Semi-annual Environment & Social Monitoring Report (January to June 2015)

Environmental and Social Performance Report
September 2015

GEO: Adjaristsqali Hydropower Project

Prepared by Adjaristsqali Georgia LLC

Adjaristsqali
Georgia
LLC

SEMI - ANNUAL ENVIRONMENTAL

AND

SOCIAL MONITORING REPORT

Reporting Period: 01 Jan 2015 – 30 Jun 2015

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SEMI - ANNUAL ENVIRONMENTAL AND SOCIAL MONITORING REPORT

Georgia: Adjaristsqali Georgia LLC

Annual Environmental and Social Monitoring Report (AMR) Reporting Period: 01 Jan 2015 – 30 Jun 2015

Company and Project Information:
Company: Adjaristsqali Georgia LLC ("AGL" or "the Company")
Physical address of the Company: 6 Irakli Abashidze Street
Batumi - 6010
Georgia

Company website: www.agl.com.ge

Project: The development, construction, operation and maintenance of the Shuakhevi and Skhalta hydro-electric power plants with total electricity generation capacity of 181 MW, to be located on the Adjaristsqali River in Georgia.

Authorised AGL representative who can be conducted by Lenders on the AMR :

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Certification of the AMR by Adjaristsqali Georgia LLC

I certify that eh data contained in this AMR completely and accurately represents Adjaristsqali Georgia LLC during this reporting period.

Chandrashekhar Shrinivas Damle

Adjaristsqali Georgia LLC Employee Name

Signature

Summary

During this reporting period work continued on all tunnel faces, numbering 12 in total and at the end of the reporting period approximately *50%* of the 32km tunnel program had been completed. The dams at Didachara and Skhalta had ground preparations finalised in readiness for the construction works. The Shuakhevi Powerhouse excavation works was completed in March 2015 allowing powerhouse construction activities to commence. At the end of this reporting period the powerhouse achieved 35% completion.

Environment & Social

A road traffic partnership scheme, in collaboration with EBRD and the UK led NGO, EASST, was delivered in February 2015 with positive feedback received from the mayor's in the affected communities of Khulo and Shuakhevi.

English language courses were conducted for local English teachers in Khulo and Shuakhevi. An English Afternoon Club for students has been initiated for 2015 weekly and an English Essay contest was held in April.

Batumi based NGO, Tanadgoma, started a series of health awareness meetings in the local communities to promote basic healthcare and hygiene with a view to reducing minor ailments such as the common cold but not more serious transmittable viruses and diseases for women.

AGL's Detailed Livelihood Restoration Plan (DLRP) was initiated in May 2015 with the commencement of Apiculture activities in Shuakhevi. This was the first restoration measure to be introduced by AGL. In the second half of 2015, AGL will introduce appropriate restoration measures through other sections of the affected communities in line with the DLRP schedule. AGL has experienced several difficulties implementation due to a lack of understanding by the affected persons and a regular changing of mind towards restoration. AGL recruited the Tbilisi based NGO, Elkana to deliver and manage Apiculture restoration measure to those that volunteered or showed interest in this option.

The first spoil disposal area at Zamleti in the Khulo Municipality was recultivated in April 2015. Two other spoil areas were undergoing the same recultviation methods in the Shuakhevi Municipality in July 2015. These will be subject to weekly and monthly monitoring regimes. Written reports are being prepared for senior managers from the environment team to allow for the application of additional resources to remedy any defects or anomalies should they occur.

AGL continues to use local NGO's for Project compliance monitoring on construction activities. The NGOs are following stipulations in the Project Biodiversity Action Plan (BAP), Environmental & Social Management Plan (ESMP) and Construction Environmental Management Plan (CEMP). NGO's write monthly reports that are issued to AGL for review and comment. The findings are then presented to the Civil Works Contractor AGE as part of the Ecological Flow requirement of the BAP.

Compliance evaluation

The Project has operated to a satisfactory level of compliance as per the requirements of Schedule 12, ESAP that was developed by the financing parties in 2014. The UK based Consultant, ARUP conducted audits in March and May 2015 to assess the Project's compliance levels. The Overarching CEMP's and supporting Sub plans were reviewed by ARUP in July and August 2015.

The Land Acquisition and Livelihood Restoration Plan (LALRP) and Detailed Livelihood Restoration Plan (DLRP) received an Addendum update in mid-July 2015 to include the Ghorjomi Bridge and associated new road section. An additional Addendum will be required in late 2015 to include the 35 KV Transmission Line that AGL is constructing as part of the Shuakhevi Hydro Scheme.

The Government of Georgia setup a monitoring agency called 'The Adjarian Supervision & Technical Agency' in early 2015 to monitor the Project for compliance against the local water discharge, noise and environmental requirements for tree cutting, land permitting and effectiveness of land restoration measures for completed spoil disposal areas. This Agency's main office is located in Tbilisi with a satellite office established in Batumi.

Major environmental and social achievements

AGL commissioned several small scale projects within the affected communities ranging from road development, drainage installation and bridge strengthening in remote communities. In early 2015, AGL refurbished a public library in Skhalta. This library is associated with the local school and used by both school children and the wider public. Of particular success from an environmental and social view was the reconstruction of irrigation systems for local farmers in both affected municipalities of Khulo and Shuakhevi.

In the summer of 2015, AGL teamed up with the Mayor and affected communities in Akhaldaba (Akhaldaba has a large Project drilling operation and is affected by the Project) and installed a water pipe to give the village water all year-round and not seasonal.

In February 2015, AGL announced its intention to award paid internships to 3 students from Tbilisi Technical College. These 3 students are assigned to the Project on a scheme called 'Energetics'. These students received a health and safety induction, visited the entire construction areas above ground and underground works. They also attended meetings and are were part of presentations to the public and media.

In early February 2015, AGL successfully teamed up with EBRD to initiate a traffic safety week in the affected municipalities of Khulo and Shuakhevi. This is part of the Project's CSR program to warn and advise the local university and local schools of the dangers of reckless driving and standing in roads, especially at night. This has had the added bonus of assisting the Project in raising the awareness of road safety as the Project has numerous large and small vehicles using the public roads to access work, camp and spoil disposal areas. The Adjaran Government warmly received the training campaign and expressed positivity towards AGL for exercising care in the community. This campaign was completed over a 4 day period from 16th to 19th February 2015.

There is no reported damage caused by the project to the external environment around the Project or disrupted the wildlife that uses the surrounding areas for migration or the species that are native to the Adjara region. This is a major achievement for a large Project spread over several square kilometres across two municipalities of Khulo and Shuakhevi with active ongoing construction works above and below ground.

Major challenges and issues for the Company

On the 3rd April in Akhaldaba, local residents blocked the access road to the Surge Shaft as they objected to the Project. Negotiations on the 4th April saw the road re-opened and normal services resumed.

On the 17th April 2015, at the Ghorjomi Bridge location, the Project incurred a double fatality due to a crane collapse. The investigation concluded overloading with formwork as the direct cause with underlying causes being that the works at height on the bridge Pier had increased the crane radius and height of the operation being performed. Dual investigations were carried out by the Contractor's independent HSE Consultant, Selin in June 2015. The UK based Consultant, ARUP carried an independent investigation on behalf of the Owner's.

On May 3rd 2015, a strike was held at the main camp by employees of the Civil Works Contractor, AGE. The strike was held as a result of weak local currency. The local labour force was demanding a salary increase to offset any perceived loss in in currency exchange between the USD and Georgian Lari even though local labour receives salaries are in Lari. As a result, a settlement was reached with some increase in compensation.

CSR activities are conceived within the affected communities between the residents and village leaders. These ideas are then fed through the mayor and then into the AGL. Upon agreement, the CSR activities are implemented by the local community residents. CSR activities include, but are not limited to; road widening, water pipe installation, school refurbishment, paving of roads and drainage installation. Appendix 2 at the rear of this document shows the CSR register of completed and pending projects.

AGL faces challenges for the remainder of 2015 with DLRP restoration measure implementation. The Plan schedules the ideal timescales for restoration measure commencement based of selection of measure such Apiculture, nut farming and fruit tree development. The affected persons have great fluctuation of interest with the previously agreed restoration measures. AGL's contracted NGO. Elkana will continue to experience problems with sustained involvement. Elkana will produce reports based on progress, performance and community involvement to AGL, AGL will actively monitor the interaction of the NGO within the communities to ensure that obligation and targets are met.

Key Project implementation data relevant to E&S performance evaluation

Start of construction date: 26th July 2013
Start of commercial operation date: N/A
Gross electricity generation capacity (MW): N/A
Net electricity generation capacity (MW): N/A
Gross Electricity generated during the reporting year (GWh/year): N/A
Net Electricity generated during the reporting year (GWh/year) - Total, a portion exported to Turkey, a portion delivered to Georgia: N/A
Plant capacity factor (%) - Gross Electricity generated (GWh/year) / Gross electricity generation capacity MW x 8,760 hour/year: N/A

Number of workers as of June 2015 of the reporting period:
Number of direct employees of AGL: 29 in total disaggregated as 11 expatriate and 20 Georgian. AGL also employs an additional 126 local people to undertake small CSR projects in affected communities. This brings the total to 146 Georgian and 11 expatriate = 156 persons in AGL.

Contractors:
Civil Works Contractor: AGE Batum
Number of employees: 1135
596 Employees (mainly Turkish workers) and 539 Georgian workers

Electro-Mechanical Works Contractor: Alstom India
Number of employees: 25
18 Expat employees and 7 Georgian employees

Owners' Engineer: Mott Macdonald Ltd UK
Number of employees: 34
17 Expat employees and 17 Georgian employees

Compliance with IFC Performance Standards / ESRD Performance Requirements / ADS Safeguard Policy Statement (SPS):
PS1/PR1/SPS - Assessment and Management of Environmental and Social Risks and Impacts:
E&S Assessment and Management System / Policy:

The Project 2015 EHS Policy is adopted across all work areas. In this reporting period the Turkish Contractor, AGE strengthened its team with the addition of two HSE managers. This has given the Contractor real direction and understanding of AGL's systems and targets.

In the first half of 2015, the Project statistically operated with 10% – 50% less accidents. The civil works contractor, AGE invested substantial money and effort in improving discipline with vehicle users. In April 2015, AGE introduced a camera system in the front of road going vehicles and as a result the Project is operating with a 33% reduction in vehicle accidents.

AGL's use of local NGO's was continued through this reporting period. All 3 NGO's continue to produce monthly reports that make assessment of BAP requirements and possible effects on the environment outside of the Project boundary.

Identification of Risks and Impacts

Key risks encountered during this reporting period's construction process were mainly confined to the tunnel construction works. From February 2015, the Skhalta Outlet Tunnel has been severely affected by large water ingress. However, by May 2015 the water levels had been brought down and tunnel excavation increased.

Skhalta dam design changes have been beneficial to the environment and cost but the continued changes have not aided the construction process. This has been ongoing from later 2014 to July 2015.

High risk activities above ground such as works at height, plant operation and electricity are controlled specific Risk Assessments and Method Statements (RAMS). These are in Turkish and English. Each work team has a Turkish translator to help ensure that communication is free flowing and comprehensible.

Organizational Capacity and Competency

Please refer Annex 3 for the HSE organisational chart. HSE direction and Policy is set by the AGL HSE Manager with final authorisation coming from the AGL Project Director.

The roles and responsibilities are broadly set out in the overarching CEMP with more specific duties named in the AGL & AGE HSE Plans. The Plans and CEMP was subjected to the ARUP audit on implementation in August 2014. ARUP had made several observations requiring an update. Where appropriate, the comments were incorporated into the HSE Plans and CEMP to ensure compliance with the Lender's requirements.

The Project has targeted areas as working at height, medical arrangements, tunnel working and vehicle operation for training due to the high potential for loss of life to Project personnel and members of the public. Works at height over 5m are completed by specifically trained persons by the civil works contractor. Scaffolding and working at height training has been completed as a key component in only allowing scaffolding and working platforms to be changed, altered or dismantled by these specially trained persons to reduce the likelihood of falls or falling objects from height.

AGL's social team numbers 12 persons. Of these 6 employees have the role of distributing Project information to the community as well as recording grievances and advising the public on Project status new phases of work and possible employment opportunities. Unexpectedly, the most significant challenge of the AGL social team was to obtain suitable contributions for the AGE (Contractor) social team. During this reporting period, the AGL social team has worked closely with the Contractors social team but with limited results. The affected communities are using AGL's social team as the main point of contact for all means of communication and grievance. A major target of 2015 is to have the Contractors team become more involved in the affected communities with a view to answering queries in the communities, dealing with complaints at ground level to prevent grievances being raised.

The contractor's social team numbers 7 persons plus 1 lead social member. This brings the Project's combined social team to 20 persons. Proper leadership and participation in the 2015 will be essential if continuous development is to be sustained. As the Project implements more CSR schemes, AGL is reviewing its social team in terms of personnel numbers to assess if additional staff are required. A decision will be made in March 2015 on this.

Emergency Preparedness and Response

The Project has developed area specific procedures to deal with emergencies. AGE, with input from AGL, has developed and Emergency Response Plan and Spill Response Plan. These Plans show how, who and when these Plans will be initiated. They also contain roles and responsibilities along with communication lines.

The list of Emergency Response Plans (ERP) are named below:

1. AGL HSE Plan, dated June 2015
2. AGE HSE Plan, dated June 2015
3. Emergency Spill Response Plan, dated February 2015
4. Community Emergency Response Plan, date January 2015

For serious occurrences that could have a material adverse impact on the Project the AGL Project Director & Chief Financial Officer will notify the Lender group as per the CTA to advise of the occurrence, measures taken and rectification action that will be adopted to redress loss and prevent recurrence with future activities or emergencies that concern the affected communities.

Monitoring and Review

If the Company publicly reported on overall E&S performance (e.g. sustainability report), please describe how it was done. Please also provide a summary of the Company's internal inspections and audits conducted to verify E&S performance compliance.

AGL has conducted internal monitoring of the HSE performance and compliance with the project HSE Plans, RAMS and Lender's requirements. Weekly and monthly site inspection are carried out between the Client, Owner's Engineer and Contractor. The outcome of these written inspections recorded several minor to moderate environmental violations as aresult of construction activities. However, the Porject has an active management system that intiatates corrections at site or ona time weighted basis dependant on severity of breach.

The most common failing with environmental management were fitration system failings with sediment ponds and lack of prompt spill clean up in the vehicle repair workshops in the outlying camps at Chiruqistsqali and Didachara. The civil Contractor's environmental engineer conducted specific spill prevention, containment and disposal training to address the noted failings in addition to the Contractor's site managers deploying more mechanical resources to clean out sediment ponds and improve the silt traps used to stem the flow of water and filter suspended solids.

The audit procedure mentioned above recorded compliance with hazardous and inert waste management. Checks were made upon the authorised hazardous waste contrator's waste consignement notes, transfer notes and phone calls made the hazardous waste disposal unit in Tbilisi to ensure that the civil Contractor was following procedures and Georgian legislation. Inert waste at the accommodation areas is segerated in colour coded waste facilties that are labelled, this is in line with Lenders requirements, and however, this segregated waste is transfered to a licenced landfill in Batumi.

Stakeholder Engagement

Please provide a summary of how the Company continued to engage stakeholders, including affected communities and civil society organizations, to ensure that their concerns are properly monitored and addressed. Please also describe how the affected communities were informed about the progress of E&S management programs.

In the first half of 2015, AGL has continued is relationship with the livelihood restoration NGO, Elkana.

AGL has contracts with local NGO's to help facilitate the requirement of environmental monitoring to assess impacts, if any, are occurring to surrounding areas of construction. The NGO are Batumi Botanical Centre, PSOVI and Flora and Fauna. This provision ensure that all species of animal, tree and vegetation is assessed to review condition and population. These NGO's have direct access to AGL management to exchange information of the effectiveness of environmental mitigation or areas where risks are developing.

PS2/PR2/ADB's Social Protection Strategy 2001 - Labor and Working Conditions:

Human Resources Policies and Procedures: The Project has not received any claims and allegations of mistreatment by employers. The Project has an internal grievance mechanism which can be completed anonymously if chosen by the claimant. New starters to the Project are made aware of the grievance mechanism at the site induction stage before commencement of work and periodically at toolbox talk's sessions in the workplace. Management operates an 'open door Policy' for workers in all positions to approach them anonymously or otherwise to discuss grievances or concerns.

Labour condition i.e. accommodation, welfare arrangements and leisure faciltiies are assessed on a monthly basis as part of the joint HSE inspection process mentioned above in the 'Monitoing and Review' section.

Number of workers as of June 2015 of the reporting period:
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Name(s) of the workers' organization(s)

The Project, in most part uses AGL's legal team to advise Project management organisations and unions. The AGL team has close working relationships with both the Owners' Engineer and the Contractor AGE. To date no organisations have been sought out by workers; managers encourage freedom of speech and would welcome the addition of union involvement on the Project in a controlled and proportionate measure.

Grievance Mechanism

AGL has continued to register grievances against the Poject. These grievances are then analysed by senior members of AGL and AGE to allow appropriate action to be taken. AGL and AGE hold weekly meetings to discuss the status of outstanding grievances and the update the grievance register accordingly.

Child Labor / Forced Labor

AGL has ensured the Project is compliant with the Child Labor Standards and the Child Labor laws of Georgia. This has been achieved, and the standard will be sustained by having close involvement from the AGL legal team, active monitoring by AGL and the Contractor. At present the youngest age on the Project is 19. Such persons are subject to lower risk activities and subject to close management in a team of experienced workers. Child labour is assessed monthly and quarterly as part of the management audit system.

Occupational Health and Safety (OHS): Please provide occupational health and safety performance data of the Company using the tables below and analyse the effectiveness of the actions being taken for improvement.

As of June 2015, the Project employed approximately 460 local people and 620 Turkish people. The Project, from January 2015 to June employed an average of 1200 people. This figure includes all office and support personnel.

All local and internal workers receive a health, safety and environmental site induction before commencement of works. Local labour that is unskilled are assigned to experienced teams with experienced supervisors to gain the correct experience and understanding of safety rules.

On April 17th 2015, the Project incurred a fatal accident at the Didachara work area, specifically, the Ghorjomi Bridge. This accident is attached in Appendix 3 but in summary, a crane collapsed due to overloading by the crane supervisor. One Turkish and one Georgian was killed. A third worker survived with a broken leg and ribs. This Georgian survivor will return in some capacity in due course. He was released from hospital two weeks after the accident.

Occupational Health and Safety Performance (Construction / Operation Phase)

Item	Number			Target
	Employees	Contractors	Total	
A: Fatalities:"	0	2	2	
B: Total Lost Time Accidents (including vehicular):"	0	4	22	
C: Total number of lost workdays resulting from incidents.	0	29	98	
D: Total man-hours worked this reporting period:	0	1.560,791	3.736,598	
E: Incidence during this reporting period: (Note: Incidence = total lost workdays / total hours worked)	0	0.007	0.007	
F: Lost Time Injury Frequency Rate (Number of lost time accidents x 1,000,000 hours / total man-hours worked = injuries per million hours worked)	0	5.8	5.8	
G: Lost Time Severity Rate Total Lost workdays x 1,000,000 hours / total man-hours worked = lost workdays per million hours worked)	0	4.8	4.8	7.5 or less (construction phase) or 4.5 or less (operational phase)

Improvement Trend of Occupational Health and Safety Performance

Item	2014	2015	2016	-----
A: Fatalities: [Employees] [Contractors] [Total]	0	2		
B: Total Lost Time Accidents (including vehicular): [Employees] [Contractors] [Total]	18	4		
C: Total number of lost workdays resulting from incidents: [Employees] [Contractors] [Total]	69	22		
D: Total man-hours worked this reporting period: [Employees][Contractors] [Total]	1.337,484	3.736,598		
E: Incidence during this reporting period:	0	0.007		
F: Lost Time Frequency Rate (employees) (Contractors) (Total)	9	5.8		
G: Lost Time Severity rate (employees) (Contractors) (Total)	8.8	4.8		

1 Please attach separate reports detailing the circumstances of each fatality. Also discuss how the company has provided benefits/assistance to the worker's family.

2 In capacity to work for at least one full workday beyond the day on which the accident or illness occurred.

3 Lost workdays are the number of workdays (consecutive or not) beyond the date of injury or onset of illness that the employee was away from work or limited to restricted work activity because of an occupational injury or illness.

Workers Engaged by Third Parties: Please provide a summary of how the Company is managing and monitoring the performance of third party employees in relation to the requirements of the PSs I PRs.

Third parties such subcontractors and consultants are subjected to weekly and monthly monitoring practices by AGL, MML and AGE management. Records, such as inspections and audit are maintained at the main camp. AGE (contractor) employ third party organisations for calibration services and testing or key site items such as lifting equipment and cranes. These third party employees or visitors are subjected to the same induction and supervision practices as full time Project employees on the Shuakhevi HEPP.

PS3/PR3/SR1 - Resource Efficiency and Pollution Prevention:
Resource Efficiency - Greenhouse Gas (GHG) emissions avoidance: Please provide the Company's estimate about the GHG emissions avoidance effect of the Project:

GHG emissions avoidance of the Project

Year	Gross electricity generation (MWh / year)	Auxiliary electricity consumption (MWh / year)	Net electricity generation (MWh / year)	Grid emission factor (tonCO2 / MWh)	GHG emissions avoidance (tonCO2 / year)
	A	B	C = A – B	D	E = C x D
PDD for CDM					
Actual					
2015					
2016					
2017					

Note: PDD for CDM (Project Design Document, completed *31/08/2012)*

Estimated CO2 Emissions from Mobile Sources (Gasoline Vehicles)

	Total number of vehicles	Total length of distance travelled (km)	Gasoline consumed		Gasoline vehicle efficiency (litre / km)	CO2 emissions factor (kgCO2/TJ-LHV)	CO2 emissions (tonCO2)
			(litre)	(TJ - LHV)			
		A	B	C	D=B/A	D=69300	E=BxD/1000
2014	2	400	30		0,075	69300	0,00225
2015	3	532	105		0,080	70850	0,00386
2016							
2017							

Note: CO2 emissions factor (gasoline) 69300 kgCO2/TJ-LHV from 2006 IPCC Guidelines.

Estimated CO2 Emissions from Mobile Sources (Diesel Vehicles)

	Total number of vehicles	Total length of distance travelled (km)	Diesel consumed		Diesel vehicle efficiency (litre / km)	CO2 emissions factor (kgCO2/TJ-LHV)	CO2 emissions (tonCO2)
			(litre)	(TJ - LHV)			
		A	B	C	D=B/A	D=74100	E=BxD/1000
2014	292	400	30		0,075	69300	0,00225
2015	294	1153988	873852		0,7572	74100	661,68
2016							
2017							

Note: C02 emissions factor (diesel 011) 74100 kgC02IT J-LHV from 2006 IPCC Guidelines.

Pollution Prevention - Waste: Please provide a summary of non-hazardous and hazardous waste generation and minimization activities using the table below. Please add a summary description of major recycling activities conducted.

Non-hazardous and Hazardous Waste Minimization Activities

Item	Non-hazardous waste				Hazardous waste			
	Generated (ton)	Re-cycled (ton)	Disposed (ton)	Recycling ratio (%)	Generated (ton)	Re-cycled (ton)	Disposed (ton)	Recycling ratio (%)
	A	B	C=A-B	D=B/A	E	F	G=E-F	H=F/E
2014 June - Dec	285	-	285	0%	13,71	13,71	-	100%
2015 Jan-June	236,4	-	236,4	0%	27,30	27,30	-	100%
2015 July - Dec								
2016 Jan – June								

The Contractor has initiated a waste segregation system in the workplace and camp areas. This system comes in the form of colour coded waste bins. However, this waste is then taken to a licensed refuse in the city of Batumi where no such waste segregation of waste recycle exists resulting in mixing of the waste categories. AGL has made several calls to the waste disposal in Tbilisi to confirm receipt of the hazardous waste and the correct quantities as per removal Hazardous waste types are segregated in the workplace. This waste is then collected in suitable vehicles under license and taken to Tbilisi where a license hazardous disposal factory receives the waste.

PS4/PR4/SR1 - Community Health, Safety and Security

Implementation of key actions for community health and safety (dam safety): Please provide a summary of the planned key mitigation measures of related to dam safety (e.g. dam safety review conducted, dam safety monitoring, community emergency response program).

Dam excavation works were near completion in June 2015. Further elaboration on the construction and controls will be explained in the December 2015 Report. Likewise, Skhalta Dam excavation works are planned for November 2015 and will be commented upon later this year. Excavation works for both dams has progresses as per the plans and no accidents or incidents were recorded.

The 5m high Chiruqistsqali Weir will have the excavation finished by August 2015, at which point the concrete foundation will be poured, the concrete outfall was completed in June 2015.

Implementation of key actions for security personnel management: Please provide a summary of the planned key mitigation measures of the security staff about appropriate use of force where applicable toward workers and affected Communities.

All security personnel working on the Project are subject to onsite supervision for key installation such as the fuel store, magazine store and main camp. Outlying camps at Chiruqistsqali, Didachara and Skhalta are managed by the contractor and a lead security guard. AGL has a strict Policy on security and its implementation. During this reporting period, no use of force was necessary an facility belonging or associated with the Shuakhevi Hydro-Project

Implementation of key actions to other incidents. Please provide summary of incidents recorded including date, scale of damage and injury, if any; authorities in charge of investigation / recording and media or community reactions, if any; action taken to respond to the incident; and any outstanding issues and proposed measures. Please provide any other health and safety events or out-reach activities including incidents that have caused damage to the environment or to human health, and/or attracted attention of outside parties (e.g., fire, explosion, chemical or oil spill, and pollution release).

On April 17th at the Didachara work site (Ghorjomi Bridge), 3 workers, 2 Georgian and 1 Turkish national feel 32m for a bridge pier due to crane overloading. One Georgian survived and proposes to return to the Project in September 2015. The second Georgian and Turkish worker died as result of their injuries. The accident scene was attended too by the Project emergency services and local Police from the local town of Khulo.

No persons from the Project were arrested as a result of the accident. However, in May 2015 AGE managers attended a meeting with the Ministry of Economy in Tbilisi. This meeting was to brief the Government of Georgia on the accident cause and what measures were taken to prevent recurrence. Also in May 2015, the civil Contractors HSE Manager, Construction Manager and Project Manager were summoned to the Khulo Police for a formal interview. The Khulo Police were investigating and taking statements from the persons to fully understand what safety measures were in place and which of those measures were broken. All three of the above mentioned persons were released without charge by the Police and returned to work and resumed

normal duties.

The Police will complete their report by September 2015, at which point they may release the findings to the Project but refused to commit this undertaking.

On June 6th, one worker bending steel for the powerhouse construction broke a finger on his right hand. The 40yr old Turkish national failed to secure a rebar cage which was circular in design, it rolled forward and broke his finger. The injured person was taken to hospital the same afternoon and released soon after treatment. He returned to work the next day.

No pollution or contamination events were recorded in this period as a result of construction activities. In March 2015 a small electrical fire broke out at 01:15 in the main camp gym. The fire was small and due to an electrical fault. The site fire teams quickly extinguished the fire. Less than USD 300 damage was caused.

In April 2015, a waste facility caught fire near to a smoker's area at the electro-mechanical workers accommodation (Alstom) area at the main camp. As with the fire mentioned above, the fire alarm system and team notification was such that minimal fire damaged was recorded. The waste facility was moved a greater distance from the accommodation area.

PS5/PR5/SPS - Land Acquisition and Involuntary Resettlement:
Land Acquisition. Livelihood Restoration: Please provide a summary of the land acquisition and livelihood restoration, including implementation of the Land Acquisition and Livelihood Restoration Plan. Identify any gaps and the corresponding measures/corrective actions undertaken by the Company.

The Land Acquisition and Livelihood Restoration Plan (LALRP) implementation was followed for the Project's planned land acquisition for the Didachara access road. Small land parcels for the 35kV Transmission Line that AGL will construct in 2016 will be acquired from the state in the first quarter of 2016.

Affected persons from the Shuakhevi Hydro Project that had land acquired for construction took part in a restoration survey mapping their interest in income restoration programs from June to July 2015. This information was fed into June 2015 update of the Detailed LRP and records the schedule of restoration measures that will be implemented by AGL with close support from the NGO, Elkana.

LALRP CAP

The Mott MacDonald Corrective Action Plan Audit undertaken in 2014 has been predominantly closed but some items are classed as 'Ongoing' in the first half of 2015. The CAP items are subjected to monthly internal monitoring by AGL line managers to ensure that standards are maintained.

There are a small number of ongoing actions, or actions that were not due at the present time, which are presented in an updated CAP in section 3 and summarised as follows:

- Implementation of the Detailed LRP
- Monthly internal monitoring reports on resettlement to be submitted to ADB
- Organisation of AHs into correct categorisation on data spreadsheets
- Preparation of an Addendum LALRP when new land needs to be acquired
- Updating the spreadsheets (or creation of new spreadsheets) when new land is acquired
- Preparation of a Completion Audit when all land has been acquired

AGL now has suitable personnel resources and competence to manage these systems in line with Lenders Standards. In addition, the UK based Consultant, ARUP have been contracted to conduct independent quarterly or semi-annual reporting on behalf of the Lenders group. ARUP will be focusing on the LALRP, DLP and Stakeholder Engagement Plan (SEP) implementation and key items for AGL.

In July 2015, this procedure was changed to quarterly desk top studies and 6 monthly inspections of the Project by designated members from ARUP and the Lending group.

Please provide a summary of PS5/PR5/SPS related stakeholder engagement and outcomes. AGL has had significant involvement with government authorities and local press during 2015.

Communication with external organisations at the highest level has been effective. The Government conducted several Project inspections from March 2015 to June 2015. Key areas for assessment were borrow pits and spoil disposal areas. In the first quarter of 2015, AGL received criticism from the Government for breaching site boundaries at the Chanckhalo spoil disposal area. However, the Project avoided penalties due to swift action from the civil Contractor to bring the spoil material to within the site boundaries again.

AGL opened a third Information Centre (IC) in the village of Skhalta. This village is 6 km outside the Skhalta dam work area and directly positioned on the road leading to site. The IC is managed by local people and monitored by AGL team members.

PS6/PR5/SR1 - Biodiversity Conservation and Sustainable Management of Living Natural Resources Implementation status of key actions: Please provide the implementation status of key mitigation measures for conservation of biodiversity, including implementation of the Biodiversity Action Plan.

The obligations in the BAP for the construction activities are being managed by AGL management and local NGO's that monitor tree, plan, mammal, reptile, amphibian and bird species for potential impact. The NGO's are PSOVI (birds and mammals), Flora & Fauna (river habitat and water based species & Batumi Botanical Centre (Plant and tree life). Project mitigation measures such sedimentation ponds and silt traps in the work area well established. In the wider area outside the Project workspaces, the NGO's monitor the site boundaries to ensure the Project does not enter restricted areas.

ESIA Obligations

Below is the Summary of conservation objectives section under the Adjaristsqali BAP Rev G.

B1 Protect the natural forest habitats and the populations of notable plant species during construction of the Project
B2 Replant affected forest and enhance forest habitat within the Study Area

C1 Protect river habitat and associated species during construction and operation of the Project
C2 Provide support for the enhancement of river habitats, fisheries and awareness raising within the Study Area in the period 2013-2016

D1 Protect terrestrial mammals and reptiles during construction of the Project
D2 Provide offsetting and enhancement for the protected mammal and reptile populations in the Study Area

E1 Protect bird species during construction
E2 Provide compensation and increase understanding of priority bird species in the Study Area

AGL, through its Local NGO involvement, also monitors nesting bird and migrating bird activity along with large mammal observation through visual and camera trap activity whilst also monitoring the effects on reptile and amphibians in water courses and areas upstream and downstream of construction sites,

Ecological flow management: Please provide a summary of the ecological flow management during the reporting year.

AGL's local NGO's, Flora and Fauna, PSOVI & MTBARI completed eco-flow monitoring in the first half of 2015. This data was provided to the civil works contractor. AGL now has fixed base stations in place downstream of the dams, weir and powerhouse locations to monitor flow activity along with humidity, TSS and temperature. This data is then analysed by the Georgian Government and NGO's. In the first half of 2015, the surveys from the NGO's revealed that no contamination or pollution had taken place, thus plant species and aquatic life have not been threatened or harmed as a result of site activities. All records are maintained in the AGL main camp.

Late in 2015 AGL will commence the design of the Operational Manual for the Project. The data collated during the pre-construction in line with the ESIA, and data collated during the construction phase will help the conclusions and decision during the Operational Manual design.

PR 10/SPS/ADB's Public Communications Policy 2011 - Stakeholder Engagement Implementation status of key actions: Please provide the implementation status of stakeholder engagement plan and any evolutions or modifications to the Project SEP.

AGL opened a thid information cenrtre in the municipality of Khulo, Skhalta. This new information was commissioned in April 2015 with day-to-day operations carried out by local staff and management coming from the AGL social team manager. In May 2015, all three information were updated with the latest Project related information in addition to other key information messages such as; ban on hunting, awareness of protected species and the importance fo maintaining a clean environment.

The Project SEP was updated in June 2015 with the latest developments by AGL. This Plan was then subjected to scrutiny by the Lenders auditor's, ARUP for comoplaince against the pertinent Performnace Standards. AGL is still awaing the outcomes of this srucitny.

Information Disclosure: *Please provide a summary of project related information that has been disclosed as well as consultations conducted with affected people, local communities, civil society groups, and other stakeholders during the monitoring period, in what form and any comments received.*

In May 2015, AGL opened a third Information Centre in Skhalta. This new Centre mirror's the other two information centres and provides employment for local persons as well as informing the communities on key items such as construction techniques, progress and Project benefits.

Public Grievance Mechanism: Please provide a summary of stakeholder concerns complaints, grievances, or protests received from local communities, recorded dates and organizations involved and measures taken to address such grievances and any outstanding issues and proposed measures for resolution.

The most common grievances noted through trend analysis from January 2015 to March 2015 were multiple allegations of cracked houses due to blasting activities and heavy mobile plant in close proximity to houses. The village of Chanckhalo was the most vocal village and protestor of the Project but after 3 months of continuous vibration monitoring from March to May 2015 the date provided to the mayor and community leader showed that accusations were baseless due to such low vibration magnitude rates.

The Project has installed vibration magnitude sensors and portal noise recording devices at the tunnel portal and receptors such as human dwelling, structures of interest and where people are making allegations of high noise and vibration. This is being completed in conjunction with cooperation from the local authorities and periodic participation from the main Georgian government in Tbilisi.

Corporate sustainability activities: Please provide a summary of the Company's corporate sustainability activities (e.g. Corporate social responsibility activities, corporate community support activities, corporate sustainability reporting activities), if conducted during the reporting year.

CSR proposals are agreed upon within communities by the village leaders and mayors. These proposal are then issued in writing to AGL. Selection is made and, through the use of local people, implementation initiated.

From January 2015 to June 2015, AGL undertook positive community schemes such as playground development, library refurbishment and installed a major new supply in Akhaldaba to ensure year-round water availability for the community.

Environmental and Social Action Plan (ESAP) included in Schedule 12 - Form of Action Plan of the Plan: Please provide a summary of the implementation status of the ESAP using the format below.

No	Action	Source of requirement	Implementation schedule	Target For Successful Implementation / Reporting Requirement	Current Status
1	Report to Lenders on the status of each ESAP requirement and compliance with PRs/PSs/SRs.	ADB SR1 EBRD PR1 IFC PS1	- Semi-annually throughout construction until commissioning - Annually during operation	Submission of reports in format to be mutually agreed, acceptance by Lenders *ESHS Reporting Requirement:* - *Completeness and adequacy of ESHS Report*	Second Semi-Annual report issued to Lenders covering period Nam 15 to June 2015
2	Finalize development of the ESHS Management System to include (as required by ESIA, vol. IV, sec.4.2.2): - Register of environmental and social aspects - Register of requirements and conditions in legislation, consents, permits, etc. - Schedule of monitoring program, including required and recommended surveys / inspections/audits (EHS Monitoring Schedule) - Development of Environmental Improvement Plan through development of: - E&S Management and Monitoring procedures	ADB SR1 EBRD PR1 IFC PS1 Best Practice	Prior to commencement of construction works and then prior to commercial operation	- Finalized ESHS with all aspects included. - Lender approval of monitoring program - Monitoring of environmental management (including design change management) and mitigation as per AGL ESHS. *Report to Lenders:* - *Status of ESHS Management System development* - *Metrics of key performance indicators as set down in AGL ESHS* - *Summary of audit results of AGL ESHS implementation*	Significant EHS occurrences are recorded in the monthly site progress report along KPI's – ongoing KPI's attached is Appendix 5

No	Action	Source of requirement	Implementation schedule	Target For Successful Implementation / Reporting Requirement	Current Status
	- EnvironmentalOperating procedures - Preparation of action lists and responsibilities - Development of training materials and key performance indicators. - Design Change Management procedure				
3	Acquire and comply with all required permits and authorizations	Georgian law ADB SR1 EBRD PR1 IFC PS1	Prior to beginning any activities that require permits or authorizations	- Permits & authorizations received - Reports submitted to authorities as required Report to Lenders: - Compliance status - Report immediately any formal enforcement actions for noncompliance	The AGL legal monitor permit requirements and advise AGL management of acquisition process and status Quarterly external monitoring is provided by ARUP. AGL carryout monthly internal monitoring
4	Implement ESMP and all associated plans	ADB SR1 EBRD PR1 IFC PS1 Best practice	Throughout construction and operation	- ESMP and all plans implemented - ESHS impacts avoided, minimized, mitigated or compensated Report to Lenders: - Highlights of implementation, including major deviances	Noise, dust and water discharge are being monitored as per the ESMP & CEMP control documents. Result are collated monthly and issued to the Engineer for review – ongoing.
5	Use best efforts to ensure ESIA on Batumi-Akhaltsikhe transmission line is completed	ADB SR1 EBRD PR1 IFC PS1	Throughout development of ESIA and construction/ operation of line	- Transmission line ESIA meets international standards - Construction and operation	The TL ESIA was uploaded to the WB website in December 2013 as evidence of acceptance

No	Action	Source of requirement	Implementation schedule	Target For Successful Implementation / Reporting Requirement	Current Status
	in accordance with international best practice and that required mitigation measures are fully implemented.			accordance with agreed mitigation *Report to Lenders:* - *Status of transmission line ESIA and approval process* - *Summary of construction and operation*	The ESIA for the TL was agreed by the GoG on December 2013.
6	Further develop OHS plan to be specific to Adjaristskali project(s) and ensure that the procedures and HSE manuals referred within it are an integral part of health safety and environmental management on site	ADB SR1 EBRD PR2 IFC PS 2 Best Practice	Prior to construction	- OHS plan further developed, adopted, and implemented - Minimum lost time incidents and fatalities - Monitoring of environmental and social management and mitigation as per AGL ESHS Monitoring Schedule *Report to Lenders:* - *Status of updating of OHS plan* - *Outcome of OHS monitoring as per ESHS Monitoring Schedule.* - *Summary of OHS issues, including incident and enforcement statistics, status of training, etc. Report to cover AGL and contractor workforces* - *Report to Lenders immediately in case of major accidents*	Lost injuries and significant near-miss occurrences are recorded in accordance with the Contractor's and AGL's HSE Plans and elaborated upon on in monthly reports when they happen. The monthly report contains, summaries, causation and trend analysis into negative site activities. Monthly assessments are also made on camp / accommodation arrangements as part of the ESMP along with possible effects of nose and dust on local communities directly or indirectly affected by the Project – Ongoing.

No	Action	Source of requirement	Implementation schedule	Target For Successful Implementation / Reporting Requirement	Current Status
				and/or fatalities	
7	Implement Labor Grievance Plan (2012), including grievance mechanism made available toall AGL and contractor workers	ADB SR1 EBRD PR2 IFC PS 2	Throughout construction and operation	- Plan implemented, mechanism made available. - Timely resolution of all grievances *Report to Lenders:* - *Outcome of labor grievance monitoring as per ESHS Monitoring Schedule* - *Summary of grievances and resolutions*	A grievance mechanism has been developed and implemented by AGL and AGE. MM provide monitoring support on behalf of AGL. The AGL information centres record grievance and provide prompt feedback to AGL management and the wider social team that deals with community liaison whilst the Project is live.
8	Review Spoil Management Plan to ensure: - Plan is consistent with ESIA and project design, including estimated spoil quantity - Specific method statements and risk assessments are completed for each spoil disposal site - Clarity on potential land acquisition - Site specific subsidiary plans to cover management of each individual site during fill and subsequent site reinstatement - Designs sufficient to prevent erosion due to specified	Georgian law ADB SR1 EBRD PR3 IFC PS3 Best Practice	Prior to spoil generation	- Site specific spoil management plans developed/approved by AGL - Spoil managed according to plan - Monitoring of environmental management and mitigation as per AGL ESHS Monitoring Schedule *Report to Lenders:* - *Status of site specific spoil management plans* - *Outcome of spoil monitoring as per EHS Monitoring Schedule*	Specific spoil management method statements are produced and agreed before construction as part on the EHS management process. The Plans are developed under scrutiny from AGL and MML, these Plans are then issued to the MoE after translation.

No	Action	Source of requirement	Implementation schedule	Target For Successful Implementation / Reporting Requirement	Current Status
9	Complete all necessary additional surveys, reviews and consultations identified in the ESIA and project permit approval conditions. Modify ESMP and associated plans as needed to incorporate findings into environmental and social management.	Georgian law ADB SR1/SR2 EBRD PR3 IFC PS3 Best Practice	Prior to commencement of construction	- Surveys, reviews, consultations completed - ESMP modified as needed *Report to Lenders:* - *Status of additional surveys and impacts of outcomes on ESMP*	Phase II, mesohabitat, Low flow, high flow, CHA and pre-construction surveys were completed as required in the BAP and ESIA. These surveys were completed under the supervision and guidance of MML. AGL employ local NGO's to carry on with construction monitoring as the project develops. The NGO's provide monthly reports that are subjected to analysis by AGL.
10	Identify mitigation measures for concrete within CEMP11 and ensure appropriate management techniques are employed through the ESMP.	ADB SR1 EBRD PR3 IFC PS3 Best Practice	Prior to commencement of construction	- Mitigation measures identified - ESMP modified as needed *Report to Lenders:* - *Updated CEMP12* - *Outcome of CEMP12 implementation monitoring as per EHS Monitoring Schedule*	CEMP 11 – water discharge assessment has been delivered by the acquisition of a specific sub-contractor that manages the waste water treatment plan on site. This was setup before the construction phase and will be continuous throughout. Management documents are the CEMP 00,11 and the HSE Plan. CEMP 12 has target specific plans in the Contractors HSE Plan and the Project Emergency & Major Accident Plan.

No	Action	Source of requirement	Implementation schedule	Target For Successful Implementation / Reporting Requirement	Current Status
11	Identify within CEMP09 specific solutions with regards to the need for management of waste at appropriately licensed landfill or other sites.	Georgian law ADB SR1 EBRD PR3 IFC PS3 Best Practice	Prior to commencement of construction	- Solutions identified - CEMP09 modified *Report to Lenders:* *- Updated CEMP09* *- Status of site – specific spoil waste disposal site risk assessments and method statements* *- Outcome of monitoring spoil management practices as per EHS Monitoring Schedule*	CEMP 09 is the waste management plan for the Project. Specific risk assessments and a hazardous waste management plan are in place as per CEMP 09. Licences for hazardous waste transport was obtained from the MoE in January 2014, the Contractor has hazardous waste contract established with a licenced disposal area in Tbilisi.
12	Identify and evaluate risks to community health and safety from construction and operation of the project, develop and implement commensurate preventive measures and plans to address them.	ADB SR1 EBRD PR1 IFC PS1	Prior to creation of potential risks	- Community H&S risk assessment for all project stages - Mitigation/prevention measures developed and implemented - ESMP monitoring and reporting *Report to Lenders:* *- Status of risk identification and mitigation, and planning* *- Outcome of monitoring of H&S management of risks to the community as per EHS Monitoring Schedule*	Project and Community Management Plan agreed in May 2015 Monthly and quarterly reporting are the obligations in the ESMP and ESIA. EHS monitoring outcomes will be further assessed when full scale construction commences. To date minor construction operation shave taken place including camps and work areas. The project also has a community Emergency Response Plan that has been agreed by the GoG.

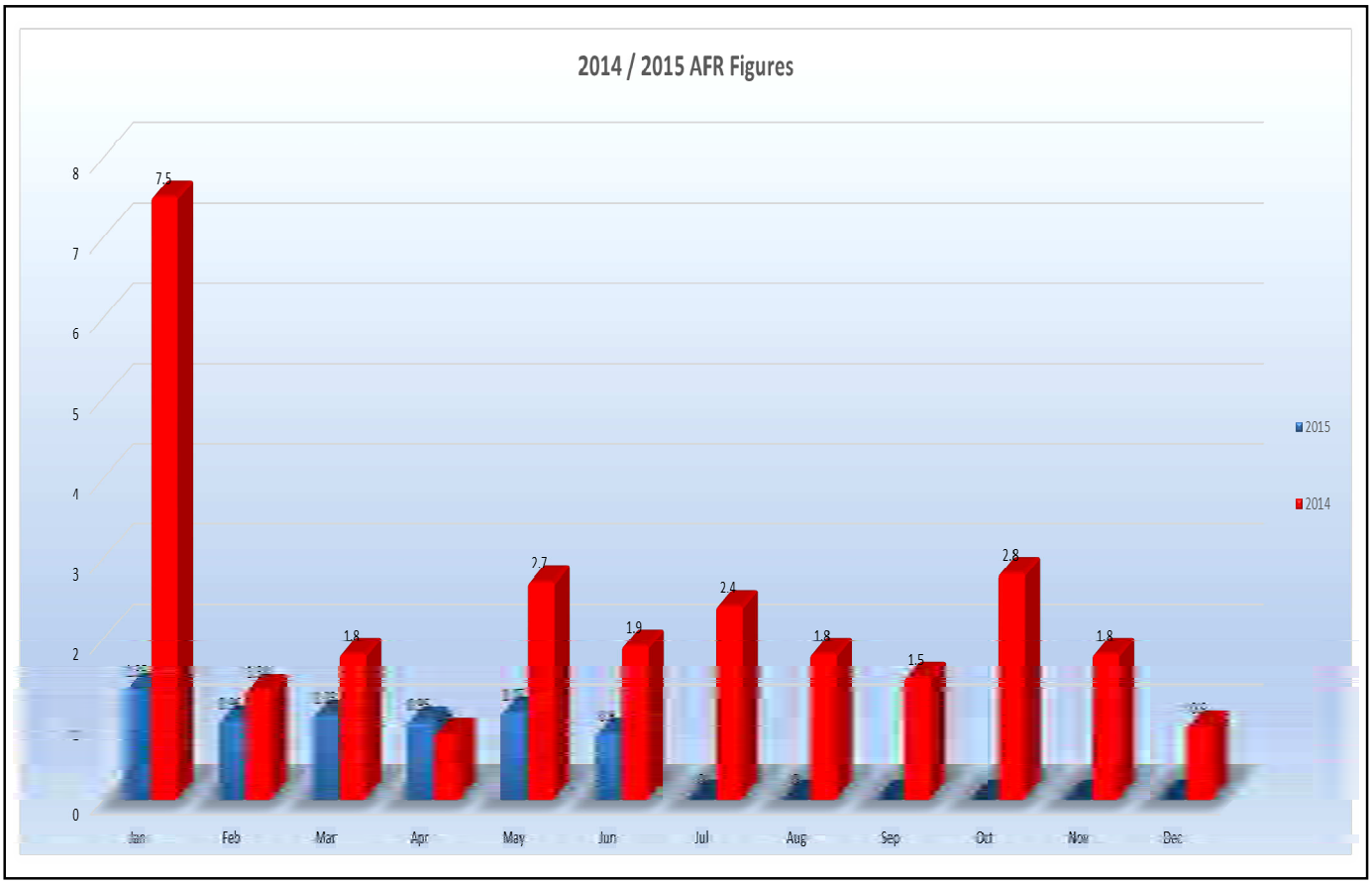
No	Action	Source of requirement	Implementation schedule	Target For Successful Implementation / Reporting Requirement	Current Status
13	Develop and enforce a Code of Conduct for Security Personnel	ADB SR1 EBRD PR4 IFC PS1 Best practice	Prior to commencement of construction	Code of Conduct developed and enforced *Report to Lenders:* - *Status of Code of Conduct development* - *Outcome of monitoring of effectiveness of Code of Conduct for Security Personnel as per EHS Schedule*	Code of Conduct developed and implemented. This was a Policy that as delivered to the Lender's in May 2013 as part of the DD.
14	Develop and enforce Worker Code of Conduct in accordance with the Worker Behaviour Guidelines	ADB SR1 EBRD PR4 IFC PS4 Best Practice	Prior to commencement of the construction phase	- Code of Conduct developed and enforced *Report to Lenders:* - *Status of Code of Conduct* development - Outcome of monitoring of effectiveness of Worker Code of Conduct as per ESHS Schedule	To support the Code of Conduct, the Project has Policies covering Anti-Corruption and Misconduct. Issued to Lender's as part of the May 2013 DD process.

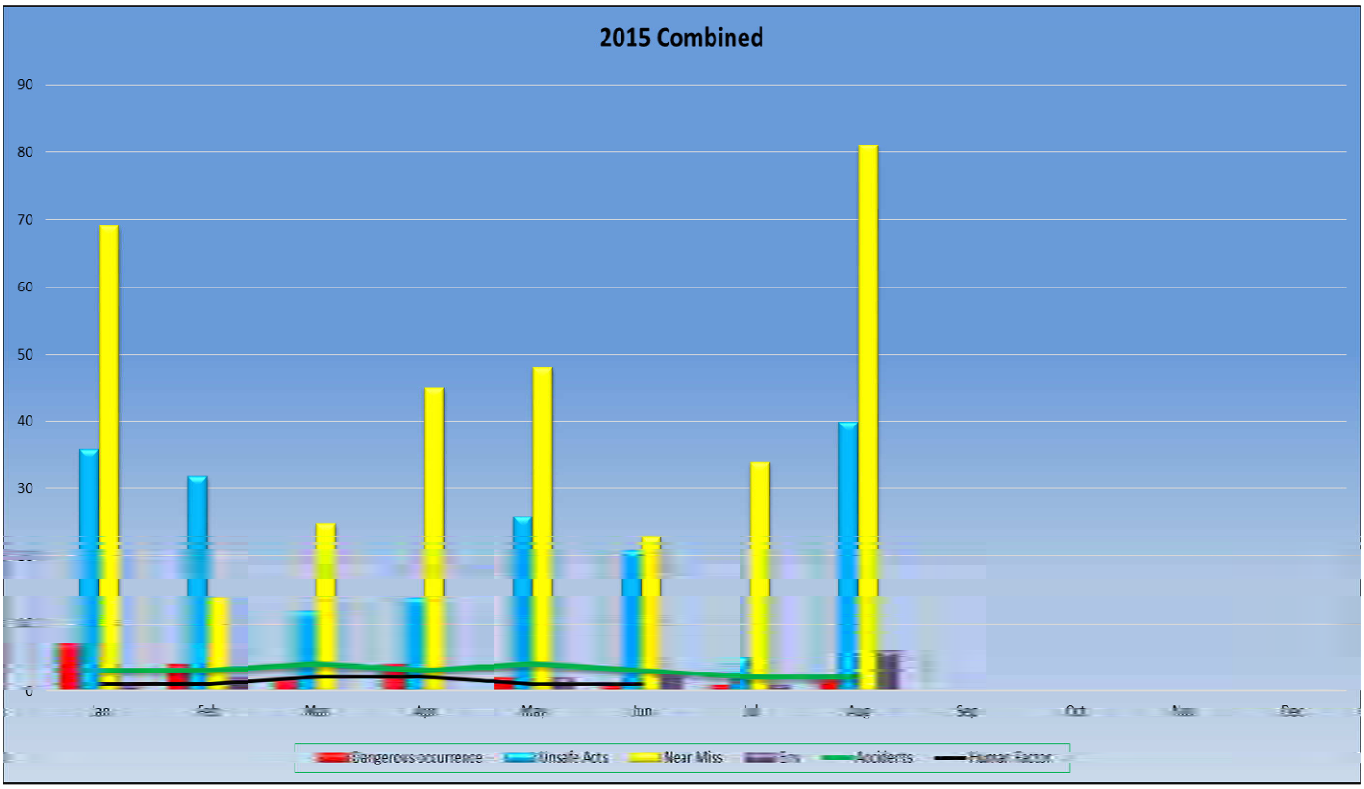
No	Action	Source of requirement	Implementation schedule	Target For Successful Implementation / Reporting Requirement	Current Status
15	Implement the LALRP, including timely disclosure of up-to-date land acquisition and resettlement documentation, summary of LALRP and information on progress (e.g. monthly Information Letters, booklets, brochures, etc.)	ADB SR2 EBRD PR5 IFC PS5	Throughout land acquisition process	- LALRP implemented - Up-to-date land acquisition and resettlement documentation available on AGL's website and locally. *Report to Lenders:* - *Status of acquisition* - *Summary of disclosures*	Implemented and complete as April 2014. Additional land maybe required for the new road alignment in Didachara. The LALRP will be opened again wherever additional land is required. In April 2014 ADB initiated an Audit that focused on the effectiveness of the LALRP implementation with a subsequent report issued and agreed in May 2014.
16	Implement the BAP, including: - developing and implementing detailed monitoring schedule for evaluation and reporting of ecological impacts and recognizing findings of additional surveys undertaken - monitoring flow upstream and downstream of all dams to verify required minimum flows are met - Ecological assessments as performed to verify flows are adequate to preserve biodiversity, or to redefine minimum flows	Georgian law ADB SR1 EBRD PR6 IFC PS4, 6	- Develop schedule: Prior to construction - Implement monitoring schedule: as specified in BAP throughout during construction and operation - Monitor flow: throughout operation - Ecological assessments: as per BAP	- BAP implemented - ESMP monitoring and reporting *Report to Lenders:* - *Status of schedule development* - *Outcome of ecological monitoring as per Monitoring Schedule* - *Summary of minimum flows against requirements* - *Summary of ecological assessments, including need for adjustments in minimum flows.*	Local NGO's perform the monitoring on the BAP and ESMP specification. The Contractor's social team along with AGL's social team provide the physical monitoring in line with the ESMP requirements – ongoing.

No	Action	Source of requirement	Implementation schedule	Target For Successful Implementation / Reporting Requirement	Current Status
17	Conduct additional surveys to determine presence of graveyards, and if needed work with communities to minimize impacts	ADB SR1/SR2 EBRD PR8 IFC PS8	- Survey of area: prior to disturbance of the area - Consultation with communities to minimize impact: prior to disturbance of graves	- Surveys conducted - Consultations held and actions agreed *Report to Lenders:* - *Summary of surveys and actions taken (consultations, etc.)* - *Outcome of monitoring of graveyard protection as per EHS Monitoring Schedule*	As stated in section 9.
18	Update CEMP01, Chance Finds Procedure, to call for archaeologist to be on site as needed to verify archaeological finds, provide advice to a nominated AGL representative, and liaise with relevant authorities.	Georgian law ADB SR1 EBRD PR1 IFC PS1	Prior to construction	- Updated Chance Finds Procedure *Report to Lenders:* *Status of* ADB SR1 EBRD PR4 - *IFC PS1updated Chance Finds Procedure* - *Outcome of chance finds procedure implementation, monitored per EHS Monitoring Schedule*	This task was completed in late 2013. An extensive assessment was completed of the work and camp areas for Archaeology or areas of special interest.
29	Implement Stakeholder Engagement Plan	ADB SR 1 EBRD PR10 IFC PS1	Throughout construction and operation	- SEP implemented *Report to Lenders:* - *Summary of stakeholder engagement*	AGL, through its monitoring process has recognised areas for improvement with SEP delivery. AGL has to observe the obligation set forth to reach full compliance.
20	Evaluate and update SEP to improve/ refine stakeholder list,	ADB SR1 EBRD PR10	Evaluation and update: annually during	- SEP evaluated and updated if needed	September 2013 is the current revised document. Lenders are in possession of this document.

No	Action	Source of requirement	Implementation schedule	Target For Successful Implementation / Reporting Requirement	Current Status
	Communication methods, media, etc.	IFC PS1	construction, biennially thereafter	*Report to Lenders:* - *Updated SEP*	Reports will be issued to the Lender's twice per year to formerly update on EHS, land, financial and progress.

Annexure 1 - HSE Key Performance Indicators





Annexure 2 - Ghorjomi Bridge Accident

Adjaristsqali Georgia LLC

Shuakhevi Hydropower Project

Ghorjomi Bridge Investigation

REP/HP/03

Issue | 19 August 2015

Job number 237510-04

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ARUP

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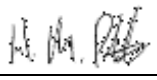
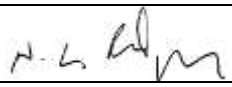
		Signature			
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		Name			
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				Issue Document Verification with Document	✓

Contents

Executive Summary

Introduction

Arup were commissioned by Adjaristsqali Georgia LLC (AGL) to carry out an investigation into the major accident which occurred at Ghorjomi Bridge on 17 April 2015 at the Shuakhevi Hydropower Project in Ajara district, Georgia, which was carried out between 21 and 23 July 2015.

During this investigation interviews were conducted with a selection of staff from AGL (the Employer) and AGE (the Contractor), together with a site visit to Ghorjomi Bridge. Information available on site was examined and the Contractor's accident investigation report was reviewed. The objective of the investigation was to establish the cause and to prevent a repeat of the accident, and did not set out to attribute blame to any of the parties involved.

This report analyses the possible causes of the accident and makes a number of recommendations to reduce the likelihood of a recurrence of similar accidents.

Summary of Events

On Friday 17 April 2015 a mobile crane was being used to remove a platform, which consisted of a two storey scaffolding and formwork in an integrated unit, from pier 2 of Ghorjomi Bridge. The team on site found that the tapered locking pin, locally referred to as a "carrot" (which was supporting the platform) and the platform were stuck when they tried to remove the platform from its position, and it could not be lifted up to release it from the "carrot".

Eventually whilst under significant tension, the platform broke free in an uncontrolled manner. The crane mast buckled and struck the pier, and the fly-jib buckled and also hit the pier, leading to an uncontrolled release of the platform. Due to the dynamic load the crane ropes broke, causing the platform with the three men on it to fall, hitting the base of the pier and the riverbed. Two men were killed and one survived. The man who survived was interviewed briefly for this investigation.

Findings and Analysis

The main findings were:

- Pier 2 was 8 metres higher when the platform was to be removed than it had been when it had been installed, and as a result the length of the crane was greater with two sections of fly-jib deployed.
- There was no overall person appointed as the lifting supervisor and no lifting plan had been drawn up for the lifting operation.
- The crane operator lifted a load that exceeded the safety limit for the crane. During the investigation different crane tables were referred to and different weights were stated for the weight of the platform. These would

have both contributed to the miscalculation of the maximum capacity of the crane.

- There was no audible or visual warning alarm on the crane (a Liebherr LTM 1050 – 4 axles), although the AGE procedure for crane operations requires every crane to be provided with a safe working load indicator visible to the operator and an overload warning device.
- No technical abnormalities were reported relating to the crane during the dismantling and removal process by the AGE Mechanical Manager, although no report has yet been received from the Georgian Government expert in cranes or from the Georgian police authority.
- There were documented risk assessments, safe systems of work and safety procedures within the AGE Occupational Health & Safety and Environmental Management Plan, but these were not sufficiently detailed for the type and complexity of the lifting operations on site for Ghorjomi Bridge.
- The method statement for the construction of Ghorjomi Bridge was not being followed and implemented correctly, as it stated that a tower crane will be used for the construction stages rather than a mobile crane.
- The permit to work system in operation at the time of the accident did not explicitly include lifting operations, although working at height was included.
- Toolbox talks and training were in place for a variety of tasks and operations, but the risks and specific circumstances of the crane operation to remove the platform were not documented in the evidence seen. However the survivor of the accident attributed his survival to the correct wearing and use of the safety harness which he learned through the training and toolbox talks that he received.
- The work was being undertaken although not all of the licences were in place (i.e. the Crane Operator's Georgian licence, the Georgian "passport" for the crane, and the construction permit for Ghorjomi Bridge).
- The team were working late beyond the end of the shift on a Friday in order to complete the work, as the AGE Works Manager was going on holiday the next day.
- Three men were positioned on the platform to be removed at the time when it was released, although the survivor stated that they could not have accessed the position where the platform was stuck without standing on it.

Conclusions

The primary cause of the accident is attributed to several unsafe behaviours by those involved. The failure by the crane operator and works manager to accurately calculate the safe maximum capacity for the load. The failure by the team on site to stop work and reassess the situation when the locking pin (locally

referred to as a "carrot") and platform were stuck. The team were working late beyond the end of the shift on a Friday in order to complete the work. The team could have cut the head of the "carrot" to remove it but considered that doing so would have been a waste of materials.

The accident could have been prevented if a competent lifting supervisor had been appointed and a lifting plan prepared and followed, a proper risk assessment had been conducted and implemented, the contractor's method statement had been complied with, and if a robust permit to work system had been in place the non-compliances would have been identified and rectified.

Recommendations

A table of recommendations is included in section 6 at the end of this report which if implemented should reduce the likelihood of a recurrence of similar accidents.

1 Introduction

Arup were commissioned by Adjaristsqali Georgia LLC (AGL) to carry out an investigation into the major accident which occurred at Ghorjomi Bridge on 17 April 2015 at the Shuakhevi Hydropower Project in Ajara district, Georgia. This accident investigation was carried out between 21 and 23 July 2015 to establish the cause and to prevent a repeat of the accident, and did not set out to attribute blame to any of the parties involved.

During this investigation interviews were conducted with a selection of staff from AGL (the Employer) and AGE (the Contractor), together with a site visit to Ghorjomi Bridge. Information available on site was examined and the Contractor's accident investigation report was reviewed.

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Eventually whilst under significant tension, the platform broke free in an uncontrolled manner. The crane mast buckled and struck the pier, and the fly-jib buckled and also hit the pier, leading to an uncontrolled release of the platform. Due to the dynamic load the crane ropes broke, causing the platform with the three men on it to fall, hitting the base of the pier and the riverbed. Two men were killed and one survived. The man who survived was interviewed briefly for this investigation.

This report analyses the possible causes of the accident and makes a number of recommendations to reduce the likelihood of a recurrence of similar accidents.

2 Summary of Events

On the day of the accident the team started the shift that morning at 07.30 and continued to work all day. The plan was to finish removing the platform by the end of the shift which was at 18.30, and they were motivated as the AGE Works Manager was going on leave the next day, which was a Saturday.

A 50 tonne Liebherr LTM-1050-4 mobile crane was being used to remove a platform, which consisted of a two storey scaffolding and formwork in an integrated unit, from pier 2 of Ghorjomi Bridge. It was operating with two sections of fly-jib at a radius of 22 metres.

The team on site found that the tapered locking pin, locally referred to as a "carrot" (which was supporting the platform) and the platform were stuck when they tried to remove the platform from its position, and it could not be lifted up to release it from the "carrot".

The team applied extra force using a portable manual hoist (i.e. a "Tirfor" winch or equivalent) to add force between the concrete and the platform, and then suddenly the platform did lift up from where it was stuck to the locking pin (i.e. the "carrot") and was released causing the platform to break free in an uncontrolled manner.

When the platform broke free in an uncontrolled manner, the crane mast buckled and bent at approximately 8 metres from the top (at the 4th boom) and struck the pier. The fly-jib buckled and also hit the pier, leading to an uncontrolled release of the platform. Due to the dynamic load it is considered that the boom and jib, and the crane ropes were overloaded, causing the platform to break the ropes and the platform with the three men on it fell approximately 30 metres under gravity, hitting the base of the pier and the riverbed. Two men were killed and one survived.

The injured person who survived is a Georgian whose name is Tengiz Geopaksadze. He suffered several broken ribs, a broken leg and cuts and bruises to various places on his body. He was in hospital for three weeks after the accident. He had been off work since the accident, but he was walking and reportedly had good motor functions at the time of this investigation. With his consent, he was interviewed briefly for this investigation.

One of the deceased was Turkish and he was the signaller who had been on the radio in contact with the crane operator and his name was Ahmet Cakmak. He was 40 years old and had 20 years' experience and was well respected by his colleagues. The other person who died in the accident was Georgian and his name was Paata Iakobadze and he was 25 years old.

At the time of the accident it was getting dark and the team had chosen to continue to work on beyond the end of the shift. The accident happened at 18.50.

On 4 May 2015 a meeting was held in Tbilisi with the Government to discuss this accident. There was one Police Officer and two Representatives from the Ministry of the Environment Supervision Agency in attendance. AGL were told by the Government to ensure that there was no repeat of such an accident and the

Government Representatives were satisfied with the compensation paid out swiftly to the families of the two deceased, as a result of this it was confirmed that no further action would be taken against any parties as a result of the accident.

On 18 May 2015 AGL disclosed to the lenders the outcome of that meeting which was that no action was being taken as a result of the accident.

At the time of this investigation there had been no Police report issued to AGL.

Photograph 1 Crane with buckled mast and fly-jib

Photograph 2 Crane mast buckled

Photograph 3 Fly-jib buckled, showing two sections of fly-jib were used

Photograph 4 Fallen work platform

Photograph 5 Tapered locking pins where the fallen platform had been fixed to pier 2

Photograph 6 Pier 2 at the time of the site visit for this investigation

Photograph 7 Platform which had been removed from pier 1 showing slot that receives the tapered locking pin

Photograph 8 Close up of slot mechanism that receives the tapered locking pin

3 Findings

3.1 Site constraints

Pier 2 was 8 metres higher when the platform was to be removed than it had been at the time when it had been installed, as the concrete cap had then been poured and cured. As a result, the length of the crane was greater and two sections of fly-jib had to be deployed (approximately 8 metres), thus reducing the maximum capacity of the crane from 3.6 tonnes when the platform was lifted into place without a fly-jib, to 3.05 tonnes when it was operating with the two sections of fly-jib, according to the Liebherr LTM-1050-4 crane table referred to by the contractor on site at the time of this investigation.

3.2 No lifting supervisor

There was no overall person appointed as the lifting supervisor to be in control of the lifting operations, although the AGE Works Manager was on site as well as the crane operator and the site team working on the pier. Good co-operation between them was reported but there was a lack of ultimate authority and responsibility.

3.3 No lifting plan

No lifting plan had been drawn up for the lifting operation. It was reported that the crane operator and the AGE Works Manager had used crane tables to determine the safe working load of the crane for that lift. As both of these persons are no longer employed on the project by AGE it was not possible to interview them to confirm this.

It was reported in the interviews and in the contractor's investigation report that the crane operator could not see the platform from the crane as it was on the opposite side of the pier, and that he was relying on the instructions over the radio by those on the platform.

According to the crane table seen within the Georgian Crane Licence document for the 50 tonne Liebherr LTM-1050-4 mobile crane, when operating at a radius of 22 metres the maximum capacity of the crane was 3.7 tonnes without a fly-jib and was reduced to 2.85 tonnes with two sections of fly-jib. However this document was not issued until 15 June 2015.

During the investigation, an alternate crane table was also being referred to by the contractor which was labelled as being for a Liebherr LTM 1050-4 (with 4 axles) and this indicated a capacity of 3.6 tonnes without a fly-jib and was reduced to 3.05 tonnes with two sections of fly-jib. It was not known which (if either) of these two crane tables were used by the crane operator and the AGE Works Manager to determine the safe working load of the crane for the failed lift.

3.4 Safe working load exceeded

The crane operator lifted a load that exceeded the safety limit for the crane. During the investigation the contractor stated that the maximum safe working load (i.e. weight of hook block + lifting accessories + actual mass lifted) was calculated to be 3.4 tonnes according to the crane charts in that situation (i.e. 22 metres radius with one length of fly-jib), with the fly-jib on the fully extended boom. However from the photos it can be seen that two sections of fly-jib were deployed. The potential use of different crane tables plus the use of two sections of fly-jib rather than one, would all have contributed to the miscalculation of the maximum capacity of the crane. See the table below for data according which varies according to the different load charts and the use of fly-jib sections.

Crane table load charts for 50 tonne Liebherr LTM-1050-4 mobile crane (operating at 22 metre radius)	**As seen within the Georgian Crane Licence document**	**As referred to by the contractor during the investigation**	**As received from Liebherr GB (when requested for this investigation)**
No fly-jib	3.7 tonnes	3.6 tonnes	3.6 tonnes
One section of fly-jib	3.3 tonnes	3.4 tonnes	3.4 tonnes
Two sections of fly-jib	2.85 tonnes	3.05 tonnes	3.05 tonnes

During the interviews for this investigation different weights were stated for the weight of the platform. At the start of the investigation it was referred to as a three tonne platform, but later in the investigation it was suggested that the scaffolding platform weighed two tonnes plus the three men on it and tools and equipment. Additional force would also have come from the dynamic pendulum motion and snatch of the scaffold as it released and swung up and out.

After further discussions during interviews as part of this investigation, it was reported that the platform weighed four tonnes, and some drawings were provided but they did not relate specifically to this project and did not state the weight of the platform. The lack of clear data on the weight of the platform would also have contributed to the overloading of the crane.

The contractor's investigation report noted that the working environment and conditions had changed, as the platform had additional elements added after it was first installed. This was supported by comments made during the interview with the survivor of the accident who said that it was the largest platform so far to be dismantled. He said that it was the largest platform used so far because the size of the pier increased towards the top of it, and it was the first time that this larger platform had had to be disassembled and removed from the top of the pier.

3.5 No warning alarm on crane

The AGE Safety Manager advised that there had been no audible or visual warning alarm on the crane (a Liebherr LTM 1050 – 4 axles), when the safe working load was reached because it was 26 years old. Therefore there was no automatic cut-off limiter at that load either. The only sensor was a plumb sensor to detect if it was out of line. It was stated in the interviews that load cells can be fitted but as an optional extra and this crane did not have them fitted.

Warning alarms have been fitted to mobile cranes since the mid 1930's and their fitting became mandatory in 1961 in the UK with the introduction of the Construction (Lifting Operations) Regulations 1961. During this investigation the technical data sheet was requested from Liebherr GB for the LTM-1050-4 mobile crane and this indicates that generally on that model the following safety devices would have been fitted: LICCON safe load indicator, hoist limit switch, safety valves against pipe and hose rupture.

As the crane had been removed to Turkey by the contractor before this investigation was carried out, it is not possible to confirm whether the crane had been fitted with a warning alarm or not.

Additionally, the procedure for crane operations in the AGE Occupational Health & Safety and Environmental Management Plan (both in revision 3 dated February 2014 and revision 5 dated July 2015) requires every crane to be provided with a safe working load indicator visible to the operator and an overload warning device.

3.6 Technical crane inspections

The Georgian Government expert in cranes came to the site the night of the accident to investigate. He looked at the crane and took notes but there was concern amongst those on site because they could smell alcohol in his presence. No report has been issued from him although the site management were informed that his findings would go into the police report when that is made available. No other independent technical crane inspection was undertaken.

The AGE Mechanical Manager from Turkey, who is normally on site for 1-2 weeks per month, and the Site Mechanical Engineer managed the operations to remove the damaged crane from site. They rented a local crane to remove the boom and they removed the jib back to the undamaged part and were then able to remove it from the site. Although not a formal inspection of the crane, during this dismantling and removal process no abnormalities were detected by the AGE Mechanical Manager and the Site Mechanical Engineer.

When asked about the crane maintenance log book records of examinations and inspections, we were informed that visual daily checks were not recorded but the weekly inspections and checks were recorded. Not all inspection records were available on site during the investigation as the crane and some documentation had been removed to Turkey by the contractor, but those seen for the maintenance indicated that such work had been carried out as necessary.

3.7 Risk assessment and safe systems of work

There were documented risk assessments, safe systems of work and safety procedures within the AGE Occupational Health & Safety and Environmental Management Plan, but these were not sufficiently detailed for the type and complexity of the lifting operations on site for Ghorjomi Bridge. Additionally the procedure in the plan for crane operations was not being implemented on site, as it required the crane to be provided with a safe working load indicator and warning device, which it did not have.

The platform was stuck when they tried to remove it from its position, and it could not be lifted up to release it from the "carrot". The team could have cut the head of the "carrot" to remove it but considered that doing so would have been a waste of materials. The "carrot" is the term used for the tapered anchor with a safety pin which was to be removed and they cost about $100 each. With hindsight those interviewed for this investigation generally questioned why the site team had not just cut the "carrot". The decision lay with those on the platform who died in the accident and the Works Manager who was dismissed by the Contractor after the accident.

It was not known whether the scaffolding platform was stuck to the face of the concrete or if it was stuck on the "carrot". Ultimately, the only persons who might have known this were those carrying out the work and who died in the accident and the AGE Works Manager who was dismissed after the accident. From those interviewed there was no indication that the site team stopped to reassess the work and the risks once they realised that the "carrot" was stuck, or made any changes to the working process. During the interview with the survivor of the accident he stated that the left side was easy to lift and it was only the right side that was stuck. He also stated that the lift was on four points of the platform.

3.8 Method statement

The method statement for the construction of Ghorjomi Bridge was not being followed and implemented correctly. The method statement stated that a tower crane will be used for the construction stages rather than a mobile crane.

3.9 Permit to work system

The permit to work system in operation at the time of the accident did not explicitly include lifting operations, although working at height was included on the permit to work form.

3.10 Briefing and instructions

Toolbox talks and training were in place for a variety of tasks and operations at the time of the accident and documentation for some of these were sampled during the investigation, but the risks and specific circumstances of the crane operation to remove the platform were not documented in the evidence seen. However it was significant that the survivor of the accident attributed his survival to the correct wearing and use of the safety harness including attaching to an anchor point (a handrail) above his head, and this was directly as a result of the toolbox talks he had received on working at height and the correct use of safety harnesses. He also commented that the two workers who died when the platform fell had been attached at their feet level not above their heads, however they were at different positions on the platform and so it is not known whether the outcome would have been different if they had been attached to an anchor point above head height.

During the interview with the survivor of the accident he also said that the HSE Engineer for the site had explained the instructions on how to assemble and disassemble the platform before work took place. He commented that they had not disassembled a platform like that before as it was the largest platform, and he estimated that the platform concerned was approximately 2-3 times larger than previously dismantled platforms. He also said he was not the one to decide whether to cut the "carrot" or not. Although more questions could have been asked relating to why the "carrot" had not been cut and other aspects of the work that day, the interview was concluded in order to avoid the distress to him from more detailed questions.

3.11 Other permits and licences

Work was taking place on site although the following permits and licences were not in place:

- Works on the bridge were not covered by the overall project construction permit, since Ghorjomi Bridge was specifically excluded as it is part of the road section and no separate permission had been obtained for that. We were informed that the permit for the road section and bridge had been applied for before the accident but the Government authorities have made some changes which is making the process slower; however, it should be in place for November when works are hoped to resume on the Ghorjomi Bridge.
- The crane operator was trained and experienced from working in Turkey but did not have a valid Georgian licence to be a Crane Operator until 14 May 2015.
- The slinger/signaller and others assisting with the lifting operations did not need to have relevant certificates for their roles in Georgia, and were experienced and knowledgeable riggers and slingers. The lead signaller had 20 years of relevant experience and he died in the accident.

- The Georgian licence (translated literally as “passport”) for the crane was not issued until 15 June 2015.

At the time of the investigation there had been nine cranes on the project, including the crane involved in this accident which had since been removed from the site. AGE had permits for the mobile crane concerned and also for two tower cranes that were in use at the Shuakhevi power house construction site, but there were no permits yet for the other six cranes.

Third party agreements are in place through the Government in Georgia so that as part of the crane permit issuing system, the Government’s third party will do dynamic and static load testing of the crane being issued with a permit.

4 Analysis

4.1 Primary causal factors

4.1.1 Primary factors identified for the closing meeting

As part of the investigation on site for this report, a closing meeting was held on 23 July 2015 and the initial primary causal factors were identified as being:

- The locking pin (locally referred to as a "carrot" which was supporting the platform) and platform were stuck and could not be removed in the normal manner.
- The team were working late beyond the end of the shift on a Friday in order to complete the work, as the works manager was going on holiday the next day.
- Failure to stop work and to reassess the situation which should have resulted in a decision to cut the "carrot" where it was stuck.
- The crane did not have an overload alarm to warn when exceeding the safe working load, which may have acted as a warning.
- Three men were positioned on the platform to be removed at the time when it was released, although the survivor stated that they could not have accessed the position where the platform was stuck without standing on it.
- Compared to when the platform was assembled, the crane was operating with two fly-jib sections due to the extra height, which reduced the maximum capacity of the crane to 3.05 tonnes from 3.6 tonnes. During the interviews for this investigation different weights were stated for the weight of the platform, although latterly it was reported that the platform weighed four tonnes.

4.1.2 Unsafe behaviours

Several unsafe behaviours contributed to the accident:

- Failure by the crane operator and works manager to accurately calculate the safe maximum capacity for the load.
- Failure to stop work and to reassess the situation when the works manager, crane operator and the site team knew the platform was stuck.
- Failure to cut the "carrot" when they realised that the platform could not be lifted off as intended.
- The use of a portable manual hoist (i.e. a "Tirfor" winch or equivalent) to add an unknown force between the concrete and the platform when it was stuck.

- Two workers on the platform attaching their harness lanyards at their feet level rather than using a suitable anchor point above their heads.

4.1.3 Safe load not accurately calculated

The safe maximum capacity for the load was not accurately calculated. The weight of the platform was not known and the correct number of fly-jib sections (two rather than one) may not have been taken into account when using the crane load tables.

4.2 Contributory causal factors

4.2.1 Lack of suitable work planning

The accident happened at 18.50 and the shift should have ended at 18.30. The site team were under pressure to get the work completed that day. They could have cut the head of the "carrot" off or suspended work and then resumed the next day.

The AGE Works Manager for these works was putting them under pressure to complete the activity as he was going on holiday the next day. He was on the adjacent platform at the time of the accident. He was dismissed by the Contractor after the accident.

4.2.2 Failure to appoint a lifting supervisor

Although it is not a regulatory requirement to appoint a lifting supervisor in Georgia, the failure to appoint a competent lifting supervisor was a contributory factor. The appointment of a competent lifting supervisor is good international practice and could have prevented the accident.

4.2.3 Risk assessment and safe system of work

Although a risk assessment, safe system of work and method statement were in place they were not being implemented and were not sufficiently detailed for the type and complexity of the lifting operations on site for Ghorjomi Bridge.

The crane operations procedure in the AGE Occupational Health & Safety and Environmental Management Plan required the crane to be provided with a safe working load indicator and warning device, which it did not have.

The method statement for the construction of Ghorjomi Bridge stated that a tower crane will be used for the construction stages rather than a mobile crane, and it also stated that permits to work will be established for every section of work and that a lifting plan will be issued by the contractor. These three significant requirements were not followed.

4.2.4 No lifting plan and no permit-to-work (PTW)

With a proper lifting plan, the hazards associated with the specific operation would have been identified, and the risks assessed and appropriately mitigated. In

a PTW system unless the lifting condition is satisfactory and all reasonably practicable measures have been taken, no lifting can be carried out. These essential safeguards were absent from the failed lifting operation.

4.2.5 Working without the required licences in place

The work was being undertaken although not all of the licences were in place (i.e. the Crane Operator's Georgian licence, the Georgian "passport" for the crane, and the construction permit for Ghorjomi Bridge).

4.3 Actions taken since the accident

4.3.1 AGE Occupational Health & Safety and Environmental Management plan and risk assessments revised

Various documents have been reviewed and updated by the AGE Health and Safety Manager since the accident occurred, and also because the next phase of the works for the road bridge will be at the greater height of 40 metres (due to the cap for the bridge) compared to the height of the piers which are 32 metres.

The AGE Occupational Health & Safety and Environmental Management (OHSEM) plan was updated and is now at revision 5. The update includes the section on crane operations (section 3.9.8) which now requires greater control of lifting accessories, greater control of lifting operations that include the lifting of personnel, written clearance and authorisation by the works manager through a lifting permit for crane operations at Ghorjomi Bridge works, and similar controls at the other sites forming part of the Shuakhevi hydropower project for crane operations with loads of 5 tonnes and over.

The risk assessment section at the end of the AGE OHSEM plan has also been updated but this revision has removed many of the previously included risk assessments from revisions 3 and 4 of the document. It now has a single risk assessment incorrectly titled "Explosive Materials" which includes a section for the erection of Ghorjomi Bridge.

Within the section on the erection of Ghorjomi Bridge it lists several new control measures relating to the use of personal protective equipment (PPE), lifting operations over 5 tonnes, the use of a lifting permit for all Ghorjomi Bridge works, clearer responsibilities on the crane operator, the requirement to stop and reassess work if the normal working practice cannot be followed, and restrictions on tower cranes and mobile cranes at certain wind speeds (particularly relevant for winter working).

Whilst the revision is well intentioned, it appears to have been prepared in a rush and has removed other relevant previously included risk assessments for other activities on the project i.e. Crusher (AGE-HSE-RA-005), Rock Face Working (AGE-HSE-RA-003), Excavation (AGE-HSE-RA-001), Shot Crete (AGE-HSE-RA-004), and Explosive Materials (AGE-HSE-RA-002). There should be a thorough review of all risk assessments including those in older revisions of the

AGE OHSEM plan and revision 5 of the AGE OHSEM plan, and they should be properly documented in a revised new version of the AGE OHSEM plan.

4.3.2 Permit-to-work (PTW)

The AGE PTW has been amended to add a new column for Lifting Operations. However this has replaced the section on Blasting but consideration should be given to incorporating both high risk activities as they are both relevant to the ongoing construction activities on the Shuakhevi hydropower project.

The permit to work form also contains a translation error in that it states that a "✓" means it is convenient and "X" means inconvenient. This should be amended to "applicable" and "not applicable" for the activities (e.g. lifting operations, electric work, confined space etc). Then the form should be modified to make it clear whether the controls are in place or not (i.e. "✓" means "yes" and "X" means "no") to ensure that for each applicable activity all the necessary controls are put in place (e.g. does the operator have certification for the crane, is the overload system working? etc.).

4.3.3 Training and Toolbox Talks (TBTs)

After the accident a new Toolbox Talk (TBT no.26) on the Use of Lifting Equipment was prepared and delivered to relevant staff. It was delivered to all supervisors and charge-hands across the Shuakhevi hydropower project at every site, as the supervisors are important for communicating the safety message to all of the workers. The supervisors were also told that if they put workers under pressure to work unsafely they will be told to leave.

This TBT on the Use of Lifting Equipment includes general safety measures for lifting operations and a photograph of Pier 2 with the buckled crane after the accident, although there are no notes or information directly related to the accident. This TBT for use of lifting equipment is also now included within the TBT manual.

This TBT should be revised and updated to make it specific to the Shuakhevi hydropower project and to ensure that it aligns fully with the revised AGE requirements for crane and lifting operations. This should include all of the requirements in the section on crane operations in the AGE OHSEM plan, the requirements in the AGE risk assessment for the erection of Ghorjomi Bridge, and the requirement for an AGE Lifting Permit. This should be done after these documents are reviewed and revised, as described above.

4.4 Safety monitoring and inspections on site

The AGE Safety team carry out daily site inspections that are recorded and reviewed by the AGE Safety Manager. Examples were seen including two that were carried out in the two weeks prior to the accident in April. These both included visits to the Didachara site where Ghorjomi Bridge is located. No specific observations or recommendations were noted relating to the crane lifting operations, although one stated that a check was carried out at the Didachara site

and the other noted positively that a mirror had been installed at the 90 degree bend in the road. Generally the reports noted positive findings as well as areas for action to be taken, including who they had communicated the need for such actions to.

The daily site inspection reports are also sent to the AGE head office in Ankara, and the AGE Safety Manager reported that sometimes he or other AGE site managers receive comments or questions from the senior managers in Ankara after they have seen the reports from the AGE Safety team on site.

A safety consulting company, Selin Ltd from Ankara, are engaged by AGE to carry out monthly health, safety and environmental (HSE) audits on site, and they also prepared the accident investigation report for AGE. They have been carrying out site visits to evaluate HSE on site since the start of the project.

The last two site visits by Selin Ltd were on 24, 25 and 26 February 2015 and also after the accident, between 20 and 24 April 2015. These two reports were seen, and the one from February was mostly focused on environmental matters with some safety observations. One comment relating to Ghorjomi Bridge stated that the necessary safety measures for work at height had been taken for those working on the bridge footing. The report seen for the site visit in April was more thorough, and focussed more on safety matters across various sites which comprise the project. It identified many areas for improvement and the report made good use of photographs.

5 Conclusions

The primary cause of the accident is attributed to several unsafe behaviours by those involved:

1. The failure by the crane operator and works manager to accurately calculate the safe maximum capacity for the load.
2. The failure by the team on site to stop work and reassess the situation when the locking pin (locally referred to as a "carrot") and platform were stuck.
3. The team were working late beyond the end of the shift on a Friday in order to complete the work.
4. The team could have cut the head of the "carrot" to remove it but considered that doing so would have been a waste of materials.

Contributing factors include the failure to appoint a competent lifting supervisor, the lack of a lifting plan and no permit to work, not properly implementing the safe system of work and method statement, a risk assessment which was not sufficiently detailed, the lack of a safe working load indicator and warning device on the crane, and working without the required licences in place.

The accident could have been prevented if a competent lifting supervisor had been appointed and a lifting plan prepared and followed, a proper risk assessment had been conducted and implemented, the contractor's method statement had been complied with, and if a robust permit to work system had been in place the non-compliances would have been identified and rectified.

Similarly if work had not been undertaken until all of the correct licences were in place (i.e. the Crane Operator's Georgian licence, the Georgian "passport" for the crane, and the construction permit for Ghorjomi Bridge) this too could have prevented the accident.

6 Recommendations

The table below sets out recommendations for improvements in order to reduce the likelihood of a recurrence of this accident.

Ref.	Recommendation	By whom	By when
1	The section on crane operations in the AGE OHSEM plan should be revised to addressed: a) When a competent Lifting Supervisor is to be appointed (by referring to a Lifting Supervisor in paragraph 2 it is an implicit requirement for one to be appointed but not clear when etc.). b) A requirement for a lifting plan should be added for Ghorjomi Bridge works and for other work areas for loads of 5 tonnes and over, to ensure accurate determination of the safe working load of the crane and the weight of the load to be lifted, as well as other control measures. c) The requirement for an AGE Lifting Permit to gain authorisation and written clearance should be clarified in relation to the new requirement for a lifting plan and when a competent Lifting Supervisor is to be appointed.	AGE	30 Sep 2015
2	The requirement in the AGE OHSEM plan that every crane shall to be provided with a safe working load indicator visible to the operator and an overload warning device, must be complied with and checks should be made on the other 8 cranes in use on the Shuakhevi Hydropower project.	AGE	15 Sep 2015
3	A Georgian crane licence (i.e. "passport") for each of the 6 cranes without one should be obtained, as a matter of urgency.	AGE	15 Sep 2015
4	Review the crane licences for all existing crane operators on the project and ensure that they have a Georgian crane operator's licence.	AGE	15 Sep 2015
5	Increase monitoring of the correct implementation of all method statements to ensure greater levels of compliance on site.	AGL	31 Oct 2015
6	There should be a thorough review of all risk assessments including those in older revisions of the AGE OHSEM plan and revision 5 of the AGE OHSEM plan, and they should be properly documented with correct titles in a revised new version of the AGE OHSEM plan and then implemented.	AGE	30 Sep 2015
7	The permit to work form should be reviewed and revised to reinstate the section on Blasting and also to correct the error where it states that a "✓" means it is convenient and "X" means inconvenient. "Convenient" and "inconvenient" should be amended to "applicable" and "not applicable" for the activities, and the form modified to "yes" and "no" to check that the necessary controls are put in place.	AGE/AGL	30 Sep 2015

Ref.	Recommendation	By whom	By when
8	The new Use of Lifting Equipment Toolbox Talk (TBT) should be revised and updated to ensure it aligns fully with the revised AGE requirements for crane and lifting operations. This should include the section on crane operations in the AGE OHSEM plan, the AGE risk assessment for the erection of Ghorjomi Bridge, and the requirement for an AGE Lifting Permit. This should be done after these documents are reviewed and revised as described in items 1, 6 and 7 above.	AGE	16 Oct 2015
9	A new process and supporting toolbox talk should be introduced to ensure that supervisors and workers are aware that if the work activity or conditions change then they should stop and reassess the work to be done. This process should include identifying any additional hazards and how their risks can be controlled and reduced. Also this should apply if the work is expected to continue beyond the end of the working shift.	AGE	31 Oct 2015
10	During TBTs and briefings on working at height and the use of harnesses ensure that workers are reminded of the importance of attaching above head height and not attaching at low level.	AGE	31 Oct 2015
11	The daily site safety inspection reports carried out by the AGE Safety team could be improved if greater details are given of what was checked at some of the sites. For example, once a week a more detailed inspection could be carried out at one or two locations, which can be varied on rotation. Also monitoring should include checking on the correct implementation of all method statements, see item 5 above.	AGE	16 Oct 2015
12	Do not allow works to recommence on Ghorjomi Bridge until the construction permit is in place to cover the works.	AGL	31 Oct 2015

Annexure 3 - Noise, Dust and Water results

Selin Lab

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BİLİŞİM MÜH.MÜŞ. İNŞ. SAN. VE TİC. A.Ş.

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İstek Numarası: Order No.	15-001/IV
Numunenin Adı ve Tarifi: Name And Identity Of The Test Item	Noise Measurement
Deneyin Yapıldığı Tarih: Date Of Test	11/06/2015 – 12/06/2015
Raporun Numarası ve Tarihi: Number And Date Of The Report	15-GÜR-001/IV-1 – 22/06/2015

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15-GÜR-001/IV-1
22/06/2015

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Deney Raporu / *Test Report*

Müşterinin adı/adresi: Customer name/address	AGE Batum LTD - Shuakhevi HES BATUM/Gogebashvili N:60
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İstek Numarası: Order No.	15-001/IV
Numunenin adı ve tarifi: Name and identity of the test item	Noise Measurement
Numunenin kabul tarihi ve no: The date and number of receipt of the test item	15/06/2015 - 150612-G-2
Açıklamalar: Remarks	-
Deneyin yapıldığı tarih: Date of test	11/06/2015 – 12/06/2015
Raporun sayfa sayısı: Number of pages of the Report	38

Türk Akreditasyon Kurumu (TÜRKAK) deney raporlarının tanınması konusunda Avrupa Akreditasyon Birliği (EA) ve Uluslar arası Laboratuar Akreditasyon Birliği (ILAC) ile karşılıklı tanınma antlaşması imzalamıştır.

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Deney ve/veya ölçüm sonuçları, genişletilmiş ölçüm belirsizlikleri (olması halinde) ve deney metotları bu sertifikanın tamamlayıcı kısmı olan takip eden sayfalarda verilmiştir.

The test and/or measurement results, the uncertainties (if applicable) with confidence probability and test methods are given on the following pages which are part of this report.

Mühür Seal	*Tarih* Date	***Deneyi Yapan*** Test Done by	***Raporu Hazırlayan*** Report Prepared by	***Onay*** Approved by
	22/06/2015	**Murat DİNÇ Measurement Responsible**	**İsmail ARSLAN Quality Management Representative**	**Ersan ÖZKİŞİ Laboratory Technical Manager**

This report is only valid for the **NOISE** measurements performed on **11.06.2015 – 12.06.2015** in the scope of **AGE Batum LTD – Shuakhevi HEPP Project** and **cannot be copied without the written permission of SELİN Measurement Laboratory Co. Inc**. Reports without sign and seal are invalid. Measurement results are only related to operation conditions during measurement. **Our accreditation is restricted with the scope of the experiment methods in our scope. Competence of the opinions and interpretations stated except this is not in the scope of the accreditation. This report cannot be used for official procedures related to environmental legislation.**

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A. INTRODUCTION

This report was prepared as a result of the measurements performed in the explicit address mentioned below;

Date of the Measurement	**:**	11.06.2015 – 12.06.2015
Location of the Measurement	**:**	Shuakhevi HEPP

B. INFORMATION ABOUT THE FACILITY

The construction phase of the Shuakhevi HEPP Project, located in Adjaristsqali River, Georgia, is carried out by AGE Batum LTD.

C. NOISE MEASUREMENT REPORT

a. Introduction

The noise measurement report has been prepared to take necessary measures to prevent the deterioration of peace and tranquility and physical and mental health of the people due to exposure to environmental noise, according to the "Regulation of Permissions and Licenses to be Obtained in the Scope of Environmental Law" published in Official Gazette dated 04.06.2010 and numbered 27601 and amended on 27.04.2011 with a number of 27917, the following precautions will be taken;

a) Determining the exposure to environmental noise levels using assessment methods by preparing noise maps, acoustic report and environmental noise levels evaluation reports,
b) Informing the public about environmental noise and its effects
c) Preparing the noise prevention and mitigation action plans and implementation of these plans, based on noise maps, acoustic report and environmental noise level evaluation reports results , especially in areas where exposure to environmental noise levels may have harmful effects on human health and in areas where environmental noise quality protection is required,

This regulation scopes the principles and criteria of the environmental noises that the people are exposed in area especially densely populated areas, other quiet areas such as parks or in residential areas, quiet areas in open fields, schools, hospitals and other noise-sensitive areas and the principles and criteria of the damages caused by the environmental vibration in buildings.

Accordingly, for the noise emissions that are emitted from various sources, limit values are determined and Regulation for Assessment of Environmental Noise necessitates the measurement and monitoring noise emissions in these mentioned sources and the compliance with the principles are being determined.

In scope of the mentioned Project, environmental noise measurements have been made in the nearest residential areas to Power House (Concrete Plant and Crusher), Chanckalo Adit, Chirukhistskali Adit, Diakonidze Adit and Skhalta Outlet working area.

b. Measurement Methods

The measurements were performed according to the standard given below.

TS ISO 1996-2	Acoustics -- Description, measurement and assessment of environmental noise -- Part 2: Determination of environmental noise levels
TS 9315 ISO 1996-1	Acoustics -- Description, measurement and assessment of environmental noise -- Part 1: Basic quantities and assessment procedures

c. General Principles

- Sources of noise are determined by searching the construction site during the measurement.
- Environmental factors are observed during the measurement and situations which may affect the measurements are registered.
- Measurement time intervals should be chosen as it includes all meaningful deviations in noise emissions and dispersions.
- Noise observations given in related legislation are taken as basis for the evaluation of results of measurement provided.
- Location of microphone used in measurement is determined according to the standards implemented for measurements.
- Attention is paid not to make noise which may affect the measurement during noise measurement.
- Calibration of measurement instrument is carried out before and after the measurement.
- Sound pressure levels change according to weather conditions.

Microphone Locations

Outdoor

To evaluate the situation at a certain location, microphone should be used in subject location.

Free Field Location

Near this location there are not any reflective surface affecting the Noise Pressure Level except ground. Apart from microphone and ground, the distance between a sound reflecting surface and ground should be two times larger than the distance between the microphone and dominant side of sound source.

Microphone on the Reflective Surface

In this case, correction factor to be used to find instantaneous sound area, is +6 dB.

This location is on a reflective surface and an aluminum joint plate with a rubber tape is used as reflective surface.

The front which is 1 m inside of the microphone, should be within ± 0,05 m tolerance and straight. Distance between the edges of microphone and front surface should be more than 1 m. The distance from plate edges of the microphone should be more than 0,1 m in order to decrease the sound refraction in plate edges. Microphone can be used without joint plate if it is produced of solid material such as wall, concrete, stone, glass or wood. In this case, wall surface should be smooth in the 1 m radius from microphone within the ± 0,01 m tolerance.

There are nail holes at the 4 corners of the plate. Plate is fixed to the wall by nailing down from the holes.

Microphone near the reflective surface

In this case, correction factor to be used to find instantaneous sound area, is -3 dB.

In an ideal case, i.e., if there is not any vertical deflection barrier interfering the sound dispersion to the receiver, the difference between the microphone set up 2 m front of the front and the microphone in the free field area conditions is approximately 3dB. Therefore, the microphone is placed in 2 m distance from the front.

For more general addressing, microphone height should be (4,0 m ± 0,5) m when choosing the microphone location in multistory building regions. In single-floor regions, microphone height should be used as (1,5 m ± 0,1) m.

In order to address the noise, generally, noise levels at grid points are calculated. Measurements for special cases are conducted according to intensity of the grid points chosen in a certain location, spatial resolution required for research subject and spatial change of sound pressure levels in noise. This change is larger at regions near the source and around the larger barriers. Therefore, in these areas, intensity of grid points should be more. In general, difference of Noise Pressure Level between two neighbor grid points should not exceed 5 dB. When it is come across with larger differences, grid breakpoints should be added.

Dependant to the limitations and rules whose outlines are given below, this location aims to reach the 3 dB increase at instantaneous sound pressure level(free field area level). When the microphone is in a certain distance away from the reflective surface, direct sound and reflective sound are equally strong and if the related frequency band is wide enough, this reflection doubles up the sound area energy and leads to a 3 dB increase in sound pressure level.

Front should be a platform within a ± 0,3 m tolerance and microphone, it should be placed in a sound area between building surfaces that stand out where it will be affected by multiple reflections of sound. Windows should be accepted as a part of the front. And they should be closed during measurements. In total, measured equivalence is intended to provide that the instantaneous sound level does not deviate more than +3 dB.

Indoor

At least three different microphone locations, distributed into the room at even intervals, should be used where the persons affected by the sound will spend time.

If it is thought that the noise with a lower frequency is dominant, one of the three microphone locations should be at the corner of the room. Location of the corner microphone should be 0,5 m distant from whole circumference surfaces of a corner which is a wall and 0,5 m distant from the nearest wall opening.

Other microphones should be placed at a 0,5 m distance away from walls, ceiling and laying and 1 m distance away from conducting components such as Windows ora ir intakes. The distance between two neighbor microphones should e at least 0,7 m.

The operations in this subject are designed for rooms with a volume of smaller than 300 m^3. In larger rooms it is appropriate to use more microphone locations. In such cases, one third of the additional microphone locations should be in corners for noises with low frequency. If the room volume exceeds 300 m^3, additional microphone locations are defined.

Tone Sound

If the noise characteristics at the receiver location involve audible sound tone(s), objective measurement should be done for the precision of these tones. Microphone locations where more audible tones exist, should be selected and analysis should be done as explained below.

Experiment for the determination of the existence of spectrum component with separated frequency, is typically done by comparing the Noise Pressure Level with time average in the some part of the 1/3 octave band, and the Noise Pressure Level with time average in two neighbor 1/3 octave bands. Time averaged Noise Pressure Level in 1/3 octave band concerned in order to reveal the existence of spectrum component with separated frequency, should exceed the two neighbor time averaged sound pressure levels in 1/3 octave bands with a certain level difference.

Constant level difference can be change depending on the frequency. Possible options for the level differences are given below:

15 dB in low frequency 1/3 octave bands (25 Hz -125 Hz).
8 dB in middle frequency bands (160 Hz - 400 Hz).
5 dB in high frequency bands (500 Hz-10000 Hz).

Tone analysis of noise is not done in indoors.

d. Measurement System

Measurements were carried out with 127154 serial numbered measurement instrument. Technical specifications of the equipment is given below whereas calibration certificate is given in **Appendix 2**.

- Instrument is able to perform measurement between 10Hz – 20kHz. It gives statistics such as SPL, LEQ, SEL, Lden, Ltm3, Ltm5 etc.
- It can make measurement independently at A, C, Lin bands of IMPULSE, FAST, SLOW detector for each channel.
- Instrument automatically saves the measurements.
- Measurement in dark areas can be performed by its light.
- Time constants: (SOLW, FAST, IMPULSE).
- It can make 1/1 and 1/3 octave band analysis from 0.8 Hz up to 20kHz (45 filters).

The calibrations were made with 117566 serial numbered calibrator. After and before each measurement series, the calibrations are being performed. In this process, the microphone of the device is placed into the calibrator conjunction and than the referance noise level is being monitored from the screen, and if there are any deviations, they are kept in the specified tolerances.

Technical specifications are as follows.

- Calibrator produces noise in 1 Khz frequency, 94 dBA and 114 dBA.
- The heat and pressure values are entered in atmospheric conditions and the corrections about these data are performed automatically by the calibrator.
- Stabilization duration is 3 seconds. .
- The device is complied with the IEC 60942:2003 Class 1 standards.

e. Definitions and Abbreviations

L_{eq} TS 9315 (ISO 1996-1) : An indicator of a of a noise levels that varies within a certain time in terms of energy which is equivalent to a constant level.

dBA = This is a sound assessment unit of which the human ear is most sensitive and the mid and high frequency sounds are emphasized. dBA unit is commonly used in the noise reduction or in the control, is also related to the subjective evaluation of the volume.

f. Legal Status

The mentioned activity is being scrutinized in scope of the Article 23, items a and d of the Regulation for Assessment of Environmental Noise, Noise at Work Places, Residential and Public Buildings and Residential Territories (SRS 2.2.4/2.1.8 003/004-01,(Georgian Information Bulletin) and IFC Noise Guidelines Table 1.7.

1-"Environmental noise criteria for construction sites"

ARTICLE 23 – (1) Criteria related to the prevention of noise and noise level distributed in the environment from the construction sites are determined below:

a) Noise level distributed in the environment from the construction sites cannot exceed the limit values given in Table 5 of Annex-VII (Limit Value= 70 dBA)

d) Impact noise that might be generated as result of construction activity cannot exceed 100 dBC in terms of LCmax noise indicator.

2-" Noise at Work Places, Residential and Public Buildings and Residential Territories (SRS 2.2.4/2.1.8 003/004-01,(Georgian Information Bulletin (GIB))"

Table 1 Admissible Noise Norms.

Receiver	Admissible Noise Norms	
	Maximum allowed norms of noise dBA	
	Day 07:00 – 23:00	Night 23:00 – 07:00
For residential area	70	60

3-"IFC Noise Guidelines Table 1.7"

Table 2 IFC Noise Guidelines Table 1.7.

Receiver	IFC GENERAL ÇGS GUIDELINESS April 2007 - Table 1.7.1. Noise Level Guidelines	
	Hourly LAeq (dBA)	
	Day 07:00 – 22:00	Night 22:00 – 07:00
Residential; institutions, educational	55	45
Industrial, commercial	70	70
Note:	Values that are measured besides the values given in the Guidelines. *Source: Guidelines for Community Noise, World Health Organization (WHO), 1999* These limits should be met by either with noise preventive activities or the noise should be more than 3 dBA, at max.	

Noise levels should not exceed the levels presented in IFC Noise Guidelines Table 1.7, or result in a maximum increase in background levels of 3 dB at the nearest receptor location off-site.

g. Measurement Results

In scope of the mentioned Project, environmental noise measurements have been made in the nearest residential areas to the Power House (Concrete Plant and Crusher), Chanckalo Adit, Chirukhistskali Adit, Diakonidze Adit and Skhalta Outlet working area.

Table 3 Results of Noise Measurements.

Measurement Point	Date	Measurement Type	Result of Measurement (dBA)			Limit Value (ÇGDYY)		Limit Value (GIB)		Limit Value (IFC)	
			L_{eq}	L_{90}	L_{Cmax}	L_{eq}	L_{Cmax}	L_{eq}	L_{Cmax}	L_{eq}	L_{Cmax}
HES (Hazır Beton Santrali ve Konkasör)-Receiver Point 38 263305 E 4613165 N	11 June 2015	Noise Level Measurement	50,9	48,1	63,6	**70**	**100**	**70**	-	**55,0**	-
HES (Hazır Beton Santrali ve Konkasör)-Receiver Point 38 263305 E 4613165 N	11 June 2015	Background Noise Level Measurement	48,0	39,9	60,4	-	-	-	-	-	-
Chanckalo Adit -Receiver Point 38 268971 E 4613117 N	11 June 2015	Noise Level Measurement	51,8	48,8	65,5	**70**	**100**	**70**	-	**55,0**	-
Chanckalo Adit -Receiver Point 38 268971 E 4613117 N	11 June 2015	Background Noise Level Measurement	48,5	42,1	63,3	-	-	-	-	-	-
Chirukhistskali Adit -Receiver Point 38 276334 E 4602782 N	12 June 2015	Noise Level Measurement	61,6	58,4	77,5	**70**	**100**	**70**	-	**55,0**	-
Chirukhistskali Adit -Receiver Point 38 276362 E 4602739 N	12 June 2015	Background Noise Level Measurement	59,2	41,2	78,4	-	-	-	-	-	-
Diakonidze Adit -Receiver Point 38 277721 E 4615210 N	12 June 2015	Noise Level Measurement	49,0	48,3	64,6	**70**	**100**	**70**	-	**55,0**	-
Diakonidze Adit -Receiver Point 38 277721 E 4615210 N	12 June 2015	Background Noise Level Measurement	46,6	38,9	58,6	-	-	-	-	-	-
Skhalta Outlet -Receiver Point 38 280151 E 4614458 N	12 June 2015	Noise Level Measurement	46,7	45,8	60,9	**70**	**100**	**70**	-	**55,0**	-
Skhalta Outlet -Receiver Point 38 280151 E 4614458 N	12 June 2015	Background Noise Level Measurement	43,9	36,9	54,4	-	-	-	-	-	-

Background exceeding levels are given in Table 4.

Table 4 Background exceeding levels.

Measurement Point	$L_{Source+Background}$ Result of Measurement (dBA)	$L_{Background}$ Result of Measurement (dBA)	L_{Source} (dBA)	*Background Noise Adjustment is Done Difference $L_{Source}-L_{Background}$	Background Noise Adjustment isn't Done Difference $L_{Source+Background}-L_{Background}$	Limit Value (ÇGDYY) dBA	Limit Value (GIB) dBA	Limit Value (IFC) dBA
HES (Hazır Beton Santrali ve Konkasör)-Receiver Point 38 263305 E 4613165 N	**50,9**	**48,0**	47,78	-0,22	***2,90***	-	-	**3,0**
Chanckalo Adit -Receiver Point 38 268971 E 4613117 N	**51,8**	**48,5**	49,06	***0,56***	3,30	-	-	**3,0**
Chirukhistskali Adit -Receiver Point 38 276334 E 4602782 N	**61,6**	**59,2**	57,88	-1,32	***2,40***	-	-	**3,0**
Diakonidze Adit -Receiver Point 38 277721 E 4615210 N	**49,0**	**46,6**	45,28	-1,32	***2,40***	-	-	**3,0**
Skhalta Outlet -Receiver Point 38 280151 E 4614458 N	**46,7**	**43,9**	43,47	-0,43	***2,80***	-	-	**3,0**

* TS ISO 1996-2 – If the background noise level is 3dB or much lower than the measured noise pressure level, no correction is not allowed. The corrections are only done in cases where the background noise level is lower than 3 or 10 dB. -The red colored numbers are taken into consideration during the assessment values.

h. Assessment of Measurement Results

1-"Environmental noise criteria for construction sites"

ARTICLE 23 – (1) Criteria related to the prevention of noise and noise level distributed in the environment from the construction sites are determined below:

a) Noise level distributed in the environment from the construction sites cannot exceed the limit values given in Table 5 of Annex-VII (Limit Value= 70 dBA)

As it is seen in the measurement results given in Table 3, the 70 dBA limit value is not exceeded.

d) Impact noise that might be generated as result of construction activity cannot exceed 100 dBC in terms of LCmax noise indicator.

As it is seen in the measurement results given in Table 3, the 100 dBC limit value is not exceeded.

2-“ Noise at Work Places, Residential and Public Buildings and Residential Territories (SRS 2.2.4/2.1.8 003/004-01,(Georgian Information Bulletin (GIB))”

Table 5 Admissible Noise Norms.

Receiver	Admissible Noise Norms	
	Maximum allowed norms of noise dBA	
	Day 07:00 – 23:00	Night 23:00 – 07:00
For residential area	70	60

As it is seen in the measurement results given in Table 3, the 70 dBA limit value is not exceeded.

3-"IFC Noise Guidelines Table 1.7"

Table 6 IFC Noise Guidelines Table 1.7.

Receiver	IFC GENERAL ÇGS GUIDELINESS April 2007 - Table 1.7.1. Noise Level Guidelines	
	Hourly LAeq (dBA)	
	Day 07:00 – 22:00	Night 22:00 – 07:00
Residential; institutions, educational	55	45
Industrial, commercial	70	70
Note:	Values that are measured besides the values given in the Guidelines. *Source: Guidelines for Community Noise, World Health Organization (WHO), 1999* These limits should be met by either with noise preventive activities or the noise should be more than 3 dBA, at max.	

As it is seen in the measurement results given in Table 3, the 55 dBA limit value is not exceeded.

As it can be seen from the measurement results given in Table 3, the nearest residential areas to the Chirukhistskali Adit background noise level is higher than 55 dBA. Thus, an assessment haven't been made in scope of IFC Noise Guidelines Table 1.7.

Noise levels should not exceed the levels presented in IFC Noise Guidelines Table 1.7, or result in a maximum increase in background levels of 3 dB at the nearest receptor location off-site.

As it is seen in the measurement results given in Table 4, L_{eq} the level of background noise in terms of noise indicators, the 3 dBA value is not exceeded.

D. APPENDICES

APP-1 : LABORATORY DOCUMENTS

APP -2 : DOCUMENTS OF THE MEASUREMENT EQUIPMENT

APP -3 : DOCUMENTS OF THE PERSONNEL WHO PREPARED THE REPORT AND MADE THE MEASUREMENT

APP-1
LABORATORY DOCUMENTS

TÜRK AKREDİTASYON KURUMU

AKREDİTASYON SERTİFİKASI

Deney Laboratuvarı olarak faaliyet gösteren,

SELİN ÖLÇÜM LABORATUVAR HİZMETLERİ
Bilişim Müşavirlik İnşaat San Ve Tic A. Ş.
Deney Laboratuarı
1324.Cadde Özlem Apt. No:30/C Öveçler
06450 ANKARA / TÜRKİYE

TÜRKAK tarafından yapılan denetim sonucunda TS EN ISO/IEC 17025:2012 Standardına göre Ek'te yer alan kapsamlarda akredite edilmiştir.

Akreditasyon No : AB-0237-T

Akreditasyon Tarihi : 31 Temmuz 2009

Revizyon Tarihi / No : 10 Nisan 2015 / 06

Bu Sertifika, yukarıda açık adı ve adresi yazılı Kuruluşun TS EN ISO/IEC 17025:2012 Standardına, ilgili Yönetmelik ve Tebliğlere uygunluğunu sürdürmesi halinde , **27 Kasım 2017** tarihine kadar geçerlidir.

Dr. H. İbrahim ÇETİN
Genel Sekreter

F701-040

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Akreditasyon Sertifikası Eki (Sayfa 1/6)

Akreditasyon Kapsamı

TÜRKAK Test TS EN ISO/IEC 17025 AB-0237-T	**SELİN ÖLÇÜM LABORATUVAR HİZMETLERİ** **Bilişim Müşavirlik İnşaat San Ve Tic A. Ş.** **Akreditasyon No: AB-0237-T** **Revizyon No: 06 Tarih: 10 Nisan 2015**
Deney Laboratuvarı	
Adresi : 1324 Cadde Özlem Apt. No:30/C Öveçler 06450 ANKARA / TÜRKİYE	**Tel** : 0 312 472 94 35 **Faks** : 0 312 481 33 01 **E-Posta** : selinlab@gmail.com **Website** : www.selinlab.com.tr

Deneyi Yapılan Malzemeler / Ürünler	Deney Adı	Deney Metodu (Ulusal, Uluslararası standardlar, işletme içi metodlar)
Gürültü	Çevresel gürültü düzeyinin tespiti/L_{Aeq}, L_{max}, L_T, $L_{Aeq,T}$, L_{RT}, L_{day}, L_{Aden}, $L_{evening}$, $L_{Aeq,Tn}$, L_{Adn}, L_{CE}, L_{NT}, L_{Fmax}, L_{Ceqmax}, L_{corr}, R, L_{PT}	TS 9315 ISO 1996-1 ve TS 9315 ISO 1996-1/T1 TS ISO 1996-2 ve TS ISO 1996-2
Akustik	Çoklu gürültü kaynağına sahip sanayi tesislerinde yapılan ses basıncı düzeyi ölçümlerinden ses gücü düzeyinin tayini /L_P, L_{pf}, $L_{eq,T}$, h, ΔL_1, ΔL_2, ΔL_M, ΔL_R , L_W	TS ISO 8297
	Gürültü kaynaklarının mühendislik metodu kullanılarak yapılan ses basıncı düzeyi ölçümlerinden ses gücü düzeyinin tayini/L_P, $L_{peq,T}$, K_1, K_2, $L'p$, $L''P$, L_{AP}, L_W, Δ_L	TS EN ISO 3744
	Gürültü kaynaklarının gözlem metodu kullanılarak yapılan ses basıncı düzeyi ölçümlerinden ses gücü düzeyinin tayini L_P, $L_{peq,T}$, K_1, K_2, $L'p$, $L''P$, L_{AP}, L_W , Δ_L	TS EN ISO 3746
	Yerleşim alanlarında sesin açık alanda yayılırken azaltım faktörlerinin ve çevresel gürültü düzeyinin tespiti/$\delta L(f)$,f_{ru}, f_{rN}, f_m, α, α_{at}, α_{ref}, α_{vib},N, L_{AT}, L_{fT}, L_{fT} (DW) , D_c, A_{div}, A_{atm}, A_{gr}, A_{bar}, A_{misc}, L_{AT}(LT)	TS ISO 9613-1 TS ISO 9613-2
	Demiryolu ulaşım araçlarının ses gücü düzeyinin ve demiryolu gürültüsünün alansal dağılımının hesaplanması /E,LE,LE^{Ax}, LE^{Ax}, C_{obje}, L_{den}, L_{day}, L_{den}, L, Es, $C_{yanstma}$, D_{mesafe}, D_{hava}, D_{toprak}, D_{metro}	Hollanda ulusal hesaplama yöntemi RMR SRM II

Akreditasyon Sertifikası Eki (Sayfa 2/6)

Akreditasyon Kapsamı

SELİN ÖLÇÜM LABORATUVAR HİZMETLERİ
Bilişim Müşavirlik İnşaat San Ve Tic A. Ş.

Akreditasyon No: AB-0237-T
Revizyon No: 06 Tarih: 10 Nisan 2015

Deneyi Yapılan Malzemeler / Ürünler	Deney Adı	Deney Metodu (Ulusal, Uluslararası standardlar, işletme içi metodlar)
(Akustik Devam)	Karayolu ulaşım araçlarının ses gücü düzeyinin ve karayolu gürültünün alansal dağılımında hesaplanması/ L_{den}, L_{day}, $L_{evening}$, L_{night}, $L_{longterm}$, L_{eq}, L, L_W, A_{div}, A_{atm}, $A_{gr,f}$, $A_{ot,f}$	Fransız ulusal hesaplama yöntemi NMPB - 96 ve Fransız standardı XPS 31-133
	Yapıların akustik performansının değerlendirilmesi	TS EN 12354-4
	Yapılarda ve yapı elemanlarında ses yalıtımının ölçülmesi/R', A, L_F, L_V, L_n, W_k, D_{nT}	TS ISO 140-4
Titreşim	Madencilik faaliyetleri sonucunda oluşan hava şoku ve yer titreşiminin ölçülmesi/a,V, P_c	TS 10354
	Makine ve Ekipmanlardan Kaynaklanan Mekanik Titreşim Sonucu Oluşan Yapı Titreşiminin Ölçülmesi ve Binalara Etkilerinin Değerlendirilmesi/v_r, a,V	TS ISO 4866
	Gaz Türbini Setlerinin dönmeyen parçalarında titreşimin ölçülmesi ve değerlendirilmesi V_{rms}	ISO 10816-4
	Hidroelektrik Santrallerde Dönmeyen Parçalarda Titreşim Ölçümleriyle Makinelerin Değerlendirilmesi V_{rms}	ISO 10816-5
İSG (Gürültü)	Kişilerin maruz kaldığı gürültü düzeyinin ölçülmesi ve işitme kayıplarının tespiti L_{pA}, $E_{A,T}$, $L_{Aeq,T}$, $L_{EX,8h}$, H, N, H'	TS 2607 ISO 1999
İSG (Titreşim)	Elle İletilen Titreşimin Ölçülmesi ve Değerlendirilmesi-a_{hw}, a_{hwx}, a_{hwy}, a_{hwz}, a_{hv}, a_{hv}(eşit, 8 saat), A(8), Dy,	TS EN ISO 5349-1

Akreditasyon Sertifikası Eki (Sayfa 3/6)

Akreditasyon Kapsamı

SELİN ÖLÇÜM LABORATUVAR HİZMETLERİ
Bilişim Müşavirlik İnşaat San Ve Tic A. Ş.

Akreditasyon No: AB-0237-T
Revizyon No: 06 Tarih: 10 Nisan 2015

Deneyi Yapılan Malzemeler / Ürünler	Deney Adı	Deney Metodu (Ulusal, Uluslararası standardlar, işletme içi metodlar)
(İSG (Titreşim) Devam)	Elden Vücuda İletilen Titreşimin Ölçülmesi ve Değerlendirilmesi - a_{hw}, a_{hwx}, a_{hwx}, a_{hwy}, a_{hwz}, **A(8), Ai(8)**	TS EN ISO 5349-2
	Titreşim - Mekanik Titreşim ve Şok - Tüm Vücut Titreşime Maruz Kalma Değerlendirilmesi /**ax, ay, az**	TS ISO 2631-1
	Hareketli Makinelerde Titreşim Düzeyinin Tespiti / a_w, a_{hw}, a_{hwx}, a_{hwy}, a_{hwz}, $a_{wenbüyük}$	TS EN 1032+A1
Çalışma Ortamında Maruziyet	Kimyasal Madde Ölçümleri ve Değerlendirmesi	ASTMD 4490-96 TS EN 689
	Optik yansıma ve gravimetrik yöntem ile toz tayini	MDHS 14/3
	Aydınlatma düzeyinin tespiti/**Aydınlatma seviyesi**	COHSR-928-1-IPG-039
	Termal Konforun tespiti, çalışma şartlarının insanlar üzerindeki etkisinin belirlenmesi/ **Hava akım hızı, küresel sıcaklık, ortam sıcaklığı, bağıl nem, yaş hazne sıcaklığı ve küresel sıcaklık**	TS EN ISO 7730
	Termal Konforun tespiti ve soğuk çalışma şartlarının insanlar üzerindeki etkisinin belirlenmesi/ **Hava akım hızı, küresel sıcaklık, ortam sıcaklığı, bağıl nem, yaş hazne sıcaklığı ve küresel sıcaklık**	TS EN 27243
	İşyeri ortam havasında aktif karbon tüplerine VOC numunesinin alınması ve gaz kromotografi yöntemi ile VOC tayini /**VOC**	TS ISO 16200-1

Akreditasyon Sertifikası Eki (Sayfa 4/6)

Akreditasyon Kapsamı

SELİN ÖLÇÜM LABORATUVAR HİZMETLERİ
Bilişim Müşavirlik İnşaat San Ve Tic A. Ş.

Akreditasyon No: AB-0237-T
Revizyon No: 06 Tarih: 10 Nisan 2015

Deneyi Yapılan Malzemeler / Ürünler	Deney Adı	Deney Metodu (Ulusal, Uluslararası standardlar, işletme içi metodlar)
Bacagazı (Emisyon) (TS CEN/TS 15675 ve TS EN 15259 şartlarına uygun)	Sabit Kaynak Emisyonlarında Elektrokimyasal Hücre Metodu ile SO_2 Tayini	TS ISO 7935
	Sabit Kaynak Emisyonlarında Elektrokimyasal Hücre Metodu ile CO_2, O_2, CO	TS ISO 12039
	Sabit Kaynak Emisyonlarında Elektrokimyasal Hücre Metodu ile NO_x ($NO+NO_2$) Tayini	EPA CTM 022
	Nokta Kaynak Emisyonları - Borulardaki Gaz Akışlarının Hız Ve Debisinin Ölçülmesi	TS ISO 10780
	Baca Gazları - Destile Yakıtların Yanmasıyla Meydana -Gelen Duman Yoğunluğu (İslilik) Tayini- Bacharach Yöntemiyle	TS 9503
	Sabit Kaynak Emisyonlarında Nem İçeriğinin Tayini	EPA Metot 4
	Nem Probu ile Nem Tayini (≤ 180°C baca sıcaklığı için)	İşletme İçi Metot (Baca Sıcaklığı <180°C)
	Sabit Kaynak Emisyonları-Tanecikli Maddenin Kütle Derişiminin Elle Tayini-Referans metot	TS ISO 9096
	Sabit Kaynak Emisyonları-Tozun Düşük Aralıktaki Kütle Derişiminin Tayini-Bölüm 1: Manuel Gravimetrik Metot- Referans metot	TS EN 13284-1
	Sabit Kaynak Emisyonlarında Toz Emisyon Miktarının Tayini (Baca dışı örnekleme)	EPA Metot 5

Akreditasyon Sertifikası Eki (Sayfa 5/6)

Akreditasyon Kapsamı

SELİN ÖLÇÜM LABORATUVAR HİZMETLERİ
Bilişim Müşavirlik İnşaat San Ve Tic A. Ş.

Akreditasyon No: AB-0237-T
Revizyon No: 06 Tarih: 10 Nisan 2015

Deneyi Yapılan Malzemeler / Ürünler	Deney Adı	Deney Metodu (Ulusal, Uluslararası standardlar, işletme içi metodlar)
(Bacagazı (Emisyon) (TS CEN/TS 15675 ve TS EN 15259 şartlarına uygun) Devam)	Sabit Kaynak Emisyonlarında Toz Emisyon Miktarının Tayini (Baca içi örnekleme)	EPA Metot 17
	Sabit Kaynak Emisyonlarında Toplam Flor Miktarının Tayini-SPANDS Metodu	EPA Metot 13 A
	Sabit Kaynak Emisyonları- HF örneklenmesi ve gaz halindeki florürlerin kütle konsantrasyonunun tayini- Referans metot	ISO/FDIS 15713
	Sabit Kaynak Emisyonları- HCL olarak tanımlanan gaz halindeki klorürlerin kütle konsantrasyonunun tayini- Standard Referans Yöntem	TS EN 1911
	Sabit Kaynak Emisyonları- Gaz Halindeki Münferit Organik Bileşiklerin Kütle Derişimlerinin Tayini-Aktif Karbon Ve Çözücü Desorpsiyonu Metodu	TS EN 13649
	Sabit Kaynak Emisyonları- Baca Gazlarında Düşük Derişimlerde Bulunan Gaz Halindeki Toplam Organik Karbonun Kütle Derişiminin Tayini- Alev İyonlaştırma Detektoru Kullanılan Sürekli Metot- Referans metot	TS EN 12619
Hava Kalitesi (İmisyon) Ölçümleri	Hava Kalitesi - Askıda Katı Maddenin PM10 Kesrinin Tayini	EPA 40 CFR Part 50 Appendix J ve M

Akreditasyon Sertifikası Eki (Sayfa 6/6)

Akreditasyon Kapsamı

SELİN ÖLÇÜM LABORATUVAR HİZMETLERİ
Bilişim Müşavirlik İnşaat San Ve Tic A. Ş.

Akreditasyon No: AB-0237-T
Revizyon No: 06 Tarih: 10 Nisan 2015

Deneyi Yapılan Malzemeler / Ürünler	Deney Adı	Deney Metodu (Ulusal, Uluslararası standardlar, işletme içi metodlar)
(Hava Kalitesi (İmisyon) Ölçümleri Devam)	Hava Kalitesi - Askıda Katı Maddenin PM10 Kesrinin Tayini - Ölçme Yöntemlerinin Referans Eşdeğerliğini Göstermek İçin Saha Deney İşlemi Ve Referans Metodu	TS EN 12341
	Hava Kirliliği Ölçme Metotları Yönlendirilebilir Çökelti Ölçme Cihazı Kurma Ve Çalıştırma Metodu- Çöken Toz Tayini	TS 2342

KAPSAM SONU

Dr. H. İbrahim ÇETİN
Genel Sekreter

APP -2
DOCUMENTS OF THE MEASUREMENT EQUIPMENT

CEL 490 - CALIBRATION CERTIFICATE OF THE NOISE MEASUREMENT DEVICE

AVL
Kalibrasyon Laboratuvarı

TÜRKAK
TÜRK AKREDİTASYON KURUMU
TURKISH ACCREDITATION AGENCY
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AVL AKUSTİK VİBRASYON
KALİBRASYON LABORATUVARI
İvedik O.S.B. 1385 Sk. No: 10 OSTİM / ANKARA

Kalibrasyon Sertifikası
Calibration Certificate

AB-0089-K
2014-1100
11-2014

Cihazın Sahibi ***Customer Name***	:	SELİN ÖLÇÜM LAB. HİZM. BİL. MÜH. MÜŞ. İNŞ. SAN. VE TİC. A.Ş. Çetinemeç Bulvarı 1324. Cadde No.30/C Öveçler Dikmen / ANKARA
İstek Numarası ***Order No.***	:	TEK-2014-505
Makine / Cihaz ***Instrument / Device***	:	Ses Seviyesi Ölçüm Cihazı *Sound Level Meter*
İmalatçı ***Manufacturer***	:	CASELLA
Tip ***Type***	:	CEL-490
Seri Numarası ***Serial number***	:	127154
Kalibrasyon Tarihi ***Date of calibration***	:	6.11.2014
Sertifika Sayfa Sayısı ***Number of pages of the certificate***	:	6

Bu kalibrasyon sertifikası, Uluslararası Birimler Sisteminde (SI) tanımlanmış birimleri realize eden ulusal ölçüm standardlarına izlenebilirliği belgeler.
This calibration certificate documents the traceability to national standards, which realize the unit of measurement according to the International System of Units (SI).

Türk Akreditasyon Kurumu (TÜRKAK) kalibrasyon sertifikalarının tanınması konusunda Avrupa Akreditasyon Birliği (EA) ve Uluslararası Laboratuvar Akreditasyon Birliği (ILAC) ile karşılıklı tanınma anlaşmasını imzalamıştır.
The Turkish Accreditation Agency (TÜRKAK) is signatory to the multilateral agreements of the European co-operation for the Accreditation (EA) and of the International Laboratory Accreditation (ILAC) for the Mutual recognition of calibration certificates.

Ölçüm sonuçları, genişletilmiş ölçüm belirsizlikleri ve kalibrasyon metodları bu sertifikanın tamamlayıcı kısmı olan takip eden sayfalarda verilmiştir.
The measurements, the uncertainties with confidence probability and calibration methods are given on the following pages which are part of this certificate.

Mühür	Tarih Date	Kalibrasyonu Yapan Calibrated by	Laboratuvar Müdürü Head of the Calibration Laboratory
AVL KALİBRASYON LABORATUVARI TÜRKAK AB-0089-K	6.11.2014	Ayşegül Balmaz	Younes NEVAYE SHIRAZI

Bu sertifika, laboratuvarın yazılı izni olmadan kısmen kopyalanıp çoğaltılamaz.
İmzasız ve mühürsüz sertifikalar geçersizdir.
This certificate shall not be reproduced other than in full except with the permission of the laboratory. Calibration certificates without signature and seal are not valid.

faks: +90 312 394 15 53 tel: +90 312 394 15 50 web sitesi : www.avl.com.tr e-posta : bilgi@avl.com.tr

This report is only valid for the **NOISE** measurements performed on **11.06.2015 – 12.06.2015** in the scope of **AGE Batum LTD – Shuakhevi HEPP Project** and **cannot be copied without the written permission of SELİN Measurement Laboratory Co. Inc**. Reports without sign and seal are invalid. Measurement results are only related to operation conditions during measurement. **Our accreditation is restricted with the scope of the experiment methods in our scope. Competence of the opinions and interpretations stated except this is not in the scope of the accreditation. This report cannot be used for official procedures related to environmental legislation.**

1. Cihaza Ait Bilgiler
Device to be Calibrated

Cihazın Adı *Name of the Instrument*	:	Ses Seviyesi Ölçüm Cihazı *Sound Level Meter*
İmalatçısı *Manufacturer*	:	CASELLA
Seri Numarası *Serial Number*	:	127154
Ölçüm Aralığı *Measuring Range*	:	18,5 dB - 140 dB
Bölüntüsü *Scale Division*	:	0,1
Tipi *Type*	:	CEL-490

2. Cihazın Laboratuvara Kabul Tarihi : 3.11.2014
Date of Recipt of Device

3. Kalibrasyon Metodu
Calibration Method

Kalibrasyon IEC 61672-3 Standardında tarif edilen testlere göre yapılmıştır. AVL PR.LBBR.501 Elektroakustik Ses Ölçerleri Periyodik Kalibrasyon prosedürü kullanılmıştır. Ölçümlerden ve testlerden önce ses seviyesi ölçüm cihazı kalibre edilmiştir.

Calibration was made according to IEC 61672-3 Standard . AVL Procedure PR.LBBR.501 was used in calibration of the sound level meters. Sound level meter was calibrated before measurement.

4. Çevresel Şartlar
Environmental Conditions

Ortam Sıcaklığı *Ambient Temperature*	:	20,1	± 3 °C
Bağıl Nem *Relative Humidity*	:	42	± 25 %
Ortam Basıncı *Ambient Pressure*	:	912	± 1 hPa

5. Kalibrasyonda Kullanılan Referans Cihazlar
Reference Equipments Used During Calibration

Cihaz *Device*	İmalatçı *Manufacturer*	Seri No *Serial No*	Tipi *Type*	Sertifika No *Certificate No*	İzlenebilirlik *Traceability*
Mikrofon	Brüel & Kjaer	2709959-2154	4192-MV203	0352	Spektra
Akustik Kalibratör	Brüel & Kjaer	2705957	4231	0530	Spektra
Pistonfon	RION	37290219	NC-72A	0531	Spektra
Termo - Hygrometre	KIMO	7122852	KH100	4.02209	UMS

Kalibrasyonlarımızda Spektra CS18 kalibrasyon sistemi ve yazılımları kullanılmaktadır.

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6. Ölçüm Belirsizliği
Measurement Uncertanity

Frekans Ağırlıklı Akustik Test : 31,5 ile 2 KHz : ± 0,30 dB 2 KHz ile 5 KHz : ± 0,50 dB
Acoustical Tests of Frequency Weighting

Seviye Doğrusallığı Testi : ± 0,10 dB
Level Linearity Test

7. Kalibrasyon Sonuçları
Calibration Results

7.1. 1000 Hz 94 dB Kalibrasyon
Calibration at frequency point 1000 Hz 94 dB

Kalibrasyondan Önceki Değer : 93,7 dB
Value Before Calibration

Sapma : -0,30 dB
Deviation

7.2. C - Frekans Ağırlıklı Akustik Test
Acoustical Signal Tests of a C - Frequency Weighting

Frekans *Frequency* Hz	Uygulanan SPL *Applied SPL* dB	Okunan Ses Seviyesi *Measured Sound Level* dB	Standart Sapma *Standard Deviation* %	Tepki Farkı *Response Difference* dB	C-Ağırlıklı Filtre Karakteristiği *C-Weighted Filter Characterization* dB	Tepki Farkı Sapma *Response Deviation* dB	Tolerans *Tolerance* dB
63,00	74,79	74,10	0,14	-0,69	-0,80	0,11	±1,5
80,00	74,95	74,50	0,10	-0,45	-0,50	0,05	±1,5
100,00	75,03	74,60	0,07	-0,43	-0,30	-0,13	±1,5
125,00	75,00	74,70	0,14	-0,30	-0,20	-0,10	±1,5
160,00	75,00	74,80	0,13	-0,20	-0,10	-0,10	±1,5
200,00	75,02	74,90	0,60	-0,12	0,00	-0,12	±1,5
250,00	74,96	75,90	0,05	0,94	0,00	0,94	±1,4
315,00	74,99	75,60	0,04	0,61	0,00	0,61	±1,4
400,00	75,01	75,00	0,10	-0,01	0,00	-0,01	±1,4
500,00	75,00	75,00	0,04	0,00	0,00	0,00	±1,4
630,00	75,02	75,00	0,08	-0,02	0,00	-0,02	±1,4
800,00	75,02	75,00	0,22	-0,02	0,00	-0,02	±1,4
1000,00	75,02	75,00	0,09	-0,02	0,00	-0,02	±1,1
1250,00	75,02	75,00	0,07	-0,02	0,00	-0,02	±1,4
1600,00	75,01	74,90	0,05	-0,11	-0,10	-0,01	±1,6
2000,00	75,01	74,80	0,02	-0,21	-0,20	-0,01	±1,6
2500,00	75,02	74,80	0,02	-0,22	-0,30	0,08	±1,6
3150,00	75,01	74,80	0,01	-0,21	-0,50	0,29	±1,6
4000,00	75,00	74,80	0,01	-0,20	-0,80	0,60	±1,6
5000,00	75,01	75,30	0,01	0,29	-1,30	1,59	±2,1

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7.3. 1 kHz de Frekans & Zaman Ağırlıklı Test

Frequency & Time Weighted Test at 1 kHz

Frekans *Frequency* *Hz*	Frekans / Zaman Ağırlığı *Frequency / Time Weighting*	Voltaj *Voltage* *V*	Okunan Değer *Measured Value* *dB*	Sapma *Deviation* *dB*
1000,000	A-Fast	0,04149	94,00	Referans Değer
1000,000	C-Fast	0,041517	94,00	0,00
1000,000	Z-Fast	0,041516	94,00	0,00
1000,000	A-Slow	0,041468	94,00	0,00

İşlem *Procedure*	İşlem Sonucu *Procedure Result* *dB*	Tolerans *Tolerance* *dB*
$L_{AF} - L_{AS}$	0,00	±0,3
$L_{AF} - L_{CF}$	0,00	±0,4
$L_{AF} - L_{ZF}$	0,00	±0,4

7.4. Frekans Ağırlıklı - Elektriksel Test

Frequency Weighted Electrical Test

Frekans *Frequency* *Hz*	Uygulanan Voltaj *Applied Voltage* *V*	Okunan Ses Seviyesi *Measured Sound Level* *dB*	Tepki Farkı *Response Difference* *dB*	A-Ağırlıklı Filtre Karakteristiği *A-Weighted Filter Characterization* *dB*	Tepki Farkı Sapma *Response Deviation* *dB*	Tolerans *Tolerance* *dB*
1000,00	0,041508	94,00	Ref. Değer	---	---	---
63,00	0,041501	67,80	-26,20	-26,20	0,00	±1,5
80,00	0,041669	71,60	-22,43	-22,50	0,07	±1,5
100,00	0,041462	74,80	-19,19	-19,10	-0,09	±1,5
125,00	0,041503	77,80	-16,20	-16,10	-0,10	±1,5
160,00	0,041654	80,70	-13,33	-13,40	0,07	±1,5
200,00	0,041457	83,10	-10,89	-10,90	0,01	±1,5
250,00	0,041509	85,30	-8,70	-8,60	-0,10	±1,4
315,00	0,041595	87,40	-6,62	-6,60	-0,02	±1,4
400,00	0,041426	89,20	-4,78	-4,80	0,02	±1,4
500,00	0,041488	90,80	-3,20	-3,20	0,00	±1,4
630,00	0,041583	92,10	-1,92	-1,90	-0,02	±1,4
800,00	0,041435	93,20	-0,78	-0,80	0,02	±1,4
1000,00	0,041459	94,00	0,01	0,00	0,01	±1,1
1250,00	0,041475	94,60	0,61	0,60	0,01	±1,4
1600,00	0,041491	95,00	1,00	1,00	0,00	±1,6
2000,00	0,041484	95,20	1,21	1,20	0,01	±1,6
2500,00	0,041500	95,30	1,30	1,30	0,00	±1,6
3150,00	0,041491	95,20	1,20	1,20	0,00	±1,6
4000,00	0,041475	94,90	0,91	1,00	-0,09	±1,6
5000,00	0,041459	94,50	0,51	0,50	0,01	±2,1

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7.4. Frekans Ağırlıklı - Elektriksel Test

Frequency Weighted Electrical Test

Frekans *Frequency* Hz	Uygulanan Voltaj *Applied Voltage* V	Okunan Ses Seviyesi *Measured Sound Level* dB	Tepki Farkı *Response Difference* dB	A-Ağırlıklı Filtre Karakteristiği *A-Weighted Filter Characterization* dB	Tepki Farkı Sapma *Response Deviation* dB	Tolerans *Tolerance* dB
6300,00	0,041445	93,80	-0,19	-0,10	-0,09	+2,1; -2,6
8000,00	0,041458	92,60	-1,39	-1,10	-0,29	+2,1; -3,1
10000,00	0,041360	90,90	-3,07	-2,50	-0,57	+2,6; -3,6
12500,00	0,041274	88,60	-5,35	-4,30	-1,05	+3,0; -6,0
16000,00	0,041171	84,80	-9,13	-6,60	-2,53	+3,5; -17,0
20000,00	0,041052	79,50	-14,40	-9,30	-5,10	+4,0; -∞

7.5. Elektriksel Seviye Doğrusallığı Testi

Electrical Level Linearity Test

Frekans *Frequency* Hz	Uygulanan Voltaj *Applied Voltage* V	Referans Ses Seviyesi *Reference Sound Level* dB	Okunan Ses Seviyesi *Measured Sound Levels* dB	Sapma *Deviation* dB	Tolerans *Tolerance* dB
8000,00	0,041398	94,00	94,00	0,00	+2,1; -3,1
8000,00	0,073617	99,00	99,00	0,00	+2,1; -3,1
8000,00	0,130920	104,00	104,00	0,00	+2,1; -3,1
8000,00	0,232740	109,00	109,00	0,00	+2,1; -3,1
8000,00	0,413880	114,00	114,00	0,00	+2,1; -3,1
8000,00	0,736050	119,00	117,40	-1,60	+2,1; -3,1
8000,00	0,825830	120,00	117,90	-2,10	+2,1; -3,1
8000,00	0,926540	121,00	118,50	-2,50	+2,1; -3,1
8000,00	1,039700	122,00	119,00	-3,00	+2,1; -3,1
8000,00	1,166600	123,00	119,60	-3,40	+2,1; -3,1
8000,00	1,308800	124,00	120,10	-3,90	+2,1; -3,1
8000,00	0,041399	94,00	94,00	0,00	+2,1; -3,1
8000,00	0,023281	89,00	89,00	0,00	+2,1; -3,1
8000,00	0,013111	84,00	83,90	-0,10	+2,1; -3,1
8000,00	0,007362	79,00	78,90	-0,10	+2,1; -3,1
8000,00	0,004140	74,00	73,90	-0,10	+2,1; -3,1
8000,00	0,002324	69,00	68,90	-0,10	+2,1; -3,1
8000,00	0,001307	64,00	63,90	-0,10	+2,1; -3,1
8000,00	0,000730	59,00	58,90	-0,10	+2,1; -3,1
8000,00	0,000412	54,00	53,90	-0,10	+2,1; -3,1
8000,00	0,000229	49,00	48,90	-0,10	+2,1; -3,1
8000,00	0,000201	48,00	47,90	-0,10	+2,1; -3,1
8000,00	0,000183	47,00	46,90	-0,10	+2,1; -3,1
8000,00	0,000164	46,00	45,90	-0,10	+2,1; -3,1
8000,00	0,000144	45,00	44,90	-0,10	+2,1; -3,1

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7.5. Elektriksel Seviye Doğrusallığı Testi

Electrical Level Linearity Test

Frekans *Frequency* *Hz*	Uygulanan Voltaj *Applied Voltage* *V*	Referans Ses Seviyesi *Reference Sound Level* *dB*	Okunan Ses Seviyesi *Measured Sound Levels* *dB*	Sapma *Deviation* *dB*	Tolerans *Tolerance* *dB*
8000,00	0,000127	44,00	43,90	-0,10	+2,1; -3,1

8. Uygunluk Beyanı

Statement of Compliance

Ölçüm sonuçları ve ölçüm belirsizliği yukarıda verilmiştir. Kullanıcı bunları dikkate alarak uygunluğuna karar vermelidir. Beyan edilen genişletilmiş belirsizlik değeri standart belirsizliğin normal dağılımı için; yaklaşık % 95 güvenirlik seviyesini sağlayan k=2 kapsam faktörü ile çarpımının sonucudur. Standart ölçüm belirsizliği GUM ve EA-4/02 dokümanlarına uygun olarak belirlenmiştir. Ölçüm sonuçları, genişletilmiş ölçüm belirsizlikleri ve kalibrasyon metotları bu sertifikanın tamamlayıcı bir bölümüdür.

The measurenment results and and measurenment uncertinity were given. The user have to consider the results and decide compliance of the device. The reported expended uncertainity of measurenment is stated as the standart uncertainity of multitude by coverage factor k=2, which for a normal distribution corresponds to covarage of approximately 95%. The standard measurement uncertainty is defined according to the GUM and EA-4/02documents. Measurement results, the expanded measurement uncertainty of measurement and calibration methods, is an integral part of the this certificate.

9. Açıklamalar

Remarks

Bu sertifikada bulunan sonuçlar cihazın kalibrasyon tarihindeki durumu kapsar ve uzun dönem kararlığı hakkında bir öngörü içermez.

The result reported in this certificate refer to the condition of the instrument on the date of calibration and carry no implication regarding the long-term stability of the instrument

SRT.LBBR.506

CEL 110/1 - CALIBRATION CERTIFICATE OF CALIBRATORS

AVL
Kalibrasyon Laboratuvarı

TÜRKAK
TÜRK AKREDİTASYON KURUMU
TURKISH ACCREDITATION AGENCY
tarafından akredite edilmiştir.

TÜRKAK
AB-0089-K

AVL AKUSTİK VİBRASYON
KALİBRASYON LABORATUVARI
İvedik O.S.B. 1365. Sk. No: 10 DİSTİM / ANKARA

AB-0089-K
2014-1130
11-2014

Kalibrasyon Sertifikası
Calibration Certificate

Cihazın Sahibi ***Customer Name***	:	SELİN ÖLÇÜM LAB. HİZM. BİL. MÜH. MÜŞ. İNŞ. SAN. VE TİC. A.Ş. Çetinemeç Bulvarı 1324. Cadde No: 30/C Öveçler Dikmen / ANKARA
İstek Numarası ***Order No.***	:	TEK-2014-540
Makine / Cihaz ***Instrument / Device***	:	Ses Kalibratörü *Sound Calibrator*
İmalatçı ***Manufacturer***	:	CASELLA
Tip ***Type***	:	Cel-110/1
Seri Numarası ***Serial number***	:	117566
Kalibrasyon Tarihi ***Date of calibration***	:	18.11.2014
Sertifika Sayfa Sayısı ***Number of pages of the certificate***	:	3

Bu kalibrasyon sertifikası, Uluslararası Birimler Sisteminde (SI) tanımlanmış birimleri realize eden ulusal ölçüm standardlarına izlenebilirliği belgeler.
This calibration certificate documents the traceability to national standards, which realize the unit of measurement according to the International System of Units (SI).

Türk Akreditasyon Kurumu (TÜRKAK) kalibrasyon sertifikalarının tanınması konusunda Avrupa Akreditasyon Birliği (EA) ve Uluslararası Laboratuvar Akreditasyon Birliği (ILAC) ile karşılıklı tanınma anlaşmasını imzalamıştır.
The Turkish Accreditation Agency (TÜRKAK) is signatory to the multilateral agreements of the European Cooperation for the Accreditation (EA) and of the International Laboratory Accreditation (ILAC) for the Mutual recognition of calibration certificates.

Ölçüm sonuçları, genişletilmiş ölçüm belirsizlikleri ve kalibrasyon metodları bu sertifikanın tamamlayıcı kısmı olan takip eden sayfalarda verilmiştir.
The measurements, the uncertainties with probability and calibration methods are given on the following pages which are part of this certificate.

Mühür	Tarih Date	Kalibrasyonu Yapan Calibrated by	Laboratuvar Müdürü Head of the Calibration Laboratory
AVL KALİBRASYON LABORATUVARI TÜRKAK AB-0089-K	18.11.2014	Ayşegül Batmaz	Younes NEVAYE SHİRAZİ

Bu sertifika, laboratuvarın yazılı izni olmadan kısmen kopyalanıp çoğaltılamaz.
İmzasız ve mühürsüz sertifikalar geçersizdir.
This certificate shall not be reproduced other than in full except with the permission of the laboratory. Calibration certificates without signature and seal are not valid.

faks: +90 312 394 15 53 tel: +90 312 394 15 50 web sitesi : www.avl.com.tr e-posta : bilgi@avl.com.tr

AVL AKUSTİK VİBRASYON
KALİBRASYON LABORATUARI

AB-0089-K
2014-1130
11-2014

1. Cihaza Ait Bilgiler
Device to be Calibrated

Cihazın Adı *Name of the Instrument*	:	Ses Kalibratörü *Sound Calibrator*
İmalatçısı *Manufacturer*	:	CASELLA
Seri Numarası *Serial Number*	:	117566
Ölçüm Aralığı *Measuring Range*	:	1000 Hz 94 dB / 114 dB
Tipi *Type*	:	Cel-110/1

2. Cihazın Laboratuvara Kabul Tarihi : 17.11.2014
Date of Recipt of Device

3. Kalibrasyon Metodu
Calibration Method

Kalibrasyon TS EN 60942 standardına uygun olarak karşılaştırma metodu ile yapılmıştır.

4. Çevresel Şartlar
Environmental Conditions

Ortam Sıcaklığı *Ambient Temperature*	: 20,7	± 3	°C
Bağıl Nem *Relative Humidity*	: 48	± 25	%
Ortam Basıncı *Ambient Pressure*	: 918	± 1	hPa

5. Kalibrasyonda Kullanılan Referans Cihazlar
Reference Equipments Used During Calibration

Cihaz *Device*	İmalatçı *Manufacturer*	Seri No *Serial No*	Tipi *Type*	Sertifika No *Certificate No*	İzlenebilirlik *Traceability*
Mikrofon	Brüel & Kjaer	2709959-2154	4192-MV203	0352	Spektra
Pistonfon	RION	37290219	NC-72A	0531	Spektra
Termo - Hygrometre	KIMO	7122852	KH100	4.02209	UMS

6. Ölçüm Belirsizliği
Measurement Uncertainty

6.1. 94 db 1000 Hz

Ses Basınç Seviyesi *Sound Pressure Level*	: 0,14	dB
Ses Frekansı *Sound Frequency*	: 0,10	%
Bozulma Faktörü *Distortion Factor*	: 0,34	%

6.2. 114 db 1000 Hz

Ses Basınç Seviyesi *Sound Pressure Level*	: 0,14	dB
Ses Frekansı *Sound Frequency*	: 0,10	%
Bozulma Faktörü *Distortion Factor*	: 0,67	%

SRT.LBSR.504

AVL KALİBRASYON LABORATUVARI TÜRK AB-0089-K

7. Kalibrasyon Sonuçları
Calibration Results

7.1. 94 db 1000 Hz

Ses Basınç Seviyesi
Sound Pressure Level

Nominal Değer *Nominal Value*	: 94,00	dB	
Ölçülen Değer *Measured Value*	: 93,84	dB	
Sapma *Deviation*	: -0,16	dB	

Ses Frekansı
Sound Frequency

Nominal Değer *Nominal Value*	: 1000,03	Hz
Ölçülen Değer *Measured Value*	: 1000,13	Hz
Sapma *Deviation*	: 0,10	Hz

Bozulma Faktörü
Distortion Factor

Ölçülen Değer *Measured Value*	: 0,30	%

7.2. 114 db 1000 Hz

Ses Basınç Seviyesi
Sound Pressure Level

Nominal Değer *Nominal Value*	: 114,00	dB	
Ölçülen Değer *Measured Value*	: 113,80	dB	
Sapma *Deviation*	: -0,20	dB	

Ses Frekansı
Sound Frequency

Nominal Değer *Nominal Value*	: 1000,01	Hz
Ölçülen Değer *Measured Value*	: 1000,12	Hz
Sapma *Deviation*	: 0,11	Hz

Bozulma Faktörü
Distortion Factor

Ölçülen Değer *Measured Value*	: 0,40	%

Referans Ses Basıncı : 20 µPa
Reference Sound Pressure

8. Uygunluk Beyanı
Statement of Compliance

Ölçüm sonuçları ve ölçüm belirsizliği yukarıda verilmiştir. Kullanıcı bunları dikkate alarak uygunluğuna karar vermelidir. Beyan edilen genişletilmiş belirsizlik değeri standart belirsizliğin normal dağılımı için; yaklaşık % 95 güvenirlik seviyesini sağlayan k=2 kapsam faktörü ile çarpımının sonucudur. Standart ölçüm belirsizliği GUM ve EA-4/02 dokümanlarına uygun olarak belirlenmiştir. Ölçüm sonuçları, genişletilmiş ölçüm belirsizlikleri ve kalibrasyon metotları bu sertifikanın tamamlayıcı bir bölümüdür.

The measurenment results and and measurenment uncertinity were given. The user have to consider the results and decide compliance of the device. The reported expended uncertainity of measurenment is stated as the standart uncertainity of multitude by coverage factor k=2, which for a normal distribution corresponds to covarage of approximately 95%. The standard measurement uncertainty is defined according to the GUM and EA-4/02documents. Measurement results, the expanded measurement uncertainty of measurement and calibration methods, is an integral part of the this certificate.

9. Açıklamalar
Remarks

Bu sertifikada bulunan sonuçlar cihazın kalibrasyon tarihindeki durumu kapsar ve uzun dönem kararlığı hakkında bir öngörü içermez.

The result reported in this certificate refer to the condition of the instrument on the date of calibration and carry no implication regarding the long-term stability of the instrument

SRT.LBBR.504

APP-3
DOCUMENTS OF THE PERSONNEL WHO PREPARED THE REPORT AND MADE THE MEASUREMENT

TMMOB
FİZİK MÜHENDİSLERİ ODASI
BAŞARI BELGESİ

Sayın İsmail ARSLAN

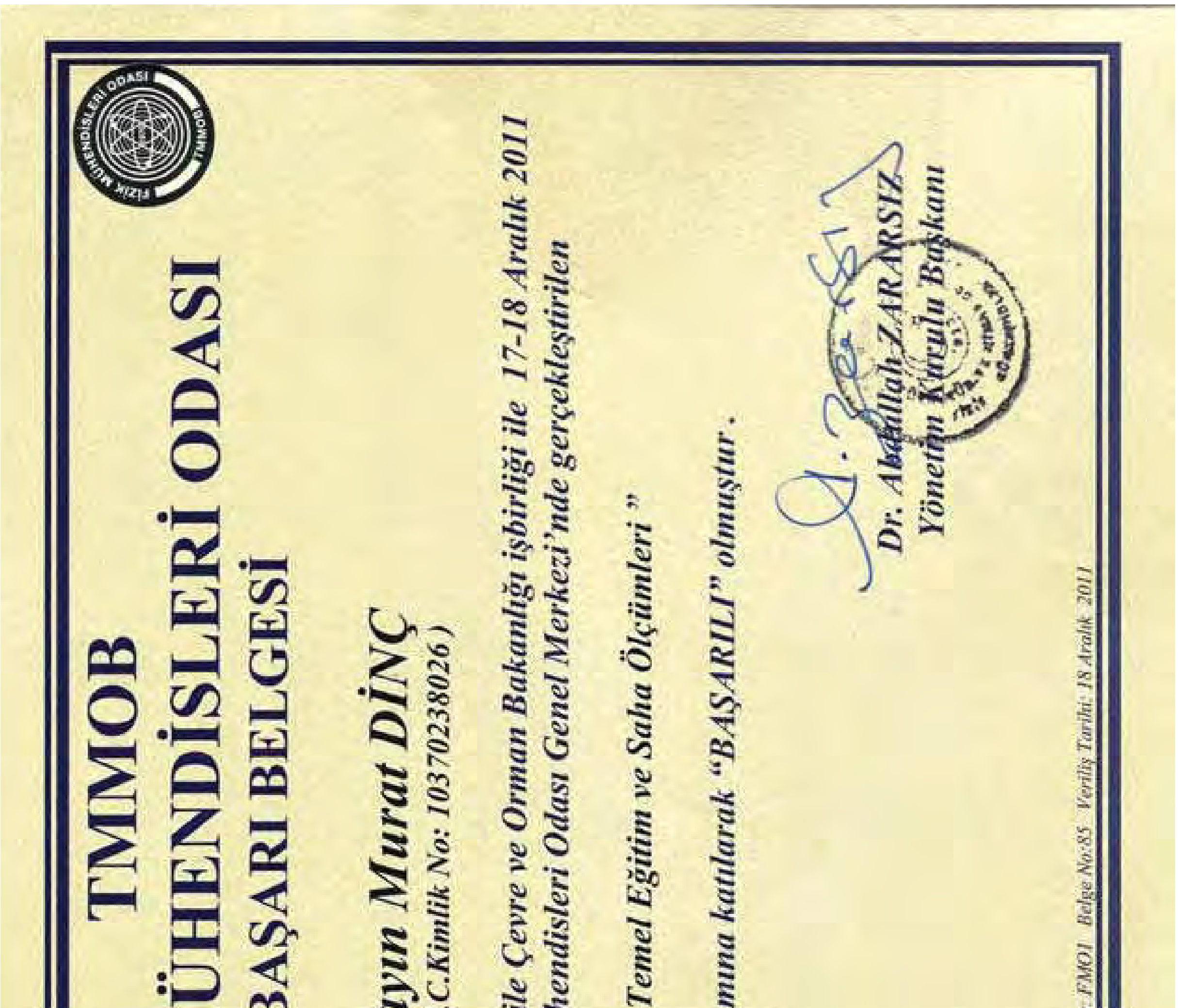
TMMOB Fizik Mühendisleri Odası ile Çevre ve Orman Bakanlığı işbirliği ile 2-5 Nisan 2009 tarihleri arasında Fizik Mühendisleri Odası Genel Merkezi'nde gerçekleştirilen

"A-2 Tipi Mühendislik Akustiği"

Sertifika Programına katılarak "BAŞARILI" olmuştur .

Dr. Abdullah ZARARSIZ
Yönetim Kurulu Başkanı

Belge Kodu: FMO1 Belge No: 14 Veriliş Tarihi: 5 Nisan 2009


TMMOB

FİZİK MÜHENDİSLERİ ODASI

BAŞARI BELGESİ

Sayın Murat DİNÇ

(T.C.Kimlik No: 10370238026)

TMMOB Fizik Mühendisleri Odası ile Çevre ve Orman Bakanlığı işbirliği ile 17-18 Aralık 2011 tarihleri arasında Fizik Mühendisleri Odası Genel Merkezi'nde gerçekleştirilen

" A-1 Tipi Temel Eğitim ve Saha Ölçümleri "

Sertifika Programına katılarak "BAŞARILI" olmuştur.

Dr. Abdullah ZARARSIZ

Yönetim Kurulu Başkanı

Belge Kodu: FMO1 Belge No:85 Veriliş Tarihi: 18 Aralık 2011

Selin Lab

www.selinlab.com.tr

SELİN ÖLÇÜM LABORATUVAR HİZMETLERİ BİLİŞİM MÜH.MÜŞ. İNŞ. SAN. VE TİC. A.Ş.

Adres: Çetin Emeç Bulvarı 1324. Cadde Özlem Apartmanı No:30/C Öveçler Çankaya / ANKARA
E-mail: selinlab@selinlab.com.tr

Tel: 0 312 472 94 35-36-37
Faks: 0 312 481 33 01

Selin Lab

SELİN ÖLÇÜM LABORATUVAR HİZMETLERİ
BİLİŞİM MÜH.MÜŞ. İNŞ. SAN. VE TİC. A.Ş.

Müşterinin Adı/Adresi: Customer Name/Address	AGE Batum LTD - Shuakhevi HES BATUM/Gogebashvili N:60
Müşterinin Telefonu/Faksı: Customer Phone/Fax	+995 422 21 22 05/06/07 +995 422 21 22 05/06/07
İstek Numarası: Order No.	15-001/IV
Numunenin Adı ve Tarifi: Name And Identity Of The Test Item	Dust (PM10) Measurement
Deneyin Yapıldığı Tarih: Date Of Test	11/06/2015 – 12/06/2015
Raporun Numarası ve Tarihi: Number And Date Of The Report	15-İMİ-001/IV-1 – 22/06/2015

TÜRKAK
Test
TS EN ISO/IEC 17025
AB-0237-T

TÜRKAK
TÜRK AKREDİTASYON KURUMU
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SELİN ÖLÇÜM LABORATUVAR HİZMETLERİ
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TÜRKAK
Test
TS EN İSO/IEC 17025
AB-0237-T

AB-0237-T
15-İMİ-001/IV-1
22/06/2015

Çetin Emeç Bulvarı 1324. Cadde Özlem Apartmanı No:30/C Öveçler
Çankaya / ANKARA
***Tel:** 0 312 472 94 35-36-37 **Faks:** 0312 481 33 01*
***Web:** www.selinlab.com.tr **E-mail:** selinlab@selinlab.com.tr*

Deney Raporu / *Test Report*

Müşterinin adı/adresi: Customer name/address	AGE Batum LTD - Shuakhevi HES BATUM/Gogebashvili N:60
Müşterinin telefonu/faksı: Customer phone/fax	+995 422 21 22 05/06/07 +995 422 21 22 05/06/07
İstek Numarası: Order No.	15-001/IV
Numunenin adı ve tarifi: Name and identity of the test item	Dust (PM10) Measurement
Numunenin kabul tarihi ve no: The date and number of receipt of the test item	15/06/2015 - 150612-T-1
Açıklamalar: Remarks	-
Deneyin yapıldığı tarih: Date of test	11/06/2015 – 12/06/2015
Raporun sayfa sayısı: Number of pages of the Report	19

Türk Akreditasyon Kurumu (TÜRKAK) deney raporlarının tanınması konusunda Avrupa Akreditasyon Birliği (EA) ve Uluslar arası Laboratuar Akreditasyon Birliği (ILAC) ile karşılıklı tanınma antlaşması imzalamıştır.

The Turkish Accreditaion Agency (TURKAK) is signatory to the multilateral agreements of the European co-operation for the accreditaion (EA) and of the International Labrotory Accreditation (ILAC) for the Mutual recognation of test reports.

Deney ve/veya ölçüm sonuçları, genişletilmiş ölçüm belirsizlikleri (olması halinde) ve deney metotları bu sertifikanın tamamlayıcı kısmı olan takip eden sayfalarda verilmiştir.

The test and/or measurement results, the uncertainties (if applicable) with confidence probability and test methods are given on the following pages which are part of this report.

Mühür Seal	*Tarih* Date	***Deneyi Yapan*** Test Done by	***Analizi Yapan*** Analyzed by	***Raporu Hazırlayan*** Report Prepared by	***Onay*** Approved by
	22/06/2015	**Murat DİNÇ Measurement Responsible**	**Ebru ŞAHİN Analysis Responsible**	**İsmail ARSLAN Quality Management Representative**	**Ersan ÖZKİŞİ Laboratory Technical Manager**

TABLE OF CONTENTS **Page No**

A. INTRODUCTION

This report was prepared as a result of the measurements performed in the explicit address mentioned below;

Date of the Measuremen : 11.06.2015 – 12.06.2015

Location of the Measurement : Shuakhevi HES

B. INFORMATION ABOUT THE FACILITY

The construction phase of the Shuakhevi HEPP Project, located in Adjaristsqali River, Georgia, is carried out by AGE Batum LTD.

C. EMISSION MEASUREMENT REPORT

i. Introduction

The aim of the Regulation of Evaluation and Management of Air Quality is to determine and develop air quality targets to prevent or mitigate the harmful effects of air pollution on human health and environment, to evaluate the air quality based on determined methods and criteria, to conserve the present situation in the regions where the air quality is well and to increase the air quality in other situations, to collect enough information related to air quality and to provide public information via warning thresholds.

The aim of the Regulation of Control of the Air Pollution Due To Industrial Facilities is to control the emissions in the form of soot, smoke, dust, gas, vapor and aerosol due to industrial and energy production facilities; to protect human beings and their environment from the dangers caused by the pollutions in the air receiving environments; to eliminate the negative effects causing significant harms to neighborly relations and public and to prevent these effects.

For the mentioned Hydroelectric Power Plant (HEPP) construction, to monitor the PM10 (dust) emissions), PM10 (dust) measurements were performed and the results are presented in this report.

i. Measurement Methods

The measurements were performed according to the standard given below.

EPA 40 CFR PART 50 National Ambient Air Quality Standards for Particulate Matter; Final Rule

ii. General Principles

Correct emission results depend both on applying a correct measurement technique and general principles of the measurement.

Our company provides correct and trustable results by the on-site measurements, preparation in the laboratory and checks made before measurement. Therefore emission analysis is made in three stages.

- **Preparation**

Before measurement, devices are checked by authorized personnel under the supervision of Technical Manager of the Laboratory before they are moved out of the laboratory and they are delivered to measurement team by Technical Manager of the Laboratory

- **Determination of the Measurement Points**

When selecting the measurement points, integrity in terms of macro environmental scale (type of the experiment location) and micro environmental scale (area surrounding directly the station) is taken into account.

- **Measurement and Analysis Process**

Device is designed for the sampling of the particulate matter (PM10) in the air in the environment. Determination of the PM10 amount was made according to EPA 40 CFR PART 50 standard. In the sampling process dust is retained on the filters and determined gravimetrically in the laboratory condition.

When selecting the measurement points, EPA 40 CFR PART 50 norms were applied and the nearest areas to the Project area and points that might be affected by the activity were selected. Samples were taken from sampling locations according to sampling technique mentioned in the EPA 40 CFR PART 50 and sampling representing the whole was made and measurement was performed.

ii. Measurement System

During measurements Dust Sampling Device with Serial No. of E0745160was used. Device is designed for the sampling of the particulate matter (PM10) in the air in the environment.

iii. Definitions and Explanations

PM 10: in EN 12341, PM10 is defined as a particulate matter that passes through with 50% efficiency from 10 µm aerodynamic diameter pervious input

iv. Measurement Results

Measurements were performed in two different points and the results of these measurements are given below.

Table 1: Measurement Points.

Source Code	Measurement Date	Source of Emission	Dust(PM10)
T1	11.06.2015	HES (Hazır Beton Santrali ve Konkasör)-Receiver Point 38 263305 D 4613165 K	X
T2	12.06.2015	Chanckalo Adit - Receiver Point 38 268971 D 4613117 K	X

$$\text{PM 10 Konsantrasyonu } (mg/m^3) = \frac{D}{A} \qquad \text{PM 10 Konsantrasyonu } (mg/Nm^3) = \frac{D}{A} \times \frac{273\,^{\circ}C + B}{273\,^{\circ}C} \times \frac{101.3\,kPA}{C}$$

Table 2: Dust (PM10) Measurement Results

	A	B	C	D	E	F
Source Code	Sample Volume (m^3)	Ambient Temperature (^0C)	Ambient Pressure (kPa)	Mass (µg)	PM 10 ($\mu g/m^3$)	PM 10 ($\mu g/Nm^3$)
T1	23,8371	26,79	97,205	430,0000	18,0391	20,64383
T2	23,8145	30,17	92,711	270,0000	11,3376	13,75701

v. Evaluation of Measurement Results

The comparison of the mean measurement results with the limit values are given below.

Table 3: The comparison of the mean measurement results with the limit values

Source Code	Measurement Date	Measuring Results PM 10 (µg/Nm^3)	Regulation of Evaluation and Management of Air Quality	The Law of Georgia on Protection of Atmospheric Air	WHO Ambient Air Quality Guidelines (and IFC General Work HS Guidelines)
T1	11.06.2015	20,64383	50 µg/m^3	150 µg/m^3	50 µg/m^3
T2	12.06.2015	13,75701	50 µg/m^3	150 µg/m^3	50 µg/m^3

When we look at the Table 3, it is seen that the measurement results are below the limit values given in related regulations.

D. APPENDICES

APP-1 : LABORATORY DOCUMENTS

APP-2 : CALIBRATION CERTIFICATE

APP-1 LABORATORY DOCUMENTS

TÜRK AKREDİTASYON KURUMU

AKREDİTASYON SERTİFİKASI

Deney Laboratuvarı olarak faaliyet gösteren,

SELİN ÖLÇÜM LABORATUVAR HİZMETLERİ
Bilişim Müşavirlik İnşaat San Ve Tic A. Ş.
Deney Laboratuarı
1324.Cadde Özlem Apt. No:30/C Öveçler
06450 ANKARA / TÜRKİYE

TÜRKAK tarafından yapılan denetim sonucunda TS EN ISO/IEC 17025:2012 Standardına göre Ek'te yer alan kapsamlarda akredite edilmiştir.

Akreditasyon No : AB-0237-T

Akreditasyon Tarihi : 31 Temmuz 2009

Revizyon Tarihi / No : 10 Nisan 2015 / 06

Bu Sertifika, yukarıda açık adı ve adresi yazılı Kuruluşun TS EN ISO/IEC 17025:2012 Standardına, ilgili Yönetmelik ve Tebliğlere uygunluğunu sürdürmesi halinde , **27 Kasım 2017** tarihine kadar geçerlidir.

Dr. H. İbrahim ÇETİN
Genel Sekreter

F701-040

+90 312 416 82 00 - www.turkak.org.tr

Akreditasyon Sertifikası Eki (Sayfa 1/6)

Akreditasyon Kapsamı

TÜRKAK Test TS EN ISO/IEC 17025 AB-0237-T	**SELİN ÖLÇÜM LABORATUVAR HİZMETLERİ** **Bilişim Müşavirlik İnşaat San Ve Tic A. Ş.** **Akreditasyon No: AB-0237-T** **Revizyon No: 06 Tarih: 10 Nisan 2015**
Deney Laboratuvarı	
Adresi : 1324 Cadde Özlem Apt. No:30/C Öveçler 06450 ANKARA / TÜRKİYE	**Tel** : 0 312 472 94 35 **Faks** : 0 312 481 33 01 **E-Posta** : selinlab@gmail.com **Website** : www.selinlab.com.tr

Deneyi Yapılan Malzemeler / Ürünler	Deney Adı	Deney Metodu (Ulusal, Uluslararası standardlar, işletme içi metodlar)
Gürültü	Çevresel gürültü düzeyinin tespiti/L_{Aeq}, $L_{Aeq,T}$, L_E, $L_{Aeq,T}$, L_{Ar}, L_{Aday}, L_{Aden}, $L_{evening}$, $L_{Aeq,Tn}$, L_{Aden}, L_{Ct}, L_{NT}, L_{Fmax}, L_{Cpeak}, L_{Cpeak}, R, L_{PT}	TS 9315 ISO 1996-1 ve TS 9315 ISO 1996-1/T1 TS ISO 1996-2 ve TS ISO 1996-2
Akustik	Çoklu gürültü kaynağına sahip sanayi tesislerinde yapılan ses basıncı düzeyi ölçümlerinden ses gücü düzeyinin tayini /L_P, L_P', L_{eq},T, h, ΔL_3, ΔL_1, ΔL_W, ΔL_0 , L_W	TS ISO 8297
	Gürültü kaynaklarının mühendislik metodu kullanılarak yapılan ses basıncı düzeyi ölçümlerinden ses gücü düzeyinin tayini/L_P, L_{peq},T, K_1, K_2, L`p, L``P, L_{AP}, L_W, Δ_L	TS EN ISO 3744
	Gürültü kaynaklarının gözlem metodu kullanılarak yapılan ses basıncı düzeyi ölçümlerinden ses gücü düzeyinin tayini L_P, L_{peq},T, K_1, K_2, L`p, L``P, L_{AP}, L_W , Δ_L	TS EN ISO 3746
	Yerleşim alanlarında sesin açık alanda yayılırken azaltım faktörlerinin ve çevresel gürültü düzeyinin tespiti/$\delta L(f)$,f_{ro}, f_{rN}, f_m, α, α_{Ci}, α_{bol}, α_{Vib},N, L_{AT}, L_{rT}, L_{rT} (DW) , D_C, A_{div}, A_{atm}, A_{gr}, A_{bar}, A_{misc}, L_{AT}(LT)	TS ISO 9613-1 TS ISO 9613-2
	Demiryolu ulaşım araçlarının ses gücü düzeyinin ve demiryolu gürültüsünün alansal dağılımının hesaplanması /E,LE,LE^{bs}, LE^{ss}, C_{Skim}, L_{den}, L_{day}, L_{night}, L, Es, $C_{curvature}$, $D_{intensity}$, D_{wave}, D_{topog}, D_{energy}	Hollanda ulusal hesaplama yöntemi RMR SRM II

Akreditasyon Sertifikası Eki (Sayfa 2/6)

Akreditasyon Kapsamı

SELİN ÖLÇÜM LABORATUVAR HİZMETLERİ
Bilişim Müşavirlik İnşaat San Ve Tic A. Ş.

Akreditasyon No: AB-0237-T
Revizyon No: 06 Tarih: 10 Nisan 2015

Deneyi Yapılan Malzemeler / Ürünler	Deney Adı	Deney Metodu (Ulusal, Uluslararası standardlar, işletme içi metodlar)
(Akustik Devam)	Karayolu ulaşım araçlarının ses gücü düzeyinin ve karayolu gürültünün alansal dağılımında hesaplanması/ L_{den}, L_{day}, $L_{evening}$, L_{night}, $L_{longterm}$, L_{eq}, L, Lw, A_{div}, A_{atm}, $A_{gr,f}$, $A_{at,f}$	Fransız ulusal hesaplama yöntemi NMP8 - 96 ve Fransız standardı XPS 31-133
	Yapıların akustik performansının değerlendirilmesi	TS EN 12354-4
	Yapılarda ve yapı elemanlarında ses yalıtımının ölçülmesi/R', A, L_n, L_v, L_n, W_s, D_{nT}	TS ISO 140-4
Titreşim	Madencilik faaliyetleri sonucunda oluşan hava şoku ve yer titreşiminin ölçülmesi/a,V, P_c	TS 10354
	Makine ve Ekipmanlardan Kaynaklanan Mekanik Titreşim Sonucu Oluşan Yapı Titreşiminin Ölçülmesi ve Binalara Etkilerinin Değerlendirilmesi/v_r, a,V	TS ISO 4866
	Gaz Türbini Setlerinin dönmeyen parçalarında titreşimin ölçülmesi ve değerlendirilmesi V_{rms}	ISO 10816-4
	Hidroelektrik Santrallerde Dönmeyen Parçalarda Titreşim Ölçümleriyle Makinelerin Değerlendirilmesi V_{rms}	ISO 10816-5
İSG (Gürültü)	Kişilerin maruz kaldığı gürültü düzeyinin ölçülmesi ve işitme kayıplarının tespiti L_{pA}, $E_{A,T}$, $L_{Aeq,T}$, $L_{EX,8}$, H, N, H'	TS 2607 ISO 1999
İSG (Titreşim)	Elle İletilen Titreşimin Ölçülmesi ve Değerlendirilmesi-a_{hw}, a_{hwx}, a_{hwy}, a_{hwz}, a_{hv}, a_{hv}(eşit, 8 saat), A(8), Dy,	TS EN ISO 5349-1

Akreditasyon Sertifikası Eki (Sayfa 3/6)

Akreditasyon Kapsamı

SELİN ÖLÇÜM LABORATUVAR HİZMETLERİ
Bilişim Müşavirlik İnşaat San Ve Tic A. Ş.

Akreditasyon No: AB-0237-T
Revizyon No: 06 Tarih: 10 Nisan 2015

Deneyi Yapılan Malzemeler / Ürünler	Deney Adı	Deney Metodu (Ulusal, Uluslararası standardlar, işletme içi metodlar)
(İSG (Titreşim) Devam)	Elden Vücuda İletilen Titreşimin Ölçülmesi ve Değerlendirilmesi - a_{hw}, a_{hwx}, a_{hwy}, a_{hwz}, $a_{hwtoplam}$, **A(8), Ai(8)**	TS EN ISO 5349-2
	Titreşim - Mekanik Titreşim ve Şok - Tüm Vücut Titreşime Maruz Kalma Değerlendirilmesi /**ax, ay, az**	TS ISO 2631-1
	Hareketli Makinelerde Titreşim Düzeyinin Tespiti / a_w, a_{hw}, a_{hwx}, a_{hwy}, a_{hwz}, $a_{wenbüyük}$	TS EN 1032+A1
Çalışma Ortamında Maruziyet	Kimyasal Madde Ölçümleri ve Değerlendirmesi	ASTMD 4490-96 TS EN 689
	Optik yansıma ve gravimetrik yöntem ile toz tayini	MDHS 14/3
	Aydınlatma düzeyinin tespiti/**Aydınlatma seviyesi**	COHSR-928-1-IPG-039
	Termal Konforun tespiti, çalışma şartlarının insanlar üzerindeki etkisinin belirlenmesi/ **Hava akım hızı, küresel sıcaklık, ortam sıcaklığı, bağıl nem, yaş hazne sıcaklığı ve küresel sıcaklık**	TS EN ISO 7730
	Termal Konforun tespiti ve soğuk çalışma şartlarının insanlar üzerindeki etkisinin belirlenmesi/ **Hava akım hızı, küresel sıcaklık, ortam sıcaklığı, bağıl nem, yaş hazne sıcaklığı ve küresel sıcaklık**	TS EN 27243
	İşyeri ortam havasında aktif karbon tüplerine VOC numunesinin alınması ve gaz kromotografi yöntemi ile VOC tayini /**VOC**	TS ISO 16200-1

Akreditasyon Sertifikası Eki (Sayfa 4/6)

Akreditasyon Kapsamı

SELİN ÖLÇÜM LABORATUVAR HİZMETLERİ
Bilişim Müşavirlik İnşaat San Ve Tic A. Ş.

Akreditasyon No: AB-0237-T
Revizyon No: 06 Tarih: 10 Nisan 2015

Deneyi Yapılan Malzemeler / Ürünler	Deney Adı	Deney Metodu (Ulusal, Uluslararası standardlar, işletme içi metodlar)
Bacagazı (Emisyon) (TS CEN/TS 15675 ve TS EN 15259 şartlarına uygun)	Sabit Kaynak Emisyonlarında Elektrokimyasal Hücre Metodu ile SO_2 Tayini	TS ISO 7935
	Sabit Kaynak Emisyonlarında Elektrokimyasal Hücre Metodu ile CO_2, O_2, CO	TS ISO 12039
	Sabit Kaynak Emisyonlarında Elektrokimyasal Hücre Metodu ile NO_x ($NO+NO_2$) Tayini	EPA CTM 022
	Nokta Kaynak Emisyonları - Borulardaki Gaz Akışlarının Hız Ve Debisinin Ölçülmesi	TS ISO 10780
	Baca Gazları - Destile Yakıtların Yanmasıyla Meydana -Gelen Duman Yoğunluğu (İslilik) Tayini- Bacharach Yöntemiyle	TS 9503
	Sabit Kaynak Emisyonlarında Nem İçeriğinin Tayini	EPA Metot 4
	Nem Probu ile Nem Tayini (≤ 180°C baca sıcaklığı için)	İşletme İçi Metot (Baca Sıcaklığı <180°C)
	Sabit Kaynak Emisyonları-Tanecikli Maddenin Kütle Derişiminin Elle Tayini-Referans metot	TS ISO 9096
	Sabit Kaynak Emisyonları-Tozun Düşük Aralıktaki Kütle Derişiminin Tayini-Bölüm 1: Manuel Gravimetrik Metot- Referans metot	TS EN 13284-1
	Sabit Kaynak Emisyonlarında Toz Emisyon Miktarının Tayini (Baca dışı örnekleme)	EPA Metot 5

Akreditasyon Sertifikası Eki (Sayfa 5/6)

Akreditasyon Kapsamı

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Akreditasyon No: AB-0237-T
Revizyon No: 06 Tarih: 10 Nisan 2015

Deneyi Yapılan Malzemeler / Ürünler	Deney Adı	Deney Metodu (Ulusal, Uluslararası standardlar, işletme içi metodlar)
(Bacagazı (Emisyon) (TS CEN/TS 15675 ve TS EN 15259 şartlarına uygun) Devam)	Sabit Kaynak Emisyonlarında Toz Emisyon Miktarının Tayini (Baca içi örnekleme)	EPA Metot 17
	Sabit Kaynak Emisyonlarında Toplam Flor Miktarının Tayini-SPANDS Metodu	EPA Metot 13 A
	Sabit Kaynak Emisyonları- HF örneklenmesi ve gaz halindeki florürlerin kütle konsantrasyonunun tayini- Referans metot	ISO/FDIS 15713
	Sabit Kaynak Emisyonları- HCL olarak tanımlanan gaz halindeki klorürlerin kütle konsantrasyonunun tayini- Standard Referans Yöntem	TS EN 1911
	Sabit Kaynak Emisyonları- Gaz Halindeki Münferit Organik Bileşiklerin Kütle Derişimlerinin Tayini-Aktif Karbon Ve Çözücü Desorpsiyonu Metodu	TS EN 13649
	Sabit Kaynak Emisyonları- Baca Gazlarında Düşük Derişimlerde Bulunan Gaz Halindeki Toplam Organik Karbonun Kütle Derişiminin Tayini- Alev İyonlaştırma Detektörü Kullanılan Sürekli Metot- Referans metot	TS EN 12619
Hava Kalitesi (İmisyon) Ölçümleri	Hava Kalitesi - Askıda Katı Maddenin PM10 Kesrinin Tayini	EPA 40 CFR Part 50 Appendix J ve M

Akreditasyon Sertifikası Eki (Sayfa 6/6)

Akreditasyon Kapsamı

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Revizyon No: 06 Tarih: 10 Nisan 2015

Deneyi Yapılan Malzemeler / Ürünler	Deney Adı	Deney Metodu (Ulusal, Uluslararası standardlar, işletme içi metodlar)
(Hava Kalitesi (İmisyon) Ölçümleri Devam)	Hava Kalitesi - Askıda Katı Maddenin PM10 Kesrinin Tayini - Ölçme Yöntemlerinin Referans Eşdeğerliğini Göstermek İçin Saha Deney İşlemi Ve Referans Metodu	TS EN 12341
	Hava Kirliliği Ölçme Metotları Yönlendirilebilir Çökelti Ölçme Cihazı Kurma Ve Çalıştırma Metodu- Çöken Toz Tayini	TS 2342

KAPSAM SONU

Dr. H. İbrahim ÇETİN
Genel Sekreter

APP -2 CALIBRATION CERTIFICATE

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TURKISH ACCREDITATION AGENCY
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AVL Kalibrasyon Laboratuvarı

AVL AKUSTİK VİBRASYON
KALİBRASYON LABORATUVARI
Aydınlık Ö.S.B. 1385. Sk. No: 10 OSTİM / ANKARA

AB-0089-K
2014-07-12

Kalibrasyon Sertifikası
Calibration Certificate

Cihazın Sahibi	:	SELİN ÖLÇÜM LAB. HİZM. BİL. MÜH. MÜŞ. İNŞ. SAN. VE TİC. A.Ş. Çetinemeç Bulvarı 1324. Cadde No:30/C Öveçler Dikmen / ANKARA
İstek Numarası	:	TEK-2014-315
Makine / Cihaz	:	PM10 Toz Örnekleme Cihazı
İmalatçı	:	Tecora
Tip	:	Echo PM
Seri Numarası	:	E0745160
Kalibrasyon Tarihi	:	11.7.2014
Sertifika Sayfa Sayısı	:	3

Bu kalibrasyon sertifikası, Uluslararası Birimler Sisteminde (SI) tanımlanmış birimleri realize eden ulusal ölçüm standardlarına izlenebilirliği belgeler.

Türk Akreditasyon Kurumu (TÜRKAK) kalibrasyon sertifikalarının tanınması konusunda Avrupa Akreditasyon Birliği (EA) ve Uluslararası Laboratuvar Akreditasyon Birliği (ILAC) ile karşılıklı tanınma antlaşmasını imzalamıştır.

Ölçüm sonuçları, genişletilmiş ölçüm belirsizlikleri ve kalibrasyon metodları bu sertifikanın tamamlayıcı kısmı olan takip eden sayfalarda verilmiştir.

Mühür	Tarih	Kalibrasyonu Yapan	Laboratuvar Müdürü
	11.7.2014	Veli Baydır	Younes NEVAYE SHİRAZI

Bu sertifika, laboratuvarın yazılı izni olmadan kısmen kopyalanıp çoğaltılamaz.
İmzasız ve mührüsüz sertifikalar geçersizdir.

faks: +90 312 394 15 53 tel: +90 312 394 15 50 web sitesi : www.avl.com.tr e-posta : bilgi@avl.com.tr

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AB-0059-K
2014-0712
07-2014

AVL AKUSTİK VİBRASYON
KALİBRASYON LABORATUARI

1. Cihaza Ait Bilgiler
Device to be Calibrated

Cihazın Adı *Name of the Instrument*	:	PM10 Toz Örnekleme Cihazı *PM10 Dust Sampling Device*
İmalatçısı *Manufacturer*	:	Tecora
Seri Numarası *Serial Number*	:	E0745160
Bölüntüsü *Scale Division*	:	0,001
Tipi *Type*	:	Echo PM

2. Cihazın Laboratuvara Kabul Tarihi : 11.7.2014
Date of Recipt of Device

3. Kalibrasyon Metodu
Calibration Method

Test cihazının kalibrasyonu karşılaştırma metodu ile yapılmıştır. PR.LBBR.201 prosedürü kullanılmıştır.

4. Çevresel Şartlar
Environmental Conditions

4.1. Referans Cihaz Verileri
Data From Reference Instrument

Ortam Sıcaklığı	: 23,4	± 3	°C
Bağıl Nem	: 50,3	± 25	%
Ortam Basıncı	: 904	± 1	hPa

4.2. Test Edilen Cihaz Verileri
Data From Instrument Under Test

Ortam Sıcaklığı *Ambient Temperature*	: 24,53	°C
Ortam Basıncı *Ambient Pressure*	: 903,38	hPa

4.3. Test Edilen Cihazın	**Hata Miktarı**		**Belirsizlik**	
Ortam Sıcaklığı	: 1,13	°C	± 0,3	°C
Ortam Basıncı	: -0,62	hPa	± 1	hPa

5. Kalibrasyonda Kullanılan Referans Cihazlar

Reference Equipments Used During Calibration

Cihaz *Device*	İmalatçı *Manufacturer*	Seri No *Serial No*	Tipi *Type*	Sertifika No *Certificate No*	İzlenebilirlik *Traceability*
Akış Kalibratörü	Sierra	132548	SL-500-44	12861	SIERRA
Termo - Hygrometre	KIMO	7122852	KH100	4.02209	UMS

6. Kalibrasyon Sonuçları

Calibration Results

Standart Şartlarda Ölçülen Debi *Measured Flow In Standart Conditions*		Akış Sapması *Flow Deviation*		Ölçüm Belirsizliği *Calibration Uncertainty*	
Referans Cihaz *Reference Instrument*	Test Edilen Cihaz *Instruments Under Test*	Hata *Deviation*	Bağıl % *Relative %*	Belirsizlik *Uncertainty*	Bağıl % *Relative %*
7,0582	7,054	-0,0042	-0,0595	0,04	0,58
14,1226	14,120	-0,0026	-0,0184	0,08	0,57
17,7474	17,742	-0,0054	-0,0304	0,10	0,57
22,0778	22,073	-0,0048	-0,0217	0,13	0,57
30,9513	30,793	-0,1583	-0,5114	0,18	0,57

Kalibrasyonla İlgili Notlar

Notes About Calibration

Ölçüm sonuçları LPM (litre/dakika) birimi kullanılarak verilmiştir.

Test results are calculated using LPM (liter/minute) unit.

Standart şartlar 20 °C ve 1013,25 mBar 'dır.

Standard conditions are 20 °C and 1013,25 mBar.

7. Uygunluk Beyanı

Statement of Conformance

Ölçüm sonuçları ve ölçüm belirsizliği yukarıda verilmiştir. Kullanıcı bunları dikkate alarak uygunluğuna karar vermelidir. Beyan edilen genişletilmiş belirsizlik değeri standart belirsizliğin normal dağılımı için; yaklaşık % 95 güvenirlik seviyesini sağlayan k=2 kapsam faktörü ile çarpımının sonucudur. Standart ölçüm belirsizliği GUM ve EA-4/02 dokümanlarına uygun olarak belirlenmiştir. Ölçüm sonuçları, genişletilmiş ölçüm belirsizlikleri ve kalibrasyon metotları bu sertifikanın tamamlayıcı bir bölümüdür.

8. Açıklamalar

Remarks

Bu sertifikada bulunan sonuçlar cihazın kalibrasyon tarihindeki durumu kapsar ve uzun dönem kararlığı hakkında bir öngörü içermez.

Selin Lab

www.selinlab.com.tr

SELİN ÖLÇÜM LABORATUVAR HİZMETLERİ BİLİŞİM MÜH.MÜŞ. İNŞ. SAN. VE TİC. A.Ş.

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სსიპ „ლაბორატორიული კვლევითი ცენტრი"
Georgia. The Ministry of Agriculture of Adjarias Authonomical Republic.
LEPL „Laboratory Research Centre"

აკრედიტაციის მოწმობა accreditation certificate - GAC-TL-0030
17.12.13წ-28.11.17წ

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გამოცდის ოქმი № 1681

ნიმუშის საიდენტიფიკაციო კოდი: 60-6-1,5-02-15 04.06.15

დამკვეთი - შ.პ.ს. „ AGE BATUM"-ი,ბათუმი გოგებაშვილის ქ. №60

გამოსაკვლევი ნიმუშის დახასიათება - ჩამდინარე წყალი 1,5 ლ პეტის ბოთლით .

ნიმუშის აღების ადგილი, თარიღი/დრო – №1.სხალთის გვირაბის გამდინარე წყალი. 02.06.15

ნიმუშის ლაბორატორიაში შემოსვლის თარიღი და დრო - 02.06.15 14:40

გამოცდის დაწყების/დამთავრების დრო - 03.06.15 - 04.06.15

გამოკვლევის მიზანი - შეწონილი ნაწილაკები

ქიმიური კვლევა

№	მაჩვენებლები	ანალიზის შედეგი	მეთოდის დასახელება
1	შეწონილი ნაწილაკები	40 მგ/ლ	№268-1.3-0755- 08 1990 წ ა.პ.შიცკოვას კრებული გვ.26 3.2

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საგამოცდო ლაბორატორიის უფროსი: ე.ანტონიშვილი

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Georgia. The Ministry of Agriculture of Adjarias Authonomical Republic,
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ნიმუშის საიდენტიფიკაციო კოდი: 60-6-1,5-02-15 04.06.15

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ნიმუშის აღების ადგილი თარიღი/დრო – №2 ჩირუხის წყალი გვ. ჩამ. წყ. 02.06.15

ნიმუშის ლაბორატორიაში შემოსვლის თარიღი და დრო - 02.06.15 14:40

გამოცდის დაწყების/დამთავრების დრო - 03.06.15 - 04.06.15

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ქიმიური კვლევა

№	მაჩვენებლები	ანალიზის შედეგი	მეთოდის დასახელება
1	შეწონილი ნაწილაკები	20 მგ/ლ	№268-1.3-0755-08 1990წ ა.პ.შიცკოვას კრებული გვ.26 ა.2

პასუხისმგებელი შემსრულებელი მთავარი ქიმიკოსი: ნ. ღაჭავა

საგამოცდო ლაბორატორიის უფროსი: ე.ანტონიშვილი

საქართველო აჭარის ავტონომიური რესპუბლიკის სოფლის მეურნეობის სამინისტრო
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გამოცდის ოქმი № 1683

ნიმუშის საიდენტიფიკაციო კოდი: 60-6-1,5-02-15 04.06.15

დამკვეთი - შ.პ.ს. „ AGE BATUM-ი ", გოგებაშვილის ქ. №60

გამოსაკვლევი ნიმუშის დახასიათება - ჩამდინარე წყალი 1,5 ლ პეტის ბოთლით .

ნიმუშის აღების ადგილი თარიღი/დრო – №3 სხალთის გვ.გამდ. წყ. 02.06.15

ნიმუშის ლაბორატორიაში შემოსვლის თარიღი და დრო - 02.06.15 14:40

გამოცდის დაწყების/დამთავრების დრო - 03.06.15 - 04.06.15

გამოკვლევის მიზანი - შეწონილი ნაწილაკები

ქიმიური კვლევა

№	მაჩვენებლები	ანალიზის შედეგი	მეთოდის დასახელება
1	შეწონილი ნაწილაკები	20 მგ/ლ	№268-1.3-0755- 08 1990 წ ა.პ.შიცკოვას კრებული გვ.26 პ.2

პასუხისმგებელი შემსრულებელი მთავარი ქიმიკოსი: ნ. ღაჭავა

საგამოცდო ლაბორატორიის უფროსი: ქ. ანტონიშვილი

საქართველო აჭარის ავტონომიური რესპუბლიკის სოფლის მეურნეობის სამინისტრო
სსიპ „ლაბორატორიული კვლევითი ცენტრი"
Georgia. The Ministry of Agriculture of Adjarias Authonomical Republic.
LEPL „Laboratory Research Centre"

აკრედიტაციის მოწმობა **accreditation certificate - GAC-TL-0030**
17.12.13წ-28.11.17წ

ქ.ბათუმი. სამება ტელ: 25 13 68 591958084
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გამოცდის ოქმი 1684

ნიმუშის საიდენტიფიკაციო კოდი: 60-6-1,5-02-15 04.06.15

დამკვეთი - შ.პ.ს. „ AGE BATUM"-ი. გოგებაშვილის ქ.№60

გამოსაკვლევი ნიმუშის დახასიათება - ჩამდინარე წყალი 1,5 ლ პეტის ბოთლით.

ნიმუშის აღების ადგილი თარიღი/დრო – №4 ახალდაბის გვ. გამ. წყალი 02.06.15

ნიმუშის ლაბორატორიაში შემოსვლის თარიღი და დრო - 02.06.15 14:40

გამოცდის დაწყების/დამთავრების დრო - 03.06.15 - 04.06.15

გამოკვლევის მიზანი - შეწონილი ნაწილაკები

ქიმიური კვლევა

№	მაჩვენებლები	ანალიზის შედეგი	მეთოდის დასახელება
1	შეწონილი ნაწილაკები	40 მგ/ლ	№268-1.3-0755- 08 1990 წ ა.ა.შიცკოვას კრებული გვ.26 3.2

შემსრულებელი მთავარი ქიმიკოსი: ნ. დაჭავა

საგამოცდო ლაბორატორიის უფროსი: ე. ანტონიშვილი

საქართველო აჭარის ავტონომიური რესპუბლიკის სოფლის მეურნეობის სამინისტრო
სსიპ „ლაბორატორიული კვლევითი ცენტრი"
Georgia. The Ministry of Agriculture of Adjarias Authonomical Republic,
LEPL „Laboratory Research Centre"

აკრედიტაციის მოწმობა **accreditation certificate - GAC-TL-0030**
17.12.13წ-28.11.17წ

ქ.ბათუმი. სამება ტელ: 25 13 68 591958084
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გამოცდის ოქმი 1685

ნიმუშის საიდენტიფიკაციო კოდი: 60-7-1,5-02-15 04.06.15

დამკვეთი - შ.პ.ს. „ AGE BATUM"-ი. გოგებაშვილის ქ.№60

გამოსაკვლევი ნიმუშის დახასიათება - ჩამდინარე წყალი 1,5 ლ პეტის ბოთლით.

ნიმუშის აღების ადგილი თარიღი/დრო – №5 ჩანჩალოს გვ. გამ. წყ. 02.06.15

ნიმუშის ლაბორატორიაში შემოსვლის თარიღი და დრო - 02.06.15 14:40

გამოცდის დაწყების/დამთავრების დრო - 03.06.15 - 04.06.15

გამოკვლევის მიზანი - შეწონილი ნაწილაკები

ქიმიური კვლევა

№	მაჩვენებლები	ანალიზის შედეგი	მეთოდის დასახელება
1	შეწონილი ნაწილაკები	20 მგ/ლ	№268-1.3-0755-08 1990 წ ა.პ.შიცკოვას კრებული გვ.26 3.2

შემსრულებელი მთავარი ქიმიკოსი: ნ. დაჭავა

საგამოცდო ლაბორატორიის უფროსი: ე. ანტონიშვილი

საქართველო აჭარის ავტონომიური რესპუბლიკის სოფლის მეურნეობის სამინისტრო
სსიპ „ლაბორატორიული კვლევითი ცენტრი"
Georgia. The Ministry of Agriculture of Adjarias Authonomical Republic,
LEPL „Laboratory Research Centre"

აკრედიტაციის მოწმობა **accreditation certificate - GAC-TL-0030**
17.12.13წ-28.11.17წ

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გამოცდის ოქმი 1686

ნიმუშის საიდენტიფიკაციო კოდი: 60-7-1,5-02-15 04.06.15

დამკვეთი - შ.პ.ს. „ AGE BATUM"-ი. გოგებაშვილის ქ.№60

გამოსაკვლევი ნიმუშის დახასიათება - ჩამდინარე წყალი 1,5 ლ პეტის ბოთლით,

ნიმუშის აღების ადგილი თარიღი/დრო – №6 ვაშლოვანის გვ. ჩამდ. წყ 02.06.15

ნიმუშის ლაბორატორიაში შემოსვლის თარიღი და დრო - 02.06.15 14:40

გამოცდის დაწყების/დამთავრების დრო - 03.06.15 - 04.06.15

გამოკვლევის მიზანი - შეწონილი ნაწილაკები

ქიმიური კვლევა

№	მაჩვენებლები	ანალიზის შედეგი	მეთოდის დასახელება
1	შეწონილი ნაწილაკები	20 მგ/ლ	№268-1,3-0755- 08 1990 წ ა.პ.შიცკოვას კრებული გვ.26 პ.2

შემსრულებელი მთავარი ქიმიკოსი: ნ. ღაჭავა

საგამოცდო ლაბორატორიის უფროსი: ე. ანტონიშვილი

საქართველო აჭარის ავტონომიური რესპუბლიკის სოფლის მეურნეობის სამინისტრო
სსიპ „ლაბორატორიული კვლევითი ცენტრი"
Georgia. The Ministry of Agriculture of Adjarias Authonomical Republic,
LEPL „Laboratory Research Centre"

აკრედიტაციის მოწმობა accreditation certificate - GAC-TL-0030
17.12.13წ-28.11.17წ
ქ.ბათუმი. სამება ტელ: 25 13 68 591958084
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გამოცდის ოქმი 1687

ნიმუშის საიდენტიფიკაციო კოდი: 60-7-1,5-02-15 04. 06.15

დამკვეთი - შ.პ.ს. „ AGE BATUM"-ი. გოგებაშვილის ქ.№60

გამოსაკვლევი ნიმუშის დახასიათება - ჩამდინარე წყალი 1,5 ლ პეტის ბოთლით.

ნიმუშის აღების ადგილი თარიღი/დრო – №7 ჩიხურის წყალი გვ. გამ. წყ. 02.06.15

ნიმუშის ლაბორატორიაში შემოსვლის თარიღი და დრო - 02.06.15 14:40

გამოცდის დაწყების/დამთავრების დრო - 03.06.15 - 04.06.15

გამოკვლევის მიზანი - შეწონილი ნაწილაკები

ქიმიური კვლევა

№	მაჩვენებლები	ანალიზის შედეგი	მეთოდის დასახელება
1	შეწონილი ნაწილაკები	20 მგ/ლ	№268-1.3-0755- 08 1990 წ ა.პ.შიცკოვას კრებული გვ.26 პ.2

შემსრულებელი მთავარი ქიმიკოსი: ნ. დაჭავა

საგამოცდო ლაბორატორიის უფროსი: ე. ანტონიშვილი

საქართველო აჭარის ავტონომიური რესპუბლიკის სოფლის მეურნეობის სამინისტრო
სსიპ „ლაბორატორიული კვლევითი ცენტრი"
Georgia. The Ministry of Agriculture of Adjarias Authonomical Republic,
LEPL „Laboratory Research Centre"

აკრედიტაციის მოწმობა **accreditation certificate - GAC-TL-0030**
17.12.13წ-28.11.17წ

ქ.ბათუმი. სამება ტელ: 25 13 68 591958084
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გამოცდის ოქმი 1688

ნიმუშის საიდენტიფიკაციო კოდი: 60-7-1,5-02-15 04. 06.15

დამკვეთი - შ.პ.ს. „ AGE BATUM"-ი. გოგებაშვილის ქ.№60

გამოსაკვლევი ნიმუშის დახასიათება - ჩამდინარე წყალი 1,5 ლ პეტის ბოთლით.

ნიმუშის აღების ადგილი თარიღი/დრო – №8 დიაკონიძეების გვ. ჩამ. წყ. 02.06.15

ნიმუშის ლაბორატორიაში შემოსვლის თარიღი და დრო - 02.06.15 14:40

გამოცდის დაწყების/დამთავრების დრო - 03.06.15 - 04.06.15

გამოკვლევის მიზანი - შეწონილი ნაწილაკები

ქიმიური კვლევა

№	მაჩვენებლები	ანალიზის შედეგი	მეთოდის დასახელება
1	შეწონილი ნაწილაკები	40 მგ/ლ	№268-1.3-0755- 08 1990წ ა.პ.შიცკოვას კრებული გვ.26 პ.2

შემსრულებელი მთავარი ქიმიკოსი: ნ. ღაჭავა

საგამოცდო ლაბორატორიის უფროსი: ე. ანტონიშვილი