</i>	Little Owl	-	-	migratory

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280	<i>Caprimulgus europaeus</i>	Eurasian Nightjar	-	-	migratory
281	<i>Hirundapus caudacutus</i>	White-throated Needletail	-	-	migratory
282	<i>Apus apus</i>	Common Swift	-	-	migratory
283	<i>Apus pacificus</i>	Fork-tailed Swift	-	-	migratory
284	<i>Upupa epops</i>	Eurasian Hoopoe	-	-	migratory
285	<i>Dendrocopos major</i>	Great Spotted Woodpecker	-	-	migratory
286	<i>Jynx torquilla</i>	Eurasian Wryneck	-	-	migratory
287	<i>Riparia riparia</i>	Sand Martin	-	-	migratory
288	<i>Hirundo rupestris</i>	Eurasian Crag-martin	-	-	migratory
289	<i>Hirundo rustica</i>	Barn Swallow	-	-	migratory
290	<i>Delichon urbicum</i>	Northern House-martin	-	-	migratory
291	<i>Galerida cristata</i>	Crested Lark	-	-	
292	<i>Calandrella brachydactyla</i>	Greater Short-toed Lark	-	-	migratory
293	<i>Calandrella rufescens</i>	Lesser Short-toed Lark	-	-	migratory
294	<i>Calandrella cheelensis</i>	Asian Short-toed Lark	-	-	migratory
295	<i>Melanocorypha mongolica</i>	Mongolian Lark	-	-	migratory
296	<i>Eremophila alpestris</i>	Horned Lark	-	-	migratory
297	<i>Alauda arvensis</i>	Eurasian Skylark	-	-	migratory
298	<i>Anthus richardi</i>	Richard's Pipit	-	-	migratory
299	<i>Anthus godlewskii</i>	Blyth's Pipit	-	-	migratory
300	<i>Anthus campestris</i>	Tawny Pipit	-	-	migratory
301	<i>Anthus hodgsoni</i>	Olive-backed Pipit	-	-	migratory
302	<i>Anthus spinoletta</i>	Water Pipit	-	-	migratory
303	<i>Motacilla flava</i>	Yellow Wagtail	-	-	migratory
304	<i>Motacilla citreola</i>	Citrine Wagtail	-	-	migratory
305	<i>Motacilla cinerea</i>	Grey Wagtail	-	-	migratory
306	<i>Motacilla alba</i>	White Wagtail	-	-	migratory
307	<i>Lanius cristatus</i>	Brown Shrike	-	-	migratory
308	<i>Lanius isabellinus</i>	Rufous-tailed Shrike	-	-	migratory
309	<i>Lanius excubitor</i>	Great Grey Shrike	-	-	migratory
310	<i>Sturnus cineraceus</i>	White-cheeked Starling	-	-	migratory
311	<i>Sturnus roseus</i>	Rosy Starling	-	-	migratory
312	<i>Podoces hendersoni</i>	Mongolian Ground-jay	-	-	
313	<i>Pica pica</i>	Black-billed Magpie	-	-	
314	<i>Pyrrhocorax pyrrhocorax</i>	Red-billed Chough	-	-	
315	<i>Corvus dauuricus</i>	Daurian Jackdaw	-	-	migratory

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316	<i>Corvus corone</i>	Carrion Crow	-	-	
317	<i>Corvus corax</i>	Common Raven	-	-	
318	<i>Corvus fugilegus</i>	Rook	-	-	migratory
319	<i>Prunella collaris</i>	Alpine Accentor	-	-	
320	<i>Prunella fulvescens</i>	Brown Accentor	-	-	migratory
321	<i>Prunella montanella</i>	Siberian Accentor	-	-	migratory
322	<i>Prunella koslowi</i>	Mongolian Accentor	-	Yes	migratory
323	<i>Locustella certhiola</i>	Pallas's Grasshopper-warbler	-	-	migratory
324	<i>Locustella naevia</i>	Common Grasshopper-warbler	-	-	migratory
325	<i>Hippolais caligata</i>	Booted Warbler	-	-	migratory
326	<i>Sylvia nisoria</i>	Barred Warbler	-	-	migratory
327	<i>Sylvia communis</i>	Common Whitethroat	-	-	migratory
328	<i>Sylvia curruca</i>	Lesser Whitethroat	-	-	migratory
329	<i>Sylvia nana</i>	Desert Warbler	-	-	migratory
330	<i>Phylloscopus collybita</i>	Common Chiffchaff	-	-	migratory
331	<i>Phylloscopus borealis</i>	Arctic Warbler	-	-	migratory
332	<i>Phylloscopus trochiloides</i>	Greenish Warbler	-	-	migratory
333	<i>Phylloscopus inornatus</i>	Inornate Warbler	-	-	migratory
334	<i>Phylloscopus progregulus</i>	Lemon-rumped Warbler	-	-	migratory
335	<i>Phylloscopus fuscatus</i>	Dusky Warbler	-	-	migratory
336	<i>Phylloscopus griseolus</i>	Sulphur-bellied Warbler	-	-	migratory
337	<i>Ficedula albicilla</i>	Taiga Flycatcher	-	-	migratory
338	<i>Muscicapa striata</i>	Spotted Flycatcher	-	-	migratory
339	<i>Muscicapa sibirica</i>	Dark-sided Flycatcher	-	-	migratory
340	<i>Muscicapa dauurica</i>	Asian Brown Flycatcher	-	-	migratory
341	<i>Saxicola torquatus</i>	Common Stonechat	-	-	migratory
342	<i>Oenanthe oenanthe</i>	Northern Wheatear	-	-	migratory
343	<i>Oenanthe pleschanka</i>	Pied Wheatear	-	-	migratory
344	<i>Oenanthe deserti</i>	Desert Wheatear	-	-	migratory
345	<i>Oenanthe isabellina</i>	Isabelline Wheatear	-	-	migratory
346	<i>Monticola saxatilis</i>	Rufous-tailed Rock-thrush	-	-	migratory
347	<i>Phoenicurus erythronotus</i>	Rufous-backed Redstart	-	-	migratory
348	<i>Phoenicurus aureus</i>	Daurian Redstart	-	-	migratory
349	<i>Phoenicurus erythrogastrus</i>	White-winged Redstart	-	-	migratory
350	<i>Luscinia calliope</i>	Siberian Rubythroat	-	-	migratory
351	<i>Luscinia svecica</i>	Bluethroat	-	-	migratory

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352	<i>Luscinia cyane</i>	Siberian Blue Robin	-	-	migratory
353	<i>Tarsiger cyanurus</i>	Orange-flanked Bush-robin	-	-	migratory
354	<i>Turdus obscurus</i>	Eyebrowed Thrush	-	-	migratory
355	<i>Turdus ruficollis</i>	Dark-throated Thrush	-	-	migratory
356	<i>Turdus naumanni</i>	Dusky Thrush	-	-	migratory
357	<i>Turdus pilaris</i>	Fieldfare	-	-	migratory
358	<i>Zoothera dauma</i>	Eurasian Scaly Thrush	-	-	migratory
359	<i>Remiz coronatus</i>	White-crowned Penduline-tit	-	-	migratory
360	<i>Tichodroma muraria</i>	Wallcreeper	-	-	migratory
361	<i>Passer montanus</i>	Eurasian Tree Sparrow	-	-	
362	<i>Passer domesticus</i>	House Sparrow	-	-	
363	<i>Passer ammodendri</i>	Saxaul Sparrow	-	-	
364	<i>Petronia petronia</i>	Rock Sparrow	-	-	
365	<i>Montifringilla nivalis</i>	White-winged Snowfinch	-	-	
366	<i>Fringilla coelebs</i>	Eurasian Chaffinch	-	-	migratory
367	<i>Fringilla montifringilla</i>	Brambling	-	-	migratory
368	<i>Carduelis flammea</i>	Common Redpoll	-	-	migratory
369	<i>Carduelis flavirostris</i>	Twite	-	-	migratory
370	<i>Eremopsaltria mongolicus</i>	Mongolian Finch	-	-	
371	<i>Carpodacus erythrinus</i>	Common Rosefinch	-	-	migratory
372	<i>Carpodacus pulcherrimus</i>	Beautiful Rosefinch	-	-	migratory
373	<i>Carpodacus rubicilla</i>	Great Rosefinch	-	-	migratory
374	<i>Coccothraustes coccothraustes</i>	Hawfinch	-	-	migratory
375	<i>Emberiza leucocephalos</i>	Pine Bunting	-	-	migratory
376	<i>Emberiza godlewskii</i>	Godlewski's Bunting	-	-	migratory
377	<i>Emberiza cioides</i>	Meadow Bunting	-	-	migratory
378	<i>Emberiza fucata</i>	Chestnut-eared Bunting	-	-	migratory
379	<i>Emberiza schoeniclus</i>	Reed Bunting	-	-	migratory
380	<i>Emberiza pallasii</i>	Pallas's Bunting	-	-	migratory
381	<i>Emberiza rustica</i>	Rustic Bunting	-	-	migratory
382	<i>Emberiza pusilla</i>	Little Bunting	-	-	migratory
383	<i>Emberiza spodocephala</i>	Black-faced Bunting	-	-	migratory
384	<i>Emberiza aureola</i>	Yellow-breasted Bunting	-	-	migratory
385	<i>Emberiza buchanani</i>	Grey-necked Bunting	-	-	migratory
386	<i>Calcarius lapponicus</i>	Lapland Longspur	-	-	migratory
	AMPHIBIANS				

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387	<i>Pseudepidalea raddei</i>	Mongolian Toad	-	-	-
	REPTILES				
388	<i>Alsophylax pipiens</i>	Kapischer Even-fingered Gecko	-	-	-
389	<i>Teratoscincus przewalskii</i>	Przewalski's Wonder Gecko	-	-	-
390	<i>Phrynocephalus przewalskii</i>	Tuva Toad-headed Agama	-	-	-
391	<i>Eremias argus</i>	Mongolian Racerunner	-	-	-
392	<i>Eremias multiocellata</i>	Multi-ocellated Racerunner	-	-	-
393	<i>Eremias przewalskii</i>	Gobi Racerunner	-	-	-
394	<i>Eremias vermiculata</i>	Variigated Racerunner	-	-	-
395	<i>Eryx tataricus</i>	Tatary Sand Boa	-	-	-
396	<i>Coluber spinalis</i>	Slender Racer	-	-	-
397	<i>Elaphe dione</i>	Steppes Rat Snake	-	-	-
398	<i>Psammophis lineolatus</i>	Steppe Ribbon Racer	-	-	-
399	<i>Gloydius halys</i>	Halys Pit Viper	-	-	-

