

SECTION D: ENVIRONMENTAL AND SOCIAL CONSTRUCTION MANAGEMENT PLANS

D7: WATER RESOURCES CONSTRUCTION MANAGEMENT PLAN

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7 WATER RESOURCES MANAGEMENT PLAN

7.1 INTRODUCTION

This Water Resources Construction Management Plan is designed to ensure the protection of water resources in the areas surrounding the Oyu Tolgoi Project during the Construction Phases of the Project. The plan contains methods that will be used to prevent adverse effects occurring during construction activities and monitoring plans to determining the effectiveness of mitigation measures.

7.2 OBJECTIVES

The objectives of this Management Plan are as follows:

- To define management procedures for all water related functions, including defining roles and responsibilities and training requirements;
- To ensure compliance with applicable Mongolian regulatory requirements, and any international or lender obligations;
- To ensure compliance with applicable Project requirements and industry standards;
- To ensure that applicable potential environmental and social impacts are understood and addressed;
- To minimise impacts to natural surface and ground water quality;
- To ensure continuity of supply for the Project and to ensure that other water users are not adversely impacted;
- To ensure that all treated waters are safe;
- Define monitoring and reporting procedures;
- Define training requirements; and
- To ensure effective implementation of water conservation, including recycling initiatives.

7.3 SCOPE

The Project is committed to comply with various environmental standards which are managed through the Management Plans as described in *Chapter D1: Environmental and Social Management Plan (ESMP) Framework*. The ESMP Framework sets out the management framework for a suite of topic-specific Management Plans for the following phases of the Project (see *Chapter D1: ESMP Framework* for the definition of these phases):

1. Construction Phase
2. Operations Phase

This Water Resources Construction Management Plan is part of the suite of Construction Phase Management Plans. The scope of the plan addresses water resource management during day-to-day construction activities associated with:

- The development and utilisation of temporary water abstraction wells required to provide water for the Project during construction (this includes both wells within the Mine Licence Area and offsite wells);
- Water usage during construction;
- Sewage/sanitary wastewater treatment during construction;
- Drinking water supply and treatment;
- Drilling activities associated with the development of permanent water wells in the Gunii Hooloi borefield (the utilisation of these permanent wells during the operational phase will be addressed in the operational phase management plans and are not addressed here);

- Control of any leachate from the low grade ore dump derived from the construction of Shaft 2, (the control of leachate from the waste rock dump and tailings storage facility during operations will be addressed in the operational phase management plans and is not addressed here);
- The construction of the Undai water course diversion. (The design aspects for the diversion engineering are presented in Sections A and C of the ESIA and are not repeated in this Construction Management Plan); and
- All other construction activities that have the potential to have a minor or greater impact on surface and groundwater resources.

Particular reference is made here to the following other Construction Management Plans that have direct cross-linkages to water resources management:

- The Construction Emergency Response Plan (*Chapter D20*) (in relation to accidental contamination of surface and groundwater resources);
- Construction Community Health, Safety and Security Management Plan (*Chapter D18*) (in relation to potential impacts on surface and groundwater resources used by herders or the local communities);
- Construction Stakeholder Engagement Plan (*Chapter D14*) (in relation to potential impacts on surface and groundwater resources used by herders or the local communities);
- Construction Waste Management Plan (*Chapter D8*) (specifically in relation to Construction Phase low grade ore rock management);
- Petroleum and Fuels Construction Management Plan (*Chapter D5*) (in relation to control of potential contamination of surface and groundwater resources);
- Hazardous Materials Construction Management Plan (*Chapter D12*) (in relation to control of potential contamination of surface and ground waters); and
- Flora and Fauna Construction Management Plan (*Chapter D6*) (in relation to potential impacts on springs/wells utilised by wildlife).

Oyu Tolgoi has committed to a number of community investment plans associated with improvements to water resources as part of its Investment Agreement. However, details of these commitments and how Oyu Tolgoi plans to fulfil these commitments will be addressed in the Operational Phase Management Plans and are outside of the scope of this Construction Phase Management Plan.

7.4 ASSOCIATED IMPACTS

The key potential impacts on water resources that are to be mitigated against during the Construction Phase can be separated into the following elements:

- Impacts on surface water, including:
 - Loss of Bor Ovoo spring through the diversion of the Undai and construction of the waste rock dump (WRD) and impacts on the wildlife and herders which relied on it;
 - Diversion of Undai ephemeral water courses which is one of the more significant surface water features associated with the Project Area of Influence, and the impacts on its ability to contribute to the sustainability of downstream springs (such as the Khukh Khad, Maanit and Burkhant springs) and herder wells, and the wildlife and herders which rely on them, due to alterations of upstream groundwater and surface water flow regimes; and
 - Potential for contamination of surface water from spills or increased erosion and sedimentation in flood periods, which may potentially impact the quality of surface and groundwater around the Project.
- Impacts on groundwater, including:
 - Potential reduction of groundwater levels in the shallow alluvial aquifers within the Mine Licence Area as a result of the abstraction of groundwater for Oyu Tolgoi's construction water supply;

- Impacts to the flow of groundwater in the shallow alluvial aquifers associated with the diversion of ephemeral watercourses, and the impacts on the downstream users and wildlife;
- Potential for impact to groundwater from spills of chemicals at the construction and operational areas;
- Potential for reduced water levels in existing wells/springs utilised by third parties due to the development and use of temporary construction abstraction boreholes at construction areas outside of the Mine Licence Area; and
- Potential reduction in shallow groundwater resources as a result of interconnections between aquifer units in the boreholes.

7.5 PROJECT STANDARDS

Set out below is an outline of the applicable standards.

7.5.1 Mongolian Standards

The legislation and standards of key relevance to the Project are listed below:

- Law of Mongolia on Water, 22 April 2004;
- Law of Mongolia on Water Supply and Sewerage System Service of Cities and Residential Settlements, 6 October 2011;
- Law of Mongolia on Water and Mineral Water Use Fees, 22 May 1995;
- Law of Mongolia on Environmental Protection, 30 March 1995;
- Law on Mongolia on Environmental Impact Assessment, 22 January 1998; and
- Law of Mongolia on Special Protected Areas, 15 November 1994.

Further Mongolian Standards and Regulations that include requirements associated with water:

- Drinking Water Hygiene Requirements and Quality and Safety Assessment, MNS 900:2005;
- Water Quality. Water Sampling. Guideline for Developing Program of Water Sampling, MNS 5667-1:2001;
- Water Quality. Water Sampling. Guideline for Sampling from Drinking Water and Water to be used to Produce of Food and Beverage. MNS 5667-5:2001;
- Water Quality. Water Sampling. Guideline for Sampling from Wastewater, MNS 5667- 10:2001;
- Water Quality. Water Sampling. Guideline for Sampling from Ground Water, MNS 5667-11:2001;
- Bottled Drinking Water. Technical Requirements. MNS 5007:2007;
- Sample Contracts for Using Water and Water Environment, Order No. 152 of Minister of Environment, 1995;
- Regulation on Protection of Water Resources from Pollution, 1st annex to Joint Order of Minister of Nature, Environment and Minister of Health and Social Welfare No. 143/A/352, 1997;
- Water Quality Norms and Requirements for Drinking and Domestic Water Facilities, 2nd annex to Joint Order of Minister of Nature, Environment and Minister of Health and Social Welfare No. 143/A/352, 1997;
- Classification norms of Pure Level for Surface Water, 3rd annex to Joint Order of Minister of Nature, Environment and Minister of Health and Social Welfare No. 143/A/352, 1997;
- Clarification of Classification of Pure Level for Surface water; 4th annex to Joint Order of Minister of Nature, Environment and Minister of Health and Social Welfare No. 143/A/352, 1997;
- Permissible Maximum Rate of Toxic Substances for Drinking and Domestic Water Facilities, 5th annex to Joint Order of Minister of Nature, Environment and Minister of Health and Social Welfare No. 143/A/352, 1997;

- Regime for Special and Ordinary Protected Zones of Water Resources and Sanitary Zone of Water Supply Resources, Joint Order No. 51/75 of Minister of Nature, Environment and Tourism and Minister of Health, 2009;
- Water Use Fee Rate, Resolution No. 351 of The Government, 2009;
- Regulation on Mineral Water Protection and Use, 1st annex to Joint Order No. A-79/99 of Minister of Nature, Environment and Tourism and Minister of Health, 2010;
- Water Quality Wastewater Effluent Standard, MNS 4943:2000; and
- Regulation to Set-up Wastewater Removal Point, 2nd annex to Joint Order No. 167/335/a/171 of Ministers of Environment, Infrastructural Development and Health, 1995.

The Mongolian law provides for the regulation of water resources as follows:

Law on Water

This legislation makes provision for the proper use, protection and restoration of water resources. It sets out a regime to create an inventory of water resources (the "Water Reserve Resource") and to determine the potential maximum quantity of water that may be taken from such resources over a specific time without affecting the 'natural water balance' (the "potential use"). This law also makes provision for the following:

- setting up of a Water Monitoring Network and Water Databank;
- Central and Local government are given powers to protect water resources;
- creation of water conservation zones;
- the adjustment of the amount of water that may be used for commercial purposes;
- protection of water against pollution;
- use of water for household and commercial purposes;
- contracts for commercial water use (the application for such contracts shall be made to *Soum* and District Governors);
- rights and duties of water users; and
- use of transboundary waters in accordance with international law.

Regulatory Agreements, Permits and Licenses

The applicable regulatory agreement, permit and licenses applicable to water use by the Project include:

- The Oyu Tolgoi Investment Agreement (IA);
- Approved Detailed Environmental Impact Assessments (DEIA);
- Approved Environmental Protection Plans (EPP);
- Approved Environmental Monitoring Plans (EMP);
- Approved Water Reserve Conclusions;
- Water Use Contracts;
- Government Ministry approvals and notices;
- Government Authority approvals and notices;
- Aimag (regional) Government approvals and notices; and
- Soum (local) Government approvals and notices.

7.5.2 International Standards

IFC General Environmental Health & Safety Guidelines and the Environmental Health and Safety Guidelines for Mining cover several aspects of water resource management^{1,2}. Other applicable standards and guidelines associated with water include:

- World Health Organization, Guidelines for Drinking-water Quality, Revision 3, 2004; and
- Codex Alimentarius Commission, General Standard for Bottled / Packaged Drinking Waters (Other than Natural Mineral Waters), CODEX Stan 227-2001.

EBRD Performance Requirements³ (particularly *PR1: Environmental and Social Appraisal and Management* and *PR3: Pollution Prevention and Abatement*) [and the following applicable EU regulations, including:

- EU Council Directive 98/83/EC of 3rd November 1998 on drinking water quality; and
- EU Council Directive of 21 May 1991 concerning urban waste water treatment.

7.5.3 Project Numeric Standards

The Project has set numeric standards for the following waters during the construction period:

- Drinking water; and
- Effluent wastewater (including mine area surface runoff).

The specific numeric values for the above are presented in *Annex A*, together with a comparison with applicable national and international standards. *Annex A* presents the full list of substances controlled under Mongolia regulations; Oyu Tolgoi will not undertake analysis against all these parameters unless the local situation warrants this and it is directed by the Water Resource Principal Advisor or the Mongolian Water Authority.

7.6 ROLES & RESPONSIBILITIES

In addition to the specific responsibilities identified in Section 7 below, general responsibilities for the management of water resources are defined below. Overall lines of responsibility between Oyu Tolgoi and the Contractors are described in *Chapter D1: ESMP Framework*. More specifically for water resources management, the following roles and responsibilities apply.

Oyu Tolgoi Chief Operating Officer:

- Ensuring that adequate resources are provided to allow implementation of water monitoring, mitigation, research and development activities.

Oyu Tolgoi Senior Vice President:

- Review and approval of environmental screening and DEIAs prior to submission to the Ministry of Nature, Environment and Tourism (MNET);
- Review and approval of annual EPPs prior to submission to the MNET; and
- Review and approval of an Annual Environmental Reports (AER's) prior to submission to the MNET.

Environmental Manager:

- Responsible for ownership and overall implementation of this plan and ensuring Principal Contractors implement applicable elements of this plan;

¹ International Finance Corporation. *Environmental, Health & Safety Guidelines for Mining*. 10 December 2007.

² International Finance Corporation. *General Environmental, Health & Safety Guidelines, Section 1.5*. 30 April 2007.

³ <http://www.ebrd.com/pages/about/principles/sustainability/requirements.shtml>

- Overall ownership and responsibility for submitting development projects to the MNET for environmental screening and, where required, for the preparation and submission of DEIAs;
- Overall ownership and responsibility for submitting EPP's that address all requirements associated with related approved DEIAs and for ensuring implementation of related monitoring and mitigation requirements;
- Ensuring payment of the required environmental performance bond to the Ministry of Nature and Environment associated with annual EPPs;
- Updating and gaining approval for any revisions to EPPs;
- Overall ownership and responsibility for the development of AERs that presents environmental achievements during the course of the year and demonstrates that the requirements of the annual EPP have been satisfied;
- Ensuring that applicable bonds that have been placed with the MNET are appropriately recovered;
- Ensuring that all implementation teams within the Environmental Department are appropriately staffed and supported; and
- Creating and implementing an on-going environmental monitoring and measurement programme.

Water Resource Principal Advisor:

- Ensuring that a water monitoring plan is maintained and implemented;
- Developing Annual Water Reports that describe research, monitoring and impact mitigation activities for submission to the Water Authority of the MNET and for developing water sections of AER's;
- Developing routine water reports, as required, to notify and guide site activities;
- Ensuring that all planned hydrogeological drilling activities are permitted;
- Ensuring that all water abstraction wells are permitted, that water use is accurately measured using certified flowmeters and that related water use fees are promptly paid to the local *soum* governor's office;
- Establishing and implementing water research programs; and
- Attendance at routine meetings with local *soum* representatives, including herders, on water related topics and issues.

Water Resource Coordinator:

- Supervising monitoring and measurement programs;
- Reporting results and findings of periodic reviews and evaluations to Water Resource Principal Advisor;
- Reviewing field documents and procedures, data analysis and preparing related reports; and
- Attendance at routine meetings with local *soum* representatives, including herders, on water related topics and issues.

Hydrogeologists / Environmental Officers:

- Day-to-day operation, water level measurement and water quality sampling;
- Implementing monitoring and measurement programs;
- Reporting results and findings of periodic reviews and evaluations to Water Resource Coordinator and Principal Advisor;
- Immediate reporting of abnormal test results to the Water Resource Coordinator and Principal Advisor;
- Maintaining all water monitoring documents;
- Maintaining water monitoring database and ensuring correct input of data;

- Undertaking routine inspections of water facilities and activities, including by Contractor's and advising the Water Resource Coordinator and Principal Advisor of any non-compliant activities; and
- Supporting the implementation of the Communities and Social Performance Department's (CSP) Participatory Water Monitoring (PWM) which is a component of the Participatory Environmental Monitoring (PEM) Programme (see Annex C).

Principal Contractor (contracted directly by Oyu Tolgoi)

- Undertake water resource management in accordance with this plan and ensure standards are met; and
- Develop their own management plans and inspection procedures, consistent with the requirements outlined in this plan, prior to the commencement of works which will entail to use or management of water resources or activities in proximity to surface waters, springs or wells.

All Employees:

- Conserving water;
- Reporting any misuse of water to the Environment Department; and
- Obtaining permission from the Environmental Department for access into water monitored areas.

Herders:

- Providing observation on water levels and general environmental changes. This is primarily from the herders involved in the PWM Programme. These herders gather data on groundwater levels in their wells up to twice a day (before and after watering their animals) using equipment provided by Oyu Tolgoi (see Annex C).

7.7 MITIGATION MEASURES AND MANAGEMENT CONTROLS

The mitigation measures and management controls that are to be implemented during the Construction Phase to minimise the risks and impacts on water resources are described in the table below. Contractors are required to incorporate the measures outlined in the table below within their own working procedures.

Table 7.1: Mitigation Measures and Management Controls- Water Resources Management

ID	Topic/ Aspect	Applicability/ Activity	Control Description	Responsible Parties	Means of verification	Comments
WR01 - a	Water usage and conservation	Water and wastewater usage	<ul style="list-style-type: none"> ▪ A water balance inventory will be developed and maintained for the Construction Phase. The water balance will be used to: <ul style="list-style-type: none"> ○ Undertake routine review of the effectiveness of water conservation measures. ○ Undertake routine review of water usage during construction. In the event that water usage significantly exceeds predicted levels the potential impacts of this will be assessed and any necessary additional mitigation measures will be identified. 	Oyu Tolgoi Environmental Department Principal Contractors	Water balance inventory Auditing	
WR01 - b	Water usage and conservation	Water and wastewater usage	<ul style="list-style-type: none"> ▪ Wastewater generated from the Construction Phase sewage/sanitary treatment plant will be reused where possible (e.g. for concrete production and road dust suppression) and where not immediately possible, shall be placed in approved grey water storage ponds pending reuse. 	Oyu Tolgoi Environmental Department Principal Contractors	Water balance inventory Auditing	
WR01 - c	Water usage and conservation	Water and wastewater usage	<ul style="list-style-type: none"> ▪ Water distribution pipelines will be buried below ground freezing layer and equipped with insulated air release valves and periodic isolation valves to minimize risks of water loss/leaks. 	Oyu Tolgoi Environmental Department Principal Contractors	Water balance inventory Auditing	
WR02 - a	Water usage and conservation	Water and wastewater usage - operations	<ul style="list-style-type: none"> ▪ Oyu Tolgoi will assess and monitor the volume of water used per tonne (L/T) of ore processed as part of the Project. This information will be used to benchmark Oyu Tolgoi against the water efficiency of comparable operations elsewhere in the world. Overall Oyu Tolgoi aims to be the most efficient mine of its type worldwide in terms of the volume of water used per tonne of processed ore. 	Oyu Tolgoi Environmental Depart.	Water balance inventory Auditing	
WR02 - b	Water usage and conservation	Water and wastewater usage	<p>Oyu Tolgoi will endeavour to work with the Government of Mongolia, other water users (both private and public), NGOs and donors to:</p> <ul style="list-style-type: none"> ▪ Improve the knowledge base and understanding of the area's groundwater resources ▪ Develop a water use, treatment and efficiency model that maximises water use efficiency in the region ▪ Work with other industrial water users to coordinate activities to improve resource efficiency to support the economic development of the South Gobi region and Mongolia 	Oyu Tolgoi Environmental Depart. Oyu Tolgoi CSP	Water balance inventory Auditing	

ID	Topic/ Aspect	Applicability/ Activity	Control Description	Responsible Parties	Means of verification	Comments
			<ul style="list-style-type: none"> Seek to develop alternative water supplies Educate consumers on efficient water use Develop a common understanding of available water resources and the priority uses for that water. <p>The aim is to develop a sustainable model for water use in the South Gobi region of Mongolia. The South Gobi Regional Development Council is likely to be central to this process.</p>			
WR02 - c	Water usage and conservation	Water and wastewater usage	<ul style="list-style-type: none"> Development of a refined groundwater model to verify that there are no users of this groundwater within the groundwater cone of depression created by the open pit. If there are any springs or wells then mitigation measures will be developed to avoid or minimise the impact to a level acceptable to the local herders. 	Oyu Tolgoi Environmental Department	Auditing of groundwater model	
WR03 - a	Sewage water	Sewage/ sanitary water treatment	<ul style="list-style-type: none"> All sewage and sanitary waters produced on site, at the airport and at remote construction camps will be sent to the main waste water treatment plant at the Mine site construction camp or locally established mobile wastewater treatment plants. 	Oyu Tolgoi Environmental Department Principal Contractors Wastewater treatment plant operator	Water balance inventory Monitoring records Auditing	
WR03 - b	Sewage water	Sewage/ sanitary water treatment	<ul style="list-style-type: none"> Although the sewage effluent will not be discharged to any surface water body or soakaway, but rather reused in the mining process or for dust suppression, it is a mandatory requirement that all sewage treatment plants shall perform to applicable Mongolian discharge standards. 	Oyu Tolgoi Environmental Department Principal Contractors Wastewater treatment plant operator	Water balance inventory Monitoring records Auditing	
WR03 - c	Sewage water	Sewage/ sanitary water treatment	<ul style="list-style-type: none"> No treated wastewater to be directly discharged to local ephemeral watercourses or permitted to infiltrate into the aquifers. Treated wastewater shall be fully reused (e.g. for concrete production and road dust suppression) or placed in approved grey water storage ponds pending reuse. 	Oyu Tolgoi Environmental Department Principal Contractors Wastewater treatment plant	Water balance inventory Monitoring records Auditing	

ID	Topic/ Aspect	Applicability/ Activity	Control Description	Responsible Parties	Means of verification	Comments
				operator		
WR04 - a	Drinking water	Drinking water treatment	<ul style="list-style-type: none"> Drinking water shall be provided from reputable suppliers of bottled drinking water or produced at the site water treatment and bottling plant and will meet Mongolian, WHO and CODEX potable water standards.⁴ 	Oyu Tolgoi Environmental Department Principal Contractors Wastewater treatment plant operator	Monitoring records Auditing	
WR04 - b	Drinking water	Drinking water treatment	<ul style="list-style-type: none"> Only drinking water provided from reputable suppliers of bottled drinking water or produced at the water treatment and bottling plant will be utilised by the Project 	Oyu Tolgoi Environmental Department Principal Contractors Wastewater treatment plant operator	Monitoring records Auditing	
WR05 - a	Water abstraction drawdown impacts	Water abstraction during construction	<ul style="list-style-type: none"> All temporary construction water supply boreholes will be fully permitted by the related government agencies prior to drilling and installation. 	Oyu Tolgoi Environmental Department Principal Contractors	Assessment records Water Agency approvals Abstraction records	
WR05 - b	Water abstraction drawdown impacts	Water abstraction during construction	<ul style="list-style-type: none"> All temporary construction water supply boreholes will be individually assessed prior to use to confirm that its area of influence does not include any existing springs/boreholes used by third parties or wildlife. 	Oyu Tolgoi Environmental Department Principal Contractors	Assessment records Water Agency approvals Abstraction records	
WR05 - c	Water	Water	<ul style="list-style-type: none"> Water abstraction required during construction of the Oyu Tolgoi to 	Oyu Tolgoi	Assessment	

⁴ **Note:** The Codex Alimentarius Commission is an intergovernmental body that implements the joint Food and Agriculture Organization/WHO Food Standards Programme. Its principal objective is to protect the health of consumers and to facilitate the trade of food (including bottled water) by setting international standards (ie, Codex Standards).

ID	Topic/ Aspect	Applicability/ Activity	Control Description	Responsible Parties	Means of verification	Comments
	abstraction drawdown impacts	abstraction during construction	Gashuun Sukhait Road and Gunii Hooloi pipeline shall be sourced from aquifers that are deeper than and hydraulically separate from those used by herders	Environmental Department Principal Contractors	records Water Agency approvals Abstraction records	
WR05 - d	Water abstraction drawdown impacts	Water abstraction during construction	<p>If deemed appropriate following the individual temporary borehole assessment identified above, or as agreed following consultation with potentially affected herders, water levels and quality will be monitored at potentially affected existing springs/boreholes used by third parties or wildlife.</p> <ul style="list-style-type: none"> Should an impact be detected on a herder well, Oyu Tolgoi will provide a replacement well that provides at least the same quantity and quality as the affected well using a design that is acceptable to the herder. 	Oyu Tolgoi Environmental Department Principal Contractors	Assessment records Water Agency approvals Abstraction records	
WR05 - e	Water abstraction drawdown impacts	Water abstraction during construction	<ul style="list-style-type: none"> Monitoring of water levels and abstraction rates at each borehole will be routinely undertaken to ensure that water levels and abstraction rates are as anticipated. If water levels and/or abstraction rates significantly exceed anticipated levels, a re-evaluation of the borehole will be performed to determine if any additional mitigation actions are required. 	Oyu Tolgoi Environmental Department Principal Contractors	Assessment records Water Agency approvals Abstraction records	
WR05 - f	Water abstraction drawdown impacts	Water abstraction during construction	<ul style="list-style-type: none"> Results of all related water monitoring activities will be published in routine internal reports and in the Annual Environmental Report issued to the Ministry of Nature, Environment and Tourism which, when approved, will be made publicly available on the Oyu Tolgoi website. 	Oyu Tolgoi Environmental Department Principal Contractors	Assessment records Water Agency approvals Abstraction records	
WR05 –g	Water abstraction drawdown impacts	Water abstraction during construction	<ul style="list-style-type: none"> Monitoring of groundwater in the aquifers proximal to the area of overburden stripping to assess whether there are any dewatering impacts which could affect the groundwater flows in the Undai alluvial. Any detected impact to be addressed through measures such as pumping water ingress to soakaways or providing replacement water supply points downstream of working area. 	Oyu Tolgoi Environmental Department Principal Contractors	Assessment records Water Agency approvals Abstraction records	
WR06	Water abstraction drawdown	Water abstraction during	In accordance with the CSP Grievance Management Procedure, any reported potential herder well impact, received from a PAP as defined in <i>Table 15.10</i> of the <i>RAP</i> (including all seasonal herders identified in item	Oyu Tolgoi Environmental	Assessment records Water Agency	

ID	Topic/ Aspect	Applicability/ Activity	Control Description	Responsible Parties	Means of verification	Comments
	impacts	construction/abstraction	<p>E1), will be investigated by a team, including professional hydrogeologists to assess the likely reason of the failure. As an interim measure while the investigation is underway Oyu Tolgoi will provide a replacement water supply (e.g. tankered water) to ensure that the herder water supply is maintained. The investigations into any herder well complaints will be undertaken and completed within one week of notice being provided to the Environmental Department.</p> <p>The investigation into the herder's well will include:</p> <ul style="list-style-type: none"> ▪ Review of rainfall data ▪ Historical water level trends in this well and surrounding wells based on Oyu Tolgoi's monitoring ▪ Information collected by the herder and or PEM ▪ Review of well construction and depth of the well (and comparison with historical information) ▪ Assessment of cause of impact, if any, and recommendations for mitigation. <p>The result of the study will be discussed with the herder. If the herder is dissatisfied with the results of the investigation, appropriate follow up will be undertaken, including:</p> <ul style="list-style-type: none"> ▪ On-going contact with the herder to clarify reasons for dissatisfaction ▪ Referring the case to the Local Advisory Body (mediation body) chaired by the soum governor and potentially including the Khanbogd Environment Officer, related NGOs, Herders and Oyu Tolgoi (Environment Officer, Community Officer). [Lenders will also be informed of any further interim measures to supply water over this period, and the length of time required for this mediation step] <p>If the reported impact(s) associated with a herder well is identified as a being potentially due to Oyu Tolgoi's activities by the Local Advisory Body. Oyu Tolgoi will agree with the herder and the Local Advisory Body an acceptable solution. This solution may include:</p> <ul style="list-style-type: none"> ▪ Deepening or otherwise rehabilitating the existing well ▪ Placing a new well in an alternative location within the herders pasturelands ▪ Resettlement in accordance with the RAP 	<p>Department</p> <p>Oyu Tolgoi CSP</p>	<p>approvals</p> <p>Abstraction records</p>	

ID	Topic/ Aspect	Applicability/ Activity	Control Description	Responsible Parties	Means of verification	Comments
			<ul style="list-style-type: none"> ▪ Providing water by truck to the herder (only as a temporary measure and no longer than six months). <p>Any solution will provide the herder with a water supply of similar quantity and quality as the well which has failed; so that it can support the requirements of the herder family and animals. Provision of the replacement supply will not inconvenience the herder and shall be proximal to their pastureland and shelter.</p>			
WR07 - a	Contamination and drawdown prevention	Well drilling	<ul style="list-style-type: none"> ▪ When drilling water abstraction boreholes: <ul style="list-style-type: none"> ○ the operations will use water based polymer drilling mud; ○ the cuttings and excess mud will be collected in local mud pits; and ○ upon completion of the works the mud pits will be allowed to evaporate and will then be covered and the areas restored. (Annex B). 	Principal Contractors All supervisors	Working procedures Auditing	
WR07 - b	Contamination and drawdown prevention	Well drilling	<ul style="list-style-type: none"> ▪ All production water bores will be installed in a manner that maintains the screened sections of bores entirely within the deep aquifer zone which will be isolated from any upper aquifer layers, including any shallow alluvial aquifers by the use of a grout seal as illustrated in Annex B. 	Principal Contractors All supervisors	Working procedures Auditing	
WR07 - c	Contamination and drawdown prevention	Well drilling	<ul style="list-style-type: none"> ▪ If monitoring of water levels indicates that any connection may have been created resulting in groundwater drainage from any upper aquifer zones, plans will be developed promptly to either seal and abandon the borehole, rehabilitate it or convert it to a monitoring piezometer. Any such borehole abandonment and rehabilitation will be undertaken in consultation, as appropriate, with representatives from the Government of Mongolia, the local <i>soum</i> Governor's office and any local stakeholders, including herders. 	Principal Contractors All supervisors	Working procedures Auditing	
WR08	Alluvial aquifer connectivity and conductivity	Pipeline excavations	<p>Prevent the pipeline from acting as a barrier or otherwise impacting to groundwater flow:</p> <ul style="list-style-type: none"> ▪ Backfilling of pipeline excavations shall be performed with materials which have the same or higher permeability that the existing sediments ▪ Where feasible burying the pipeline into lower permeability sediments beneath the surficial alluvial aquifer ▪ The pipeline trench adjacent to any ephemeral watercourses will be 	Principal Contractors	Design specification Engineering records Site inspection	

ID	Topic/ Aspect	Applicability/ Activity	Control Description	Responsible Parties	Means of verification	Comments
			plugged with low permeability material to prevent groundwater leaving the alluvial aquifer and flowing along the pipeline route.			
WR09 - a	Contamination prevention	Water abstraction during construction	<ul style="list-style-type: none"> Where possible, pumps at temporary construction water abstraction wells will be powered from the construction camp mains power supply. 	Principal Contractors All supervisors	Working procedures Auditing	
WR09 - b	Contamination prevention	Water abstraction during construction	<ul style="list-style-type: none"> Pumps for remote temporary construction water abstraction wells will be powered by their own diesel generators and associated tank. In such cases the generators and tanks will be located outside of the bore shelter building and will be provided with secondary containment. Management of fuels will be in accordance with the requirements of the Petroleum and Fuels Construction Management Plan (<i>Chapter D5</i>). In addition no fuel or chemical storage will be located within 50 m of abstraction wells or springs. 	Principal Contractors All supervisors	Working procedures Auditing	
WR09 - c	Contamination prevention	Water abstraction during construction	<ul style="list-style-type: none"> Once construction is complete, all temporary water abstraction boreholes will be capped and/or sealed, unless otherwise agreed with the <i>soum</i> Governor's office. Where possible, boreholes [no longer needed for water abstraction will be used as a piezometer to allow the monitoring of groundwater levels in these locations to continue to build on the data base developed by Oyu Tolgoi. 	Principal Contractors All supervisors	Working procedures Auditing	
WR09 - d	Contamination prevention	Water abstraction during construction	<ul style="list-style-type: none"> Groundwater exploration wells will be monitored. If a water level monitoring well has been found to be leaking, resulting in connectivity between the shallow and deep aquifers, Oyu Tolgoi will fill the borehole with cement grout or convert it to a piezometer once investigations by the Water Authority are complete, and permission from the Water Authority and the Khanbogd <i>soum</i> governor has been obtained. 	Principal Contractors All supervisors	Working procedures Auditing	
WR10 - a	Contamination prevention	Waste rock management during construction	<ul style="list-style-type: none"> Control of low grade ore dumps during the construction period (from Shaft 2) will be in line with the methods outlined in the Construction Waste Management Plan (<i>Chapter D8</i>). An operations-phase waste rock management plan will be set out further details on the construction and control measures during operations. Any waste rock produced will either be placed in the start of the WRD, used in the TSF construction or temporarily stored (such as by Shaft 2), on clay with leachate collection ditches 	Oyu Tolgoi Environmental Department Principal Contractors	Construction Waste Management Plan	Additional monitoring wells will be installed along the diverted Undai channel, downstream of the WRD

ID	Topic/ Aspect	Applicability/ Activity	Control Description	Responsible Parties	Means of verification	Comments
			around the stockpile. Run-off from any waste rock stored will be collected and reused by the Oyu Tolgoi or allowed to evaporate. No run-off will be released to the local ephemeral watercourses or linear aquifers.			seepage collection pond
WR10 - b	Contamination prevention	Waste rock management during construction	<ul style="list-style-type: none"> This action refers to the construction of the WRD. No waste rock will be generated during construction; during the operations phase an operations waste rock management plan will be developed prior to commencement of operations. A cut-off wall will be installed across the Undai down-gradient of the WRD which will prevent any migration of groundwater through the alluvial sediments and cause it to flow back to the open pit. Additional monitoring wells will also be installed along the re-routed Undai channel, downstream of the seepage collection pond, and down slope of the southeast section of the WRD to enable Oyu Tolgoi to monitor the effectiveness of the cut-off wall and respond early to address any seepage if this passes past the cut-off wall. The quality of seepage or surface runoff collecting in the collection basin at the southern side of the WRD will be evaluated against Mongolian water discharge standards and if compliant with these will be released to the Undai. Water exceeding these standards will be either allowed to evaporate or pumped back to the pit. In the longer term if considered to be required directional drilling will be used to create a positive flow of any pooled seepage water back to the open pit. 	Oyu Tolgoi Environmental Department Principal Contractors	Construction Waste Management Plan	
WR11 - a	Contamination prevention	Waste management facility	<ul style="list-style-type: none"> The permanent waste management facility landfill and leachate evaporation ponds will include clay / geomembrane composite liner system to USEPA standards to prevent ground contamination. Groundwater monitoring wells will be installed around the permanent waste management facility for ongoing monitoring. 	Oyu Tolgoi Environmental Department	Monitoring records	See also the Construction Waste Management Plan
WR11 - b	Contamination prevention	Waste management facility	<ul style="list-style-type: none"> Following closure, the interim waste management facility will be completely rehabilitated, including removal of all buried wastes and the performance of a detailed assessment of any residual contamination. 	Oyu Tolgoi Environmental Department	Monitoring records	See also the Construction Waste Management Plan

ID	Topic/ Aspect	Applicability/ Activity	Control Description	Responsible Parties	Means of verification	Comments
WR12	Contamination prevention	Tailings Storage Facility	<ul style="list-style-type: none"> The TSF will be constructed with an engineered natural clay liner and equipped with a seepage capture ditch to minimize the potential for any impacts to underlying groundwater resources as described in <i>Chapter C5</i> of the ESIA. Further details on the protection of water resources from the TSF will be included in the Tailings Operations Management Plan. 	Oyu Tolgoi Environmental Department	Engineering records	
WR13 - a	Contamination prevention	All other construction activities	<ul style="list-style-type: none"> In order to minimize the risk of contamination of groundwater and surface waters, all fuels and hazardous materials will be stored and handled in accordance with the Petroleum and Fuels Construction Management Plan (<i>Chapter D5</i>) and the Hazardous Materials Construction Management Plan (<i>Chapter D12</i>). No storage will occur within 50 m of wells, surface water features or linear aquifers. 	Principal contractors All supervisors All construction workers	Auditing	
WR13 – b	Contamination prevention	All other construction activities	<ul style="list-style-type: none"> Spills kits will be available at all construction sites where bulk fuels and chemicals are stored and where these can effectively be used for clean up 	Principal contractors All supervisors All construction workers	Auditing	
WR13 - c	Contamination prevention	All other construction activities	<ul style="list-style-type: none"> All domestic and industrial wastes will be removed from construction areas on completion of the Construction Phase and disposed of through the Project waste management facility in line with the Construction Waste Management Plan. 	Principal contractors All supervisors All construction workers	Auditing	
WR14 - a	Availability of water resources used by third parties and wildlife	Undai diversion	<ul style="list-style-type: none"> The Undai diversion will be constructed in accordance with the engineering design requirements identified in Sections A and C of the ESIA. 	Oyu Tolgoi Environmental Department Principal Contractors	Detailed design Monitoring records	See also the Construction Community Health, Safety & Security Management Plan and the Construction Stakeholder Engagement Plan.

ID	Topic/ Aspect	Applicability/ Activity	Control Description	Responsible Parties	Means of verification	Comments
WR14 - b	Availability of water resources used by third parties and wildlife	Undai diversion	<ul style="list-style-type: none"> The effectiveness of the Undai diversion and the extent of impacts on downstream water resources during and immediately after construction will be monitored. The monitoring will entail monitoring of water levels and quality in downstream wells and measurement of the flux through the groundwater diversion pipe (see monitoring table for details). The diversion will be revised if necessary to ensure continuity of downstream water supply. Monitoring of the success of the diversion will form part of the Participatory Monitoring Programme to be implemented with local herders. If issues are identified Oyu Tolgoi will work with local potentially affected herders to develop, implement and monitor a mutually acceptable solution (such as provision of an alternative water supply through drilling of a new water borehole). 	Oyu Tolgoi Environmental Department Principal Contractors	Detailed design Monitoring records	See also the Construction Community Health, Safety & Security Management Plan and the Construction Stakeholder Engagement Plan.
WR14 - c	Availability of water resources used by third parties and wildlife	Undai diversion	<ul style="list-style-type: none"> Monitoring will be undertaken during the first wet season post construction of the diversion to assess the extent of any erosion within the Western Channel of the Undai and downstream of the diversion. Long term monitoring of downstream impacts on channel erosion will be addressed in the operational phase management plans. 	Oyu Tolgoi Environmental Department Principal Contractors	Detailed design Monitoring records	See also the Construction Community Health, Safety & Security Management Plan and the Construction Stakeholder Engagement Plan.
WR14 – d	Availability of water resources used by third parties and wildlife	Undai diversion	<ul style="list-style-type: none"> During the construction of the Undai diversion there will be dewatering required to enable the excavation of the Undai cut-off wall. In order to ensure that the impact of this is managed and minimized the volume of water pumped and discharged downstream will be monitored and assessed in conjunction with the monitoring data from the surrounding monitoring network. 	Oyu Tolgoi Environmental Department Principal Contractors	Detailed design Monitoring records	
WR15 - a	Availability of water resources used by third parties and wildlife	Ephemeral watercourse diversions	<ul style="list-style-type: none"> Detailed engineering solutions have been developed for the diversions to ensure that they are robust and sustainable, and will be implemented to ensure that surface water resources are not degraded, but effectively pass around Oyu Tolgoi's operations, including the subsidence zone. 	Oyu Tolgoi PMT	Detailed design Monitoring records	

ID	Topic/ Aspect	Applicability/ Activity	Control Description	Responsible Parties	Means of verification	Comments
WR15 - b	Availability of water resources used by third parties and wildlife	Ephemeral watercourse diversions	<ul style="list-style-type: none"> Monitoring of the physical behaviour of the diversion will be undertaken to ensure that it is effective, and is achieving the design criteria. 	Oyu Tolgoi Environmental Department	Detailed design Monitoring records	
WR15 - c	Availability of water resources used by third parties and wildlife	Ephemeral watercourse diversions	<ul style="list-style-type: none"> Oyu Tolgoi will undertake necessary improvements to the (Undai) design identified by the monitoring, quickly and efficiently. 	Oyu Tolgoi Infrastructure	Detailed design Monitoring records	
WR16 - a	Availability of water resources used by third parties and wildlife	Bor Ovoo Spring	<ul style="list-style-type: none"> Oyu Tolgoi will establish a permanent surface water source to replace the Bor Ovoo spring approximately 500 m to the south of the boundary of the Mine Licence Area. The permanent surface water source will be continuously supplied with water outside of the winter months (i.e. when the system is not frozen) via the subterranean flow diversion pipeline associated with the Undai River Diversion. The replacement water source will replicate the size, nature, water quality and availability of the Bor Ovoo spring. 	Oyu Tolgoi Environmental Department	Monitoring records Consultation records	See also the Construction Community Health, Safety & Security Management Plan and the Construction Stakeholder Engagement Plan.
WR16 - b	Availability of water resources used by third parties and wildlife	Bor Ovoo Spring	<ul style="list-style-type: none"> Monitoring of the success of the Bor Ovoo replacement borehole will form part of the Participatory Water Monitoring Programme to be implemented with local herders. If issues are identified Oyu Tolgoi will work with local potentially affected herders to develop, implement and monitor a mutually acceptable solution (such as provision of an alternative water supply through drilling of a new water borehole). 	Oyu Tolgoi Environmental Department	Monitoring records Consultation records	See also the Construction Community Health, Safety & Security Management Plan and the Construction Stakeholder Engagement Plan.
WR17 - a	Flood water management	Construction of surface channel	<ul style="list-style-type: none"> Where Project construction facilities/infrastructure (e.g. Project roads) cross ephemeral surface water channels or playa areas, fords or culverts will be constructed. Where culverts are used 	Oyu Tolgoi Environmental Department	Detailed design Auditing	See Oyu Tolgoi Project, Project No. A2MW, Civil

ID	Topic/ Aspect	Applicability/ Activity	Control Description	Responsible Parties	Means of verification	Comments
		crossings	these locations will be individually assessed, designed and installed to ensure adequate flow of flood waters and to avoid significant erosion upstream or downstream of the culvert. Culverts will be designed to accommodate 1 in 10 year flood events except in headwater locations where they will be designed to accommodate 1 in 100 year flood events. Working in ephemeral watercourses when flash floods may occur will be avoided to reduce the risks of erosion. Disturbed stream banks will be restored to minimize risk of erosion.	Principal contractors		Design Criteria, Document No. DC-10-002, Rev. 0, 10 March 2006
WR17 - b	Flood water management	Construction of surface channel crossings	<ul style="list-style-type: none"> ▪ Post construction monitoring will be undertaken annually to confirm the condition of all culverts. 	Oyu Tolgoi Environmental Department Principal contractors	Detailed design Auditing	
WR17 - c	Flood water management	Construction of surface channel crossings	<ul style="list-style-type: none"> ▪ The construction of Project roads within playa areas will be undertaken whenever practicable in the dry season and the area around the road will be restored prior to the following rainfall season. 	Oyu Tolgoi Environmental Department Principal contractors	Detailed design Auditing	
WR18	Subsidence	Gunii Hooloi pumping regime	<p>The elevation of the datum points in Gunii Hooloi will be monitored on an annual basis, to determine whether there are any changes in surface elevation due to the long term water extraction. In conjunction with the topographic monitoring the following will be undertaken:</p> <ul style="list-style-type: none"> ▪ Monitoring baseline environmental conditions (peak flood levels and timing of floods) on an annual basis during periods of stream flow where they pass through the Project Area; and ▪ Identifying and monitoring any valuable land located near major drainage features, or any feature in other areas where groundwater is shallow and could be influenced by changes in topography. <p>If there is any impact on ephemeral watercourse gradients which have a significant impact on the downstream water flow and users then a potential remedial measure would be for Oyu Tolgoi to implement an appropriate engineering solution, drawing on experience and lessons learnt from the Undai diversion.</p>	Oyu Tolgoi Environment Department	Monitoring records	

ID	Topic/ Aspect	Applicability/ Activity	Control Description	Responsible Parties	Means of verification	Comments
WR19	Community sanitary treatment infrastructure	Worker influx to Khanbogd.	Oyu Tolgoi will provide assistance to the development of a sustainable reticulation water supply system for Khanbogd as described in <i>D16: Influx Management Plan</i> . Further detail regarding a sustainable water supply for Khanbogd is provided in <i>D16: Influx Management Plan</i>	Oyu Tolgoi CSP Department	Detailed design	Further detail regarding a sustainable water supply for Khanbogd is provided in the Influx Management Plan.
WR20	Reporting	Environment team activities	Weekly reports shall be prepared and submitted to the Oyu Tolgoi Environment Manager, and relayed to the Project implementation team. Weekly reports shall include: <ul style="list-style-type: none"> A summary of activities undertaken during the reporting period Planned activities during the next reporting period Any other issues of concern. 	Oyu Tolgoi Environmental Department	Weekly reports	
WR21	Reporting	Environment department activities	Quarterly and annual reports shall be prepared and submitted to the Oyu Tolgoi Environment Manager. Settled annual reports shall be submitted to the MNET and Water Authority and, when approved by MNET made publicly available on the Oyu Tolgoi website. These reports will include but not be limited to the following: <ul style="list-style-type: none"> Collection of climate data at the current station including evaporation data Collection of water levels in springs and wells (monitoring wells and herder wells) and highlighting any unseasonal variations Review of water level data against the numerical models to verify long-term prediction of the effects due to groundwater withdrawal/dewatering Review of the effect of groundwater withdrawal/dewatering and its implications for other environmental resources, if monitoring indicates that further assessment is required River discharge measurements at the site. These measurements will be carried out frequently during all flood events. Attempts will be made to collect flood level and manual flow measurements for each surface water flow event During flood events, observation of where ephemeral watercourses are crossed by Project roads for bed changes (locations of 	Oyu Tolgoi Environmental Department	Quarterly and annual reports	

ID	Topic/ Aspect	Applicability/ Activity	Control Description	Responsible Parties	Means of verification	Comments
			<p>degradation and aggradation), sediment loading, flooding extent (width), changes in river path and (where installed) culvert condition and erosion</p> <ul style="list-style-type: none"> ▪ Any changes to the inventory of groundwater users, identifying any potential conflicts and proposed resolutions. 			

7.8 TRAINING

All employees of Oyu Tolgoi and Contractors to Oyu Tolgoi shall be provided with environmental induction training including the importance of water conservation and the protection of water resources. Additional, specialist training shall be provided to plant operators and key personnel involved in activities which are considered likely to impact water resources. On-going campaigns will be undertaken in order to instil a culture of water conservation to all employees.

All Hydrogeologists/Environmental Officers undertaking monitoring and/or water sampling will be trained in the sampling protocols and QA/QC procedures as summarised in Annex B, Annex C. Any herders taking part in the Participatory Water Monitoring (PWM) programme will be provided with training which is appropriate and applicable to their situation. The aim will be to develop the herders understanding of and appreciation of the local surface and groundwater interactions and what the results of the data collected by Oyu Tolgoi and the herders illustrate. The PWM programme will be run by CSP and training provided by Oyu Tolgoi Hydrogeologists/Environmental Officers. Training will include the use of the measuring equipment, recording of results and be given in the context of the overall monitoring programme. Additional training may be given at the three monthly meeting with the herders when the results are reviewed and/or at the annual review of the PWM which will be attended by CSP staff in charge of PWM, Oyu Tolgoi water team, herders, local stakeholders such as representatives of local authority, water working group and NGOs

7.9 MONITORING

The monitoring measures that are to be implemented during the Construction Phase to ensure compliance with the Project Standards (see Section 7.7.5) are described in the table below. In the event that any monitoring results identify a non-conformance with the Project Standards, these will be investigated and corrective actions identified (see the *Chapter D1: ESMP Framework* for further details).

Table 7.2: Monitoring Measures – Water Resources

ID	Topic/Aspects	Parameters	Methods	Periodicity	Location	Comments
WRM01	Groundwater impacts	Water levels	Field measurements and sampling as per Annex C	Prior to construction and monthly during construction	<p>All groundwater monitoring wells included in the baseline monitoring programme. This includes all wells downstream of the Mine Licence Area and the Undai diversion. Additional nested piezometers in the Undai and surround ephemeral watercourses</p> <p>Monitoring points outside the area of influence of all Oyu Tolgoi's operations which provide baseline data on regional fluctuation of water levels</p> <p>Any additional wells identified as per WR05 of <i>Table 7.1</i>.</p>	<p>The monitoring of herder wells and springs will utilise the dedicated shallow monitoring bores located adjacent to the herder wells to enable baseline water levels and the variability of the river bed aquifers to be monitored. Any sustained drop in water level greater than the seasonal norm, and/or sufficient to present the herder with issues of supply, will trigger an investigation and development of appropriate remedial actions to ensure that the well is brought back into full operational use and/or replaced.</p> <p>Baseline levels in the Undai gravels will be monitored for any sustained drop in baseline levels which might indicate that there is an impact on the subsurface flows and/or springs and areas of shallow water accessible to Khulan by the Construction Phase. Any impact would trigger a detailed investigation and design of appropriate remedial actions.</p>
WRM02	Surface and groundwater impacts	Water quality (see Surface and Groundwater Quality Parameters list below)	<p>Field measurement (pH, conductivity, temperature) and sampling as per Annex C</p> <p>Laboratory analysis (TDS, TSS, major ions, metals and nitrate/nitrite etc.)</p>	<p>Prior to construction and monthly during construction</p> <p>At times of rainfall and flood flows, (for surface waters)</p>	<p>All surface and groundwater monitoring wells included in the baseline monitoring programme. This includes all springs and wells immediately downstream of the Mine Licence Area and the Undai diversion</p> <p>See Section B6.5 for</p>	<p>Changes in water quality will be assessed to identify any statistically significant variations or long term trends. Any well exhibiting these features will be subject to further detailed assessment and, where this was considered likely to be due to Oyu Tolgoi's operations this would trigger remedial actions to rectify the water quality.</p>

ID	Topic/Aspects	Parameters	Methods	Periodicity	Location	Comments
					details on the monitoring programme.	
WRM03	Bor Owoo replacement spring	Water levels and water quality (see Surface and Groundwater Quality Parameters list below) Use by herd animals and wildlife.	Field measurement (level, pH, conductivity, temperature) and sampling as per Annex C Laboratory analysis (TDS, TSS, major ions, metals and nitrate/nitrite) Photographic record Participatory Monitoring Programme	Monthly (surface level) when flowing Monthly (subsurface flow in diversion pipeline in southern section) Quarterly (quality) when flowing	Replacement spring in the Undai approximately 500 m downstream of the Mine Licence Area	Success criteria for spring to be agreed with herders (see WR13 of <i>Table 7.1</i>) Measurements of subsurface flow rate will be assessed for fluctuation variations. The data will be used to establish a baseline appreciation of subsurface flow and be assessed in conjunction with the water level monitoring in the alluvial gravels up and down stream. Any indication that flows are diminishing as a result of groundwater capture by the open pit will trigger a detailed investigation and if proven, the re-engineering of the inlet to place it outside of the area of influence of Oyu Tolgoi's activities.
WRM04	Waste management facility	Water quality (see Surface and Groundwater Quality Parameters list below). In addition to the parameters below monitoring around the waste management facility will include analysis for hydrocarbons	Field measurement (level, pH, conductivity, temperature) and sampling as per Annex C Laboratory analysis (TDS, TSS, major ions, metals and nitrate/nitrite)	Monthly (level) Quarterly (quality)	Dedicated wells around the waste management facility area	Changes in water quality will be assessed to identify any statistically significant variations or long term trends. Any well exhibiting these features will be subject to further detailed assessment and, where the impact is considered likely to be due to the actions of Oyu Tolgoi remedial actions would be initiated to remediate the groundwater and remove the source of the contamination
WRM05	Water usage	Total water use (including volumes recycled and reused)	Meters flows and bulk storage measurement	Throughout construction with monthly reporting	All abstraction locations and wastewater treatment plant	Data used to maintain Construction Phase water balance inventory.
WRM06	Undai diversion channel erosion and	Significant erosion and/or sedimentation affecting the diversion or other features	Visual inspection and photography	Prior to construction. Post first wet season after construction, and then after	Western channel and the Undai downstream of diversion	Assessment of the viability of springs downstream of the diversion to ensure any additional

ID	Topic/Aspects	Parameters	Methods	Periodicity	Location	Comments
	sedimentation	such as downstream springs		each subsequent wet season (or more frequently if there are a series of significant flood events in a wet season).		sedimentation does not affect their viability. Any impacts from sedimentation and or erosion which are identified and considered to have the potential to impact local water resources will result in the development of engineering solutions to rectify the issue.
WRM07	Culverts	General condition/erosion	Visual inspection and photography	Prior to construction. Post first wet season after construction, and then after each subsequent wet season (or more frequently if there are a series of significant flood events in a wet season).	All culverts	Any impacts from sedimentation and or erosion which are identified and considered to have the potential to impact local water resources will result in the development of engineering solutions to rectify the issue.
WRM08	Drinking water produced at site WTBP	Drinking water standard parameters identified in Section 7.5 and Annex A	Laboratory analysis	Daily	Drinking water and bottling plant output	Drinking water standards identified in Section 7.5 must be met for potable water
WRM09	Wastewater treatment plant	Wastewater treatment effluent standard parameters identified in Section 7.5 and Annex A	Field and Laboratory analysis	Daily – field analysis, Quarterly – lab analysis	Wastewater treatment plant output	Wastewater treatment effluent standards identified in Section 5 must be met for potable water
WRM10	Surface run off waters	Effluent standard parameters identified in Section 7.5 and Annex A	Laboratory analysis	During rainfall events	Drainage outfalls	Includes drainage around the WRD during construction.
WRM11	Undai Subsurface Flow Diversion	Flux through the groundwater diversion pipe	Flow meter	On completion of diversion construction Monthly and following significant flood events in the Undai	Diversion pipe	Flow measurements will be taken at the inlet and outlet of the diversion.

Surface and Groundwater Quality Parameters to be monitored as standard are as follows. The exact analytical suite will vary depending at the direction of the Water Resources Principal Advisor and the objectives of the specific monitoring programme:

- pH;
- electrical conductivity;
- temperature;

-
- TDS;
 - TSS;
 - Major ions (Cl^{-1} , F^{-1} , NO^{2-} , NO^{3-} , SO_4^{2-} , CO_3^{2-} , HCO_3^{2-} , Na^{+} , K^{+} , Ca^{2+} and Mg^{2+});
 - Metals (Fe^{2+} , Fe^{3+} , Fe (total), Cu^{2+} , Cu (total), Ti, Cr, Mn, Ni, Zn, Br, Sr, Pb, As, Se, Hg and Cd); and
 - Nitrate/nitrite.

7.10 KEY PERFORMANCE INDICATORS

Oyu Tolgoi will continue to evaluate water resource management performance throughout the construction period. Specific monitoring provisions are detailed in Section 7.9 above. Key Performance Indicators (KPIs) to assess its water resource management are presented in *Table 7.3*.

Table 7.3: Key Performance Indicators

ID	KPI	Target/threshold	Monitoring measure
WR-KPI01	Non-compliances: Number of reported non-compliances with the mitigation controls identified in this Management Plan (<i>Table 7.2</i>).	Target: Minimise and continued improvement in number of reported non-compliances	See 'means of verification' column in <i>Table 7.1</i>
WR-KPI02	Water use reduction: Domestic water usage rate	Target: 100 litres/person/day Threshold 150 l/p/d	Flow meter readings as reported in routine site water usage reports
WR-KPI03	Water re-use: Percentage of treated wastewater that is reused.	Target 100%, Threshold 80%	Usage monitoring and reporting in routine site water usage reports.
WR-KPI04	Herder well impacts: Number of instances where a sustained drop in herder well water levels below (seasonal adjusted) baseline levels occurs.	Target zero, Threshold 1, with agreed mitigation	See WRM01
WR-KP105	Herder Well Complaints: Number of substantiated instances of herder complaints that wells/springs have been impacted.	Target zero, Threshold 1, with agreed mitigation	See the Construction Community Health, Safety & Security Management Plan

Annex A: Drinking Water Standards & Effluent Wastewater

The Project has set numeric standards for the following waters during the construction period:

Table A1: Drinking Water Standards

BOTTLED DRINKING WATER GENERAL ANALYSIS CONTENT AND LIMITS					
Parameter	Units	Mongolian Standard	WHO Standard	EU Standard ³	Project Standard
Physical Quality					
pH	---	6.5 – 8.5	6–9	6.5-9.5	6.5 – 8.5
Total Dissolved Solids	mg/l	1,000	---		1,000
Hardness	mg/l	350 - 500	---		350 - 500
Turbidity	mg/l	1.5	---	Acceptable to consumers and no abnormal change	1.5
Taste	Score	2.0	---	As above	No Observable Taste
Odour	Score	2.0	---	As above	No Detectable Odour
Colour	degree	20	---	As above	20
Microbial Quality					
Total Coliform	Coli / ml	100 (at source) 20 (at supply)	---	0/250 ml	100 (at source) 20 (at supply)
E.Coli or Thermotolerant Coliform Bacteria	E.Coli / 100ml	1 (at source)	Not detectable in any 100ml Sample	0/250 ml	Not detectable in any 100ml Sample
Inorganic Chemical Quality					
Aluminium (Al)	mg/l	0.5	---	0.2	0.5
Ammonium ion (NH ₄)	mg/l	1.5	---	0.5	1.5
Antimony (Sb)	mg/l	0.02	0.02	0.005	0.02
Arsenic (As)	mg/l	0.01	0.01	0.01	0.01
Barium (Ba)	mg/l	0.7	0.7	---	0.7
Beryllium (Be)	mg/l	0.0002	---	---	0.0002
Boron (B)	mg/l	0.5	0.5	1.0	0.5
Cadmium (Cd)	mg/l	0.003	0.003	0.005	0.003
Calcium ion (Ca ²⁺)	mg/l	100	---	---	100
Chloride ion (Cl ⁻)	mg/l	350	---	250	350
Chlorine (Cl)	mg/l	---	5	---	5
Chromium (Cr)	mg/l	0.05	0.05	0.05	0.05
Copper (Cu)	mg/l	1	2	2.0	1
Cyanide (CN)	mg/l	0.01	0.07	0.05	0.01
Fluoride ion (F ⁻)	mg/l	0.7 – 1.5	1.5	1.5	1.5
Hydrogen Sulphide (H ₂ S)	mg/l	0.1	---	---	0.1

BOTTLED DRINKING WATER GENERAL ANALYSIS CONTENT AND LIMITS					
Parameter	Units	Mongolian Standard	WHO Standard	EU Standard ³	Project Standard
Iodine (I)	mg/l	1.0	---	---	1.0
Iron (Fe)	mg/l	0.3	---	0.2	0.3
Lead (Pb)	mg/l	0.01	0.02	0.01	0.01
Magnesium ion (Mg ²⁺)	mg/l	30	---	---	30
Manganese (Mn)	mg/l	0.1	0.4	0.05	0.1
Mercury (Hg)	mg/l	0.0005	0.001	0.001	0.0005
Molybdenum (Mo)	mg/l	0.07	0.07	---	0.07
Nickel (Ni)	mg/l	0.02	0.02	0.02	0.02
Nitrate ion (as NO ₃ ⁻)	mg/l	50	50	50	50
Nitrite ion (as NO ₂ ⁻)	mg/l	1.0	3 or 0.2	---	1
Phosphate ion (PO ₄ ²⁺)	mg/l	3.5	---	---	3.5
Selenium (Se)	mg/l	0.01	0.01	0.01	0.01
Silver (Ag)	mg/l	0.1	---	---	0.1
Sodium (Na)	mg/l	200	---	200	200
Sulphate ion (SO ₄ ²⁺)	mg/l	500	---	250	500
Strontium (Sr)	mg/l	2.0	---	---	2.0
Uranium (U)	mg/l	0.015	0.015	---	0.015
Vinyl Chloride (C ₂ H ₃ Cl / H ₂ C)	mg/l	0.0003	0.0003	0.0005	0.0003
Zinc (Zn)	mg/l	5	---	---	5
Radiological Quality					
Total α radioactivity	Bq/l	0.1	0.5	⁴	0.1
Total β radioactivity	Bq/l	1	1		1

Note:

1. This table shows upper limit values, unless indicated otherwise as a range or lower limit value.
2. This table does not include organic chemicals, detergents, pesticides or disinfection by-products. Refer to Mongolian Standards and WHO Guidelines for Drinking Water Quality for Chemical Lists and Guideline Values, the most stringent of which will also form the Project Standard.
3. EU Council Directive 98/83/EC of 3rd November 1998
4. EU Standard for radioactivity expressed as Tritium 100 Bq/l with a total indicative dose of 0.1 mSv/year

Domestic water (not intended for routine drinking) shall meet the Project Standard for bottled drinking water and the chlorine disinfection standard shown on the table below:

DOMESTIC WATER GENERAL ANALYSIS CONTENT AND LIMITS					
Parameter	Units	Mongolian Standard	WHO Standard	EU Standard	Project Standard
Disinfection Treatment					
Residual Chlorine (after 30 min contact time)	mg/l	---	>0.5	---	>0.5
Chlorine (at end of distribution system)	mg/l	---	---	---	0.3 – 0.5

Note:

1. Given that domestic water will not typically be used for drinking purposes, consideration will be given to accepting higher inorganic / organic chemical limits than those shown.

Table A2: Effluent Wastewater (including mine area surface runoff)

Maximum permitted content of pollutants and highest values of the effluent dischargeable into soil shall be as indicated in the table below (MNS 4943:2000), the IFC and EU equivalents are provided for comparison:

No.	Parameters	Unit	Range or Maximum Allowance ¹	IFC Effluent Guidelines ²	EU Guidance ³
1.	Water temperature	°C	25	<3 degree differential	
2.	Odor	Sense	no bad smell		
3.	pH index	mg0/l	6-9	6-9	
4.	Biochemical Oxygen Demand	mg0/l	50	50	25
5.	Chemical Oxygen Demand	mg0/l	100	150	125
6.	Permanganate oxidation	mg0/l	30		
7.	Suspended Solids	mg/l	150	50	
8.	Dissolved salt	mg/l	1000		
9.	Cyanide	mg/l	0.2	1 (free cyanide 0.1)	
10.	Mineral oil	mg/l	3		
11.	Fat oil	mg/l	10	10 (Oil & Grease)	
12.	Sulphide	mg/l	0.5		
13.	Copper	mg/l	0.5	0.3	
14.	Cadmium	mg/l	0.05	0.05	
15.	Manganese	mg/l	1		
16.	Mercury	mcg/l	0.001	0.002	
17.	Arsenic	mg/l	0.1	0.1	
18.	Nickel	mg/l	0.5	0.5	
19.	Selenium	mg/l	0.02		
20.	Iron	mg/l	2	2	
21.	Lead	mg/l	0.5	0.2	
22.	Total chrome	mg/l	0.5		
23.	chromium (VI)	mg/l	0.1	0.1	
24.	Zinc	mg/l	2	0.5	
25.	Ammonium	mg/l	15		
26.	Total nitrogen	mg/l	30		15
27.	Total phosphorus	mg/l	5	tab	2
28.	Pathogens and other irregular bacteria	-	not detectable		

Notes: ¹ MNS 4943:2000,

² IFC Environmental, Health and Safety Guidelines for Mining

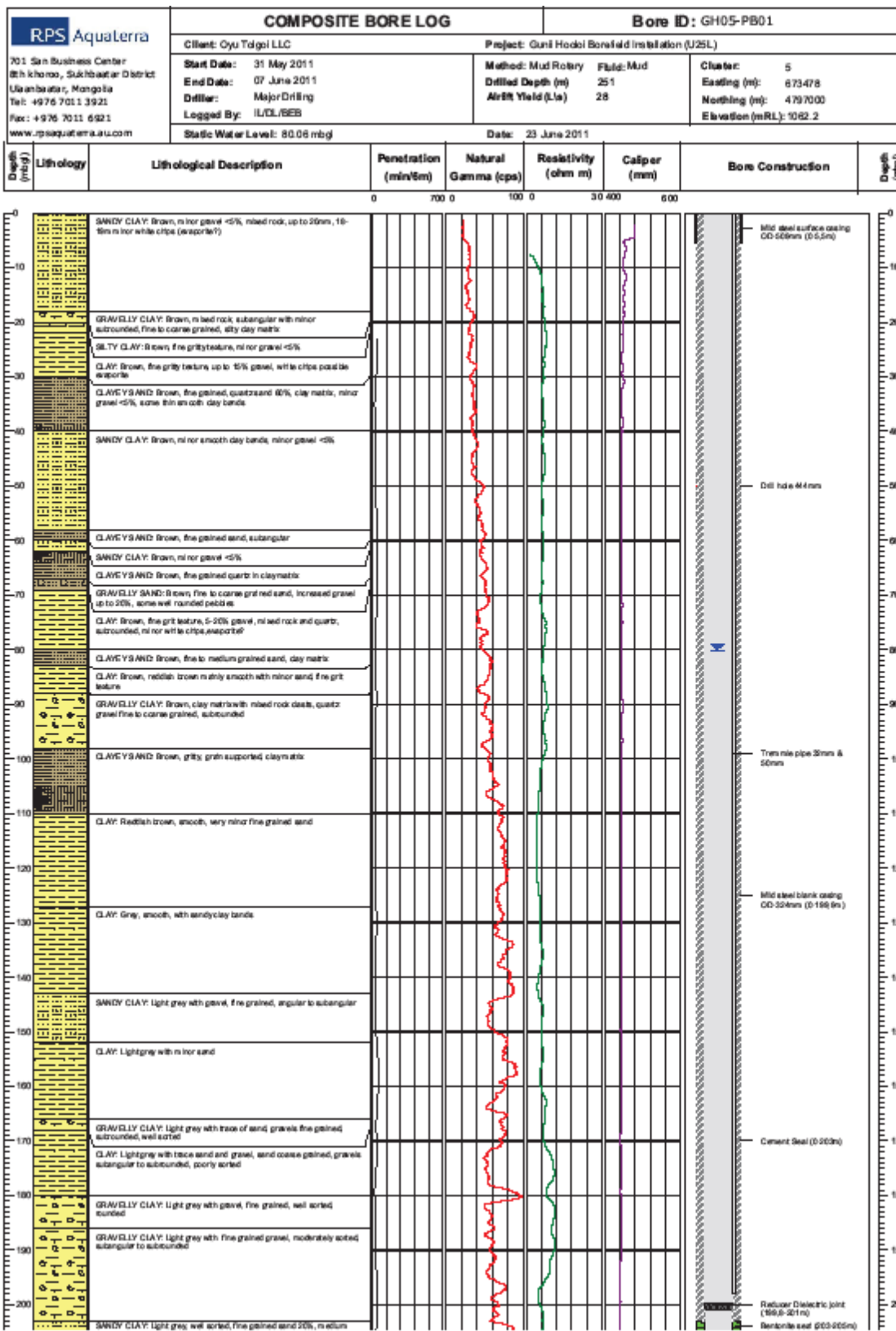
³ EU Council Directive of 21 May 1991 concerning urban waste water treatment

Annex B: Typical Borehole Design

The design of boreholes in the Gunnii Hooloi and elsewhere has evolved over the life of the Project such that the permitted design is more protective of the shallow groundwater aquifers present in the basin. A typical well design (GH05-PB01) is presented below. Pertinent points being:

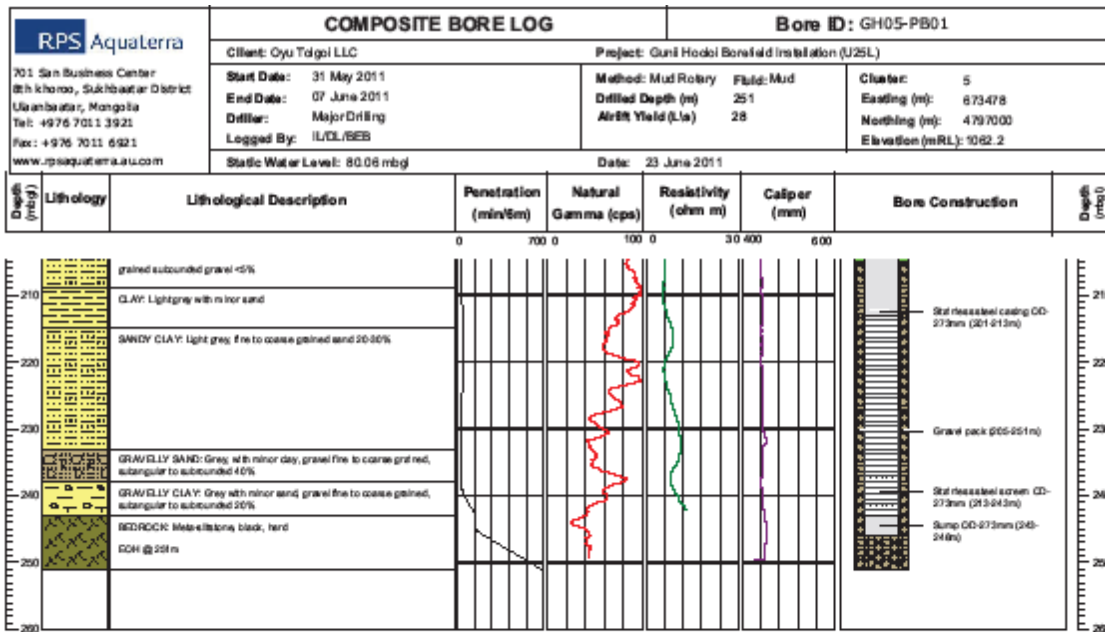
1. Surface seal around the borehole to prevent any infiltration from the surface into the annulus.
2. Solid casing from surface down to the aquifer unit.
3. Upper sections of the well bore grouted with impermeable material (bentonite or similar) to ensure that any surface or shallow aquifers units in the borehole are sealed and cannot flow into the annulus.
4. Gravel pack around the casing and screen through the aquifer section.

This design will be adapted as required to reflect the local hydrogeology; however the key principle of preventing flows between hydraulically distinct shallow and deep aquifer horizons will be maintained in all designs.



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Annex C: Water Monitoring

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1. WATER MONITORING NETWORK

Oyu Tolgoi is committed to continuing the wide spread surface and groundwater monitoring across the Project Area of Influence. This programme has developed over time with a steady increase in the number of locations monitored which reflects the increase in the number of monitoring locations added to the network by Oyu Tolgoi. These new locations have tended to be focused on the areas of particular interest or sensitivity such as around the Undai River or the Gunii Hooloi. These locations are monitored on a monthly basis unless there are operational reasons that this cannot be achieved (e.g. the springs are frozen). Going forwards in consultation with the herders and other relevant stakeholders the monitoring regime will continue to be developed with the new monitoring points added or redundant ones removed. A summary of the number of points monitored is presented in the table below.

Table 1: Water Monitoring Data Points

Location	2009			2010			2011		
	Boreholes	Herder well	Springs	Wellbore	Herder wells	Springs	Wellbore	Herder wells	Springs
Oyu Tolgoi	58	6	0	118	20	0	114	7	1
Gunii Hooloi	85	59	1	91	49	2	86	65	4
Galbyn Gobi	16	5	0	12	5	0	28	16	0
Undai riverbed	0	19	6	10	20	6	10	20	5
Total points	159	89	7	231	94	8	238	108	10
	255			333			356		

This monitoring has been developed in accordance with the Oyu Tolgoi Groundwater Monitoring Plan (Aquaterra June 2008). This network has been augmented by additional monitoring points installed in the Undai catchment which filled gaps in the existing network and tailored the network more toward environmental monitoring and operational readiness. In particular these new points have been specifically designed to:

- Improve definition of the streambed environments in the mine site area sufficient for quantitative impact assessment, groundwater management within the Undai alluvial sediments underlying the waste rock dumps and optimal siting of the upstream Undai groundwater cut-offs;
- Establish an appropriate regional network from which groundwater and surface water flows into, and out of, the mine site area can be quantified, rainfall-runoff in the catchment can be better understood and groundwater model inflows/outflows better constrained; and
- Improve the hydrogeological unit and groundwater flow definition including hydrogeological unit properties, regional piezometry and hydrochemical characteristics.

There have been an additional 57 monitoring bores in 39 holes installed at 14 locations in the immediate mine area in and around the Undai River (i.e. many locations comprise nested piezometers to enable an appreciation of the groundwater behaviour in the different aquifers. These have targets three hydrogeological units namely alluvial, weathered bedrock, and fresh bedrock. In addition selected locations have been equipped with rainfall and stream flow gauges to improve understanding of rainfall distribution, runoff generation and stream flow infiltration in the catchment.

The monitoring locations, including the newly installed monitoring locations around the Mine Licence Area are presented in the following figure.



This illustrates that there are 20 monitoring points along the Undai up to its confluence with the Budaa River, these comprise individual piezometers and 10 new monitoring locations the majority of which are nested piezometers. There are two new nested piezometers in the rivers that will be used for the diversion. Outside of the alluvium ribbon that makes up the Undai aquifer, there are 13 piezometers installed in the weathered bedrock or along faults/intrusions. A further five monitoring points are in the stream beds of tributaries of the Undai and four rainfall gauges are located through the catchment. The Budaa River also has a similar monitoring network established. As well as the ability to hand dip and measure the groundwater level, many of the new piezometers will be installed with data loggers to provide better definition of the reaction of the groundwater level to flood events and the installation of the cut-off wall and diversion of the Undai.

In the Gunii Hooloi there are 155 monitoring points comprising 86 monitoring wells, 65 herder wells and 4 springs. These include herder well and herder well monitoring bores specifically designed to monitor alluvial water levels, which are outside the Gunii Hooloi Cretaceous basin. These points, which are present to the north, west and southeast of the Gunii Hooloi area, will provide data on the natural seasonal variations in groundwater levels. The monitoring points outside of the Gunii Hooloi Cretaceous basin are located up to 35 km from the pipeline route and over 10 km from the edge of the Cretaceous Basin.

2. PARTICIPATORY WATER MONITORING

2.1 INTRODUCTION

The primary objectives of the Participatory Environmental Monitoring (PEM) programme run by CSP are to involve the local community in environmental monitoring, and to present the environmental activities of the Oyu Tolgoi Project more clearly to the local community, with the overall objective of increasing the environmental knowledge of the local community.

A key component of the PEM programme is the Participatory Water Monitoring (PWM) programme which started formally in mid-2011 with an initial 9 herders and has subsequently increased to 26. These herders are measuring water levels of their own wells with equipment supplied by Oyu Tolgoi. The herders are located in the vicinity of Oyu Tolgoi, Gunii Hooloi and along the Oyu Tolgoi to Gashuun Sukhait infrastructure corridor.

The Land and Cultural Resource Superintendent is responsible for managing PWM under the CSP Senior Manager's supervision. The direct interface with the herders in the field is the PEM Programme Officer.

Included within the PEM are the PFM and PVM (fauna and vegetation monitoring programmes). In order to identify which local herders should be involved in these programmes Oyu Tolgoi has been consulting with other stakeholders such as the Khanbogd *soum* administration (environmental inspector, *soum* ranger, volunteer rangers and *bagh* governors), Altan Nutag NGO, and Head of the Small Gobi Special Protected Area. Herders are selected carefully and discretely in order to avoid the potential risk that if information on the location of wildlife is released to the public it may be used by illegal hunters etc.

2.2 OBJECTIVES OF THE PAPER

This Briefing Note aims to meet the following objectives:

- Describe how herders are recruited to the PWM programme and trained;
- Describe the data collected and how it is discussed with the herders and integrated into Oyu Tolgoi data base;
- Describe broader stakeholder engagement; and
- Present the objectives for the programme going forwards.

2.3 HERDER RECRUITMENT AND TRAINING

CSP has been responsible for recruiting herders to the PWM program. The first stage of this has been to introduce the PWM scheme, its purpose and the methodology that is involved. This started with the PEM Program Officer visiting herder households in May 2011 to seek their opinions on the scheme and canvas their interest in being involved in the pilot PWM programme. Oyu Tolgoi focused the initial scheme on a group of herders around Gunii Hooloi area. Oyu Tolgoi's PEM Officer visited 18 families in this area, and 9 of them agreed to pilot the PWM. The programme has then been gradually extended and now includes 26 herder families living around Gunii Hooloi, along the Undai river downstream of the Mine Licence Area, and along the Oyu Tolgoi-Gashuun Sukhait infrastructure corridor.

Oyu Tolgoi recognised the equipment used by the herders in the PWM had to be practicable and robust. After consulting with the Oyu Tolgoi hydrogeologist, external water experts, and some local stakeholders, Oyu Tolgoi chose a simple tape meter with an iron cup at the end. This has been named "khlopushka" because it makes a "flop flop" noise when it reaches the water (see *Photo 1*). Field verification and comparison with results from the Oyu Tolgoi water team's electronic meter demonstrates that the potential error in the reading using a khlopushka was less than 2 cm and generally less than 1 cm.

Photo 1: Khlopushka used by herders to detect groundwater level in their well.



During these initial herder meetings, Oyu Tolgoi provided equipment and Oyu Tolgoi water team's water monitoring method, to each herder (see *Annex B*); and instructed the herder on how to measure their well levels with the "khlopushka", how to keep their daily records, and how to crosscheck their collected data with previous data, as well as with data gathered by the Oyu Tolgoi water team. As appropriate if the herder is available when Oyu Tolgoi undertake their monitoring, joint monitoring is undertaken to strengthen data QA/QC.

Data Review and Verification

The PEM program officer collects the herders' data records on a quarterly basis and arranges for the data to be crosschecked with data collected on the well by Oyu Tolgoi's water team. The monitoring undertaken by the herders is subject to the same QA/QC as the Oyu Tolgoi monitoring with results (e.g. levels) compared against previous data, so that any significant change can be validated and assessed appropriately.

The first feedback meeting to discuss the results was held between the herders' group and the Oyu Tolgoi hydrogeologist in September 2011. At the meeting the results were discussed in the context of the results from Oyu Tolgoi's broader monitoring programme. Based on the review of the data and feedback, the herders decided to measure their well water level twice a day: before and after watering their animals. The herders chose to undertake this as they considered that this would provide them with more useful data on the behaviour of their wells. This also provides Oyu Tolgoi with a level of detail which would not be collected in the normal monitoring programme.

As the current herder well data set gathered since the PWM was implemented is relatively limited, no interpretation of data trends etc. has been undertaken; however the data verification has demonstrated that there is very little difference between herders' and the Oyu Tolgoi water team's measurement of groundwater levels.

The objectives of the quarterly meetings with the herders are multi-faceted, and can be summarised as follows:

- Encouraging further active community participation in environmental monitoring programmes;
- Improving herders' knowledge on the behaviour groundwater in their wells and how other wells in and outside their particular basin are behaving;

- Increasing community trust In Oyu Tolgoi's water monitoring work and the information obtained;
- Encouraging community support for Oyu Tolgoi's approaches to environmental impact management;
- Increasing public awareness and understanding of environmental issues;
- Enabling Oyu Tolgoi to enhance their knowledge of groundwater level in herder wells with the daily (or twice daily) data on the groundwater in each herder's well supplementing Oyu Tolgoi's monthly data;
- QA/QC of the herder data; and
- Increasing the ability for Oyu Tolgoi to respond to herder concerns.

2.4 BROADER COMMUNITY ENGAGEMENT

In addition to the discussion of the results with the herders, the intention is that the data will be discussed with other stakeholders. The initial PWM results were shared with Khanbogd *soum* local water working group members during the joint investigation of the Oyu Tolgoi pipeline in November 2011. This local working group is not currently active, and Oyu Tolgoi is monitoring the situation and will re-instate the meetings once the group reforms.

The PWM will be subject to an annual review of the programme which will involve the CSP staff in charge of PWM, Oyu Tolgoi water team, herders, and local stakeholders such as representatives of local authority, water working group and NGOs. The overall objectives of these broader meetings are to build on the work with the herders by:

- Encouraging further active community participation in environmental monitoring programs;
- Increasing community trust In Oyu Tolgoi's water monitoring work and the information obtained;
- Encouraging community support for Oyu Tolgoi's approaches to environmental impact management;
- Increasing public awareness and understanding of environmental issues; and
- Increasing the ability for Oyu Tolgoi to respond to community concerns.

2.5 FUTURE DEVELOPMENT OF PWM IN 2012

Oyu Tolgoi is seeking to roll out the PWM further and is linking into the Pasture Users Group (PUG). PUG comprises a group of local herders, who have volunteered to implement a sustainable pasture management project in Khanbogd *soum* under CSP's Pasture Management Project. The PUG's aim is to meet quarterly; and Oyu Tolgoi is trying to use this forum and PUG's network to introduce PWM to a wider group of herders.

Based on the herders' feedback, Oyu Tolgoi is planning to start pump testing herders' wells in order to check recharge rate from spring 2012. The data from this will enable both the herders and Oyu Tolgoi to gather some detailed well specific information on the behaviour of each wells.

Oyu Tolgoi is planning to invite an independent third party in the programme with the aim of providing an independent peer review and help further develop the credibility of the programme with all stakeholders. Potential candidates for this role are organisations such as the Environment and Tourism Authority of South Gobi *aimag* or an Environmental NGO.

Further in the future Oyu Tolgoi are considering how herders could be involved in the monitoring of water quality. This is not considered appropriate to include in the programme at the moment due to the logistics of getting independent samples to laboratories and QA/QC concerns. In the meantime quality data collected by Oyu Tolgoi is shared with the herders.

Annex A: Oyu Tolgoi PEM MONTHLY PROGRESS REPORT

PARTICIPATORY ENVIRONMENTAL MONITORING PROGRAM MONTHLY PROGRESS REPORT

Reporting Period: 1- 31 Dec 2011

Program Title: Participatory Environmental Monitoring

Program Coordinator: Tserennadmid Osorpurev

Program Advisor: Alan Irving

Program team and Consultants team: PEM officer Munkhbayar Norovsuren

Brief Program Information

Program Objectives:

Create and maintain community participation in environmental monitoring programs associated with the Oyu Tolgoi Project. The PEM will promote active community participation in environmental monitoring programs in the field. This will lead to an increased public awareness and understanding of environmental issues arising from the Project. The active dialog and participation is aimed at developing community trust in the adopted monitoring approach and the validity of the information obtained. It will also increase the ability of Oyu Tolgoi to respond to community concerns. The ultimate objective is to engender community support for Oyu Tolgoi's approaches to environmental impact

Program Main Outputs:

- Active community participation in environmental monitoring programs;
- Increased public awareness and understanding of environmental issues;
- Development of community trust in the adopted monitoring approach and the information obtained;
- Increased ability for Oyu Tolgoi to respond to community concerns;
- Community support for Oyu Tolgoi's approaches to environmental impact management.

Program Duration:

Till mine closure.

Program Cost:

US\$ 80,000 for 2011

Summary

	Activities	Target	Achievement (percentage)	Comments
<i>Development of PEM Program Strategy and Plan</i>				
	Develop appropriate monitoring methods on each area (water, pasture, dust, wildlife, noise)	Methods are finalised and approved	70%	Participatory water, pasture and fauna monitoring methods are defined and applied. Developing method of dust control monitoring with Environment and Construction teams.
	Action plan development and progress check	Completed	80%	Developed action plan and started reviewing weekly basis since Aug.
	Updated PEM section of the MYCP and 2012 annual report.	Completed	70%	Draft is prepared and submitted.
<i>Participatory Water Monitoring</i>				
	Commencement of the herder well measurement.	Started	100%	Currently 18 herder families are measuring 26 hand wells.
	Extend the program coverage along Undai river, GS	Completed	80%	Visited herders along additional areas and 9 herder families are

	Activities	Target	Achievement (percentage)	Comments
	infrastructure corridor and GK areas.			involved in PWM. Planning to add 2-3 more herders along Oyu Tolgoi to Gashuun Sukhait road.
	Gathering herders' data monthly basis	On-going		Second round of data collection is planned in early Jan.
	Process the gathered data (insert into the excel sheet)	On-going		Planned to be done by mid Jan.
	Quarterly data cross check with Water team monitoring result	On-going		Planned to be done by mid Jan.
	Sharing cross check results with participating herders in quarterly basis.	On-going		The very first quarter data cross check and consultation with PWM participating herders is conducted successfully. Second consultation is planned to be done by third week of Jan.
	Develop a method to measure herders well water recharge speed.	Completed	10%	Exchanged ideas with Oyu Tolgoi Water team. Planned to start pump testing in the Spring 2012.
	Consult with other key stakeholders (NGOs and admin people)	Completed	30%	Discussed with some of the Khanbogd community water working group members about the PWM and potential involvement. Planned to consult with <i>Aimag</i> Environmental authority.
	Coordinate payment for the involved herders.	Ongoing	100%	Herders are receiving 1000 MNT per day. Payment is arranged through Khanbogd-Altan Nutag NGO.
	Annual review of the program	Completed	0%	Need to be participatory and expected by the end of Jan.
Water quality monitoring initiative WWMD				
	Implementation of the water quality monitoring with Khanbogd secondary school students.	Completed	100%	Students are continuing their monitoring and collecting data.
	Gathering data from students.	Completed	100%	Received all the gathered data from school chemical teacher and sent to WWMD.
	Development of report and sharing with community.	Completed	0%	Planned to be done by 20Jan.
	Extending the Project into BO, ML and DZ schools.	Completed	10%	Contacted DZ, ML and BO schools through CSP officers. Schools are expressed their interest. The applicable physic class is planned in 4 th school quarter. Need follow up visits that time.
	Purchasing required additional test set for all impacted <i>soums</i> .	Completed	100%	All the required test sets are purchased and ready to be used.
Participatory Fauna Monitoring				
	Consult with Environmental team and key local	Completed	100%	Conducted series of meetings with Environmental team and key local

	Activities	Target	Achievement (percentage)	Comments
	stakeholders and finalise PFM program approach, potential participants and technical method.			stakeholders including <i>baghs'</i> governors, <i>soum</i> environmental inspector, ranger, and environmental activists. Agreed on the approach and identified potential herders to be involved.
	Develop SOW of PFM.	Completed	100%	Reviewed and approved by CSP Senior manager. Need to be translated into English.
	Develop action plan on fauna monitoring.	Completed	100%	Agreed with Env. Team on the methods to be used. Selected environmentally active herders to be involved in the Project. Held initial discussion with Khanbogd <i>soum</i> and Protected area administration about their involvement.
	Finalise herders' incentive mechanism	Completed	15%	Got approval from manager and the Small Gobi protected area administration to pay fuel fees for involved herders like volunteer rangers. Estimated related cost and preparing for contract process.
	Purchase required equipment and tools.	Completed	20%	Provided technical requirements and potential vendors to Procurement team. Procurement process started in late Dec.
	Group meeting for herders on PFM	Completed	80%	Agreed with Gaviluud and Javkhant bag governors, EPA and will have meetings with other bags.
	Individual meeting with herders on PFM	Completed	50%	Currently visited herders and 9 of them agreed to be involved in PFM.
	Training for herders	Completed	15%	Environmental team prepared training materials. The training will be conducted once we receive required tools for herders.
	Develop SOW for the participation of local Environmental NGO	Completed	10%	Planning to involve SG Environmental NGOs. Started discussion with Mr. Dargakhuu, Head of the SG Environmental Protection Association.
Participatory Dust Control Monitoring				
	Develop a method for dust monitoring project suitable for community	Completed	20%	Decided to monitor dust control actions by Oyu Tolgoi rather than trying to measure dust level. Need to discuss with Environment and Construction teams.
	Develop a monitoring schedule and observation sheet drafts for herders.	Completed	0%	
	Consult with key local stakeholders about the PDCP	Completed	0%	

	Activities	Target	Achievement (percentage)	Comments
	approach and			
Participatory Noise Monitoring				
	Develop a method for noise monitoring project suitable for community	Completed	0%	Not started as it was not identified as the high priority.
Participatory Vegetation/Pasture Monitoring				
	Conduct pilot pastureland monitoring applying MSRM photo monitoring approach	Completed	100%	Conducted photo monitoring applying MSRM methodology. Held household visits in each PUGs to introduce the monitoring approach and selected total of 28 monitoring points with herders.
	Organise Oyu Tolgoi vegetation (pasture) monitoring observation trip with PUGs	Completed	0%	Cancelled due to the extensive consultation with herders on photo monitoring this year.
	Process gathered data according to the MSRM software	Completed	100%	PEM officer and Head of Altan Nutag NGO received data analysis software training by MSRM in December. Agreed with Environmental team to renew and add some monitoring points for better cross checking.
	Develop a final report and share with local stakeholders.	Completed	0%	
Other activities				
	Local plant seed collection	Completed	0%	Cancelled for 2011. But will be implemented in Spring 2012.
	Supporting Khanbogd secondary school initiative to plant trees and landscaping school building entrance area	Completed	10%	Procurement process is getting delayed due to the vendor's capacity load.
	Send and follow-up weekly community complaints on environmental and water issues to Environment team.	On-going	100%	Updating CSP and Environmental team every week. Agreed to restore herder Tsevegdorj's shallow well with Environment team.
	Provide updates of PEM to CSP monthly info sheet.	On-going	100%	Sent brief information of herders' well restoration work for December issue.
	Social audit by lenders	Completed	100%	Give updates on PEM and PMP programs implementations to auditor.
	Daily community engagement activities on environmental issues	On-going	100%	Conducted investigation on died horse nearby North Camp with Khanbogd <i>soum</i> veterinarian.
	Preparation of Oyu Tolgoi internal Water workshop. (to develop a plan on community water issues)	Completed	10%	Communicating with RT advisors by teleconference. Prepared draft agenda and background materials on community concerns on water.

Accomplishments:

- PWM is extending to the Undai river and Gashuun Sukhait road areas; and
- Introduction of PFM program is progressing.

Future considerations:

- Continue extension of the PWM in to Undai river downstream and GK area herders;
- Ensure continuity and extension of water quality monitoring project with students;
- Process data and report the pastureland photo monitoring;
- Commence the Project;
- Oyu Tolgoi internal Water Workshop; and
- Consultation with *Aimag* Environmental authority on PEM.

Annex B: Oyu Tolgoi Groundwater Monitoring and Sampling Procedure

<p style="text-align: center;">Ground water monitoring and sampling procedure</p> <p>Purpose: The purpose of this procedure is to monitor the level and chemical compound of all boreholes and handwells water among Oyu Tolgoi, Gunii hooloi and Galbyn gobi and organise the Oyu Tolgoi Project water database.</p> <p>Regulations and standards: Water monitoring follows the Water monitoring improved programme executed by Aquaterra on June 2008 based on the water prospecting work implemented in 2003-2004 in Oyu Tolgoi, Gunii hooloi and Galbyn gobi and following Mongolian National Standard (MNS): MNS 900-2005. Hygienic requirements and quality control of Drinking water.</p> <p>Method: Water monitoring is undertaken in first ten days of every month continually during the year. Water level observation of all boreholes is undertaken once in every three months at Gunii hooloi and Galbyn Gobi. (in March, June, September and December). Water level observation of all boreholes and handwells monthly and the quality monitoring is undertaken trimonthly at Gunii hooloi, Galbyn Gobi and Oyu Tolgoi. Photo monitoring of the open water and springs is undertaken monthly and the water quality monitoring is undertaken once in every three month around Oyu Tolgoi. Water sample taken from all points included in water monitoring programme once in a year and tested in the authorised laboratory for the chemical analysis.</p> <p>Measuring and observation:</p> <ol style="list-style-type: none"> 1. Print chain of custody (Appendix-1). 2. Prepare and check the equipment <ul style="list-style-type: none"> ▪ Clean the equipment; and ▪ Change the battery. 3. Measure off at every point and fill the form (all boreholes and handwells of Oyu Tolgoi, Gunii hooloi, Galbyn Gobi) (Appendix-1). 4. The following water indices will be identified at all handwells of Oyu Tolgoi: <ul style="list-style-type: none"> ▪ Alkalinity (pH); ▪ Electricity (E.C); ▪ Dry remains (TDS); ▪ Temperature; and ▪ Water level. <p>Water Sampling:</p> <ol style="list-style-type: none"> 5. Prepare the sampling equipment and the plastic container. 6. Print the chain of custody. 7. Check the equipment. 8. Go to the sampling points (all boreholes and handwells of Oyu Tolgoi, Gunii hooloi and 	<p>Газрын доорхи усны мониторинг дээжлэлт хийх журам</p> <p>Зорилго: Энэхүү журмын гол зорилго нь Оюу толгой, Гүний хоолой, Галбын говийн нэр заасан цооногууд болон гар худгуудад газрын доорхи усны түвшин, химийн найрлагад ажиглалт хийж, мэдээллийн сан байгуулахад оршино.</p> <p>Мөрдөх журам, стандарт: Оюу толгой, Гүний хоолой, Галбын говийн газрын доорх усны хайгуулын ажлыг 2003-2004 онд гүйцэтгэсэн Aquaterra компаниас 2008 оны 6 сард дахин боловсруулсан газрын доорхи усны мониторингийн хөтөлбөрийг мөрдлөг болгоно. MNS 900-2005. Ундны усны эрүүл ахуйн болон чанарын хяналт.</p> <p>Арга зүй: Усны мониторингийн ажлыг жилийн турш тасралтгүй явуулах бөгөөд сар бүрийн эхэнд 10 хоногийн хугацаанд явуулна. Гүний хоолой, Галбын говийн цооногуудад улиралд нэг удаа усны түвшний ажиглалт хийнэ (3,6,9,12 саруудад). Гүний хоолой, Галбын говь, Оюу толгойн гар худгууд, цоонгуудад сар тутам усны түвшин, улирал тутамд чанарын үзүүлэлтэнд ажиглалт хийнэ. Оюу Толгой орчмын задгай ус булгуудад сар тутамд фото мониторинг, улирал тутамд чанарын үзүүлэлтэнд ажиглалт хийнэ. Усны мониторингид хамрагдсан цэгүүдээс жилд нэг удаа усны дээж авах бөгөөд итгэмжлэгдсэн лабораторид усны химийн найрлагын шинжилгээ хийлгэнэ.</p> <p>Хэмжилт, ажиглалт хийх:</p> <ol style="list-style-type: none"> 1. Хэмжилтүүдийг бүртгэх маягыг бэлтгэх (Хавсралт-1). 2. Хэмжилт хийх багажыг бэлдэж шалгах: <ul style="list-style-type: none"> ▪ Багажийг цэвэрлэх; ▪ Зайг солих. 3. Хэмжилт хийх цэгт очиж хэмжилт хийж маягыг бөглөнө. (Оюу толгой, Гүний хоолой, Галбын говийн цооногууд болон гар худаг. (Хавсралт-1 үзнэ үү). 4. Гүний хоолой, галбын говь Оюу толгойн гар худгуудад усны чанарын дараах үзүүлэлтүүдийг тодорхойлно. Үүнд. <ul style="list-style-type: none"> ▪ усны шүлтлэг (pH); ▪ цахилгаан дамжуулах чадвар (E.C); ▪ хуурай үлдэц (TDS); ▪ температурыг; ▪ түвшин. <p>Усны дээжлэлт хийх:</p> <ol style="list-style-type: none"> 5. Дээжлэлт хийх багаж, савыг бэлтгэх. 6. Дээж бүртгэх маягыг хэвлэх.
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<p>Galbyn Gobi).</p> <p>9. Sampling:</p> <ul style="list-style-type: none"> ▪ Samples taken from all the boreholes, handwells and springs of Oyu Tolgoi, Gunii hooloi and Galbyn gobi once a year; ▪ Samples taken only the points attached in appendix; ▪ Samples taken only in the disposal and sterilised container (500ml) and not less than 1lt in each sampling; ▪ The number of the sample, sampling date, the number and the name of the sampling points will be written on the label of the samples; and ▪ Care to full the container with water and not allow air comes inside of the container in order to close the container tightly. <p>10. Clean and dismiss the rubbish if the surroundings of the points are polluted.</p> <p>11. Take the photo if required.</p> <p>Prepare the samples for laboratory analysis:</p> <ol style="list-style-type: none"> 1. Record sample details on the chain of custody. 2. Code the name of the samples. 3. Environmental staff of the IMMI Co. Ltd. will save the list of the codes matching the name of the samples. 4. Deliver the coded samples and the list of the required analysis indices for test to the Laboratory. (<i>Appendix-2</i>) 5. It's prohibited to give the list of code and name sampling points. <p>Establish Water Database:</p> <ol style="list-style-type: none"> 1. The result of the chemical analysis and all monitoring datas will enter the Database monthly. (<i>Aquascape programme</i>). 2. The following datas will enter. <ul style="list-style-type: none"> ▪ Water level; ▪ pH; ▪ EC; ▪ TDS; ▪ Temperature; and ▪ Chemical elements. 3. One copy of chain of custody and result of the chemical analysis will be saved in the archive file. <p>Required equipments:</p> <p>The following equipments are used in the water monitoring and observation: (<i>Appendix-3</i>)</p> <ul style="list-style-type: none"> ▪ Water Level Meter Model: Solinst 101; ▪ Waterproof ph &E.C, TDS meter Model: HI 98 129; ▪ Sampling equipment 0.5lt; ▪ GPS; ▪ Satellitephone; ▪ Sample container 0.5lt; and 	<ol style="list-style-type: none"> 7. Дээжлэлт хийх багажийг шалгах. 8. Дээж авах цэгт (Оюу толгой, Гүний хоолой, Галбын говийн гар худаг) очих. 9. Дээжлэлт хийх: <ul style="list-style-type: none"> ▪ Усны дээжийг Оюу толгой, Гүний хоолой, Галбын говийн цооногууд болон гар худаг, булагуудаас жилд нэг удаа авна; ▪ Дээжийг зөвхөн хавсралтад заасан цэгээс авна; ▪ Дээжийг зориулалтын ариутгасан нэг удаагийн саванд авах ба (500мл) нэг цэгээс 1 л-ээс доошгүй дээж авна; ▪ Дээжний дугаар, дээж авсан он, сар, өдөр, дээж авсан цэгийн дугаар, нэрийг дээжний саван дээр бичнэ; ▪ Дээжийг авахдаа дээжний савны амсарыг дүүргэж, аль болох хий оруулалгүй авч битүүмжлэнэ. 10. Мониторинг хийж байгаа цэгүүдээс хог, хаягдлыг зайлуулах, цэвэрлэх. 11. хэрэв шаардлагатай бол фото зургийг авах. <p>Дээжийг лабораторын шинжилгээнд бэлтгэх:</p> <ol style="list-style-type: none"> 1. Дээжний тухай бичиглэлийг дээж бүртгэх маягтан дээр бичнэ. 2. Дээж авсан цэгүүдийн дугаар, нэрийг тусгайлан бичиж дээж бүрт нууц дугаар тавина. 3. Нууц дугаарыг тэмдэглэсэн жагсаалтыг АММИ ХХК-ны Байгаль орчны хэлтсийн ажилтан хадгална. 4. Нууц дугаар бүхий дээжийг шинжилгээгээр тодорхойлуулах үзүүлэлтүүдийн жагсаалт (<i>Хавсралт-2</i>) ын хамт лабораторид хүргүүлнэ. 5. Дээж авсан цэгийн нэр, дугаарыг лабораторид өгөхийг хориглоно. <p>Усны мэдээллийн санг байгуулах:</p> <ol style="list-style-type: none"> 1. Хэмжилт, химийн шинжилгээний үр дүнг тухай бүр мэдээллийн санд оруулна. (<i>Aquascape програм</i>). 2. Мэдээллийн санд дараах мэдээллүүдийг оруулна. Үүнд: <ul style="list-style-type: none"> ▪ Усны түвшин; ▪ pH; ▪ EC; ▪ TDS; ▪ Температур; ▪ Химийн элементүүд. 3. Хээрийн хэмжилтийн маягт, лабораторын шинжилгээний хариуг сар бүрээр хавтаслаж архивт хадгална. <p>Хэрэглэх багаж хэрэгсэл:</p> <p>Дараах багажийг усны мониторинг, ажиглалтад хэрэглэнэ. Үүнд: (<i>Хавсралт-3</i>):</p> <ul style="list-style-type: none"> ▪ Water Level Meter Model: Solinst 101 ▪ Waterproof ph &E.C, TDS meter Model:
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<ul style="list-style-type: none"> ▪ Light vehicle. <p>Water level measuring Instruction:</p> <p>Water level is measured by the dip meter (plopper), water measuring instrument. It's measured from stable reference point and it is assured by meter (m).</p> <p>Water level of boreholes measured from upper side of excessive steel cover.</p> <p>Measure and report the height of elevated part from the surface of the ground, cement block. If current data is 1m higher than previous data, measure again and both datas will enter to the document. (<i>Appendix-4</i>)</p> <p>Connect previously installed two comparison signs at two opposite sides of the wells with rope. The line of the rope stand for the reference point and well water level is measured by the dip meter (plopper), water level measuring equipment.</p> <p>If there aren't previously installed two comparison signs at two opposite sides of the wells, the orifice of the well is used as the reference point. (<i>Appendix-5</i>)</p>	<p><i>HI 98 129</i></p> <ul style="list-style-type: none"> ▪ Дээж авагч 0.5 л ▪ GPS ▪ Satellitephone ▪ Дээжний сав 0.5 л ▪ Автомашин <p>Хэмжилт хийх аргачилал:</p> <p>Усны түвшингийн хэмжилтийг “плоппер” буюу усны түвшинг хэмжигчээр хэмжинэ. Усны түвшинг ямагт хэмжилт хийх байнгын цэгээс хэмжиж метрээр илэрхийлнэ.</p> <p>Цооногийн усны түвшинг газрын түвшингээс илүү гарсан ган бүрхүүлийн дээд хэсгээс хэмжинэ. Газрын гадаргуу буюу бетонон блокоос дээш өргөгдсөн өндрийг мөн хэмжиж тэмдэглэнэ. Шинээр тэмдэглэж авсан усны түвшин өмнөх үзүүлэлтээс нэг (1) буюу түүнээс дээш метрээр зөрж байвал хэмжилтийг дахин авах ба эхний болон давтан хэмжилтийн үзүүлэлтүүдийг хээрийн ажлын мэдээ баримтны хуудсанд тэмдэглэнэ. (<i>Хавсралт-4</i>)</p> <p>Худагын усны түвшинг хэмжихдээ худгаас ойролцоогоор 2 метрийн зайнд, худгийн эсрэг талуудад тавигдсан хоёр харьцуулах тэмдгийг оосроор холбож, оосорны шугамыг ишлэл цэг болгоно. Худаг дахь усны түвшинг плоппер буюу усны түвшин хэмжигчээр хэмжинэ</p> <p>Худагны 2 талд харьцуулах тэмдэг байхгүй нөхцөлд худагын амсараас хэмжилтийг хийнэ. Ингэхдээ газрын гадаргууд ойр, хөдөлгөөнгүй цэг сонгоно. (<i>Хавсралт-5</i>)</p>
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