



Prepared for:



**Ministry of Energy of the
Republic of Georgia**

May 2009

NON-TECHNICAL SUMMARY

ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT OF THE BLACK SEA REGIONAL TRANSMISSION PROJECT

Prepared by:



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FOREWORD

This document provides a Non-Technical Summary (NTS) of the Environmental and Social Impact Assessment Report (ESIA) of the Black Sea Regional Power Transmission Project in the Republic of Georgia. The document describes in a non-technical manner the proposed project and presents major findings of the ESIA. The document provides a summary of environmental and socioeconomic conditions and of the how the project could affect the environment and people. In addition, the NTS describes what actions have to be taken to reduce the effects on the environment or people.

This NTS is part of the larger package of documents, including the ESIA and the Public Consultation and Disclosure Plan (PCDP). The ESIA, PCDP and NTS will be publicly available in English and Georgian after May 10th for a 60-day public comment period. The ESIA and other documents are available on the Internet at www.minenergy.gov.ge, www.gse.com.ge, aarhus@dsl.ge, www.cenn.org, www.rec-caucasus.org, and www.ebrd.com. The ESIA may be reviewed at the following places:

- Energotrans Ltd, Ministry of Energy Building: Tbilisi, Baratashvili street No 2.
- Ministry of Energy of Georgia: Tbilisi, Baratashvili street No2.
- Georgian State Electrosystem, Kutaisi Branch: Kutaisi, Avtomshenebelis Street No 2a
- Scientific Research Firm GAMMA Ltd: Tbilisi, Merab Alexidze Street No9.
- Aarhus centre Tbilisi office: Tbilisi, 6 Gulua Street.
- Environmental information centre in Marneuli: Marneuli city, Leselidze street No1
- Environmental information centre in Gardabani : Gardabani city, David Agmashenebelis Avenue No127
- Visitor's centre of Borjomi-Kharagauli National Park, Borjomi city, Meskheta street No23
- Samtskhe-Javakheti Regional Department of the Ministry of Environment Protection and Natural Resources: Akhaltsikhe City, Didimamishvili Street 2a.

Copies of the NTS may be requested from the following person through 24th June during normal business hours (09:00 to 18:00M):

Ministry of Energy of Georgia
Marita Arabidze
Chief Specialist
Baratashvili Str.2, Tbilisi
+ 995 22 35 78 22 (office), +995 93 72 85 95 (mobile)
email: marita.arabidze@minenergy.gov.ge

Written comments on the project and on the draft ESIA may be submitted to Ms. Arabidze until 18:00 on 24th June. Comments can also be made at public hearings at these locations:

29 th June, 14:00	Marneuli city	Local Authority Building: 73 Rustaveli Street
30 th June, 14:00	Borjomi city	Visitor's center of Borjomi-Kharagauli National Park: Meskheta Street;
1st July, 14:00	Akhaltsikhe City	Local Authority building: 18, Kostava Street
2nd July, 14:00	Tbilisi City	Ministry of Energy building: Baratashvili street No. 2

All comments on the draft ESIA will be considered in developing the final ESIA, and in the final decisions made by the Ministry of Energy and the international financial institutions identified in the Introduction below. Further information may be obtained from the Ministry of Energy of Georgia at the address above.

INTRODUCTION AND BACKGROUND

The Republic of Georgia intends to expand and upgrade the country's electricity grid. One part of this program will be to complete a high-voltage transmission line across southern Georgia. The line will connect Gardabani to Zestaphoni via Akhaltsikhe, and a new line will run from near Akhaltsikhe to the Turkish border. In addition, the project will expand electrical substations near Gardabani and Zestaphoni and construct a new substation near Akhaltsikhe. (Figure 1)

The Ministry of Energy has approached the European Bank for Reconstruction and Development (EBRD) and other lenders for financing, possibly including the European Investment Bank and Kreditanstalt für Wiederaufbau. Under Georgian law, an Environmental Impact Assessment has to evaluate how the project could affect the environment. In addition, the lenders require an Environmental and Social Impact Assessment (ESIA) that meets their own guidelines. This NTS summarizes the draft ESIA that was prepared to meet Georgian law and EBRD guidelines.

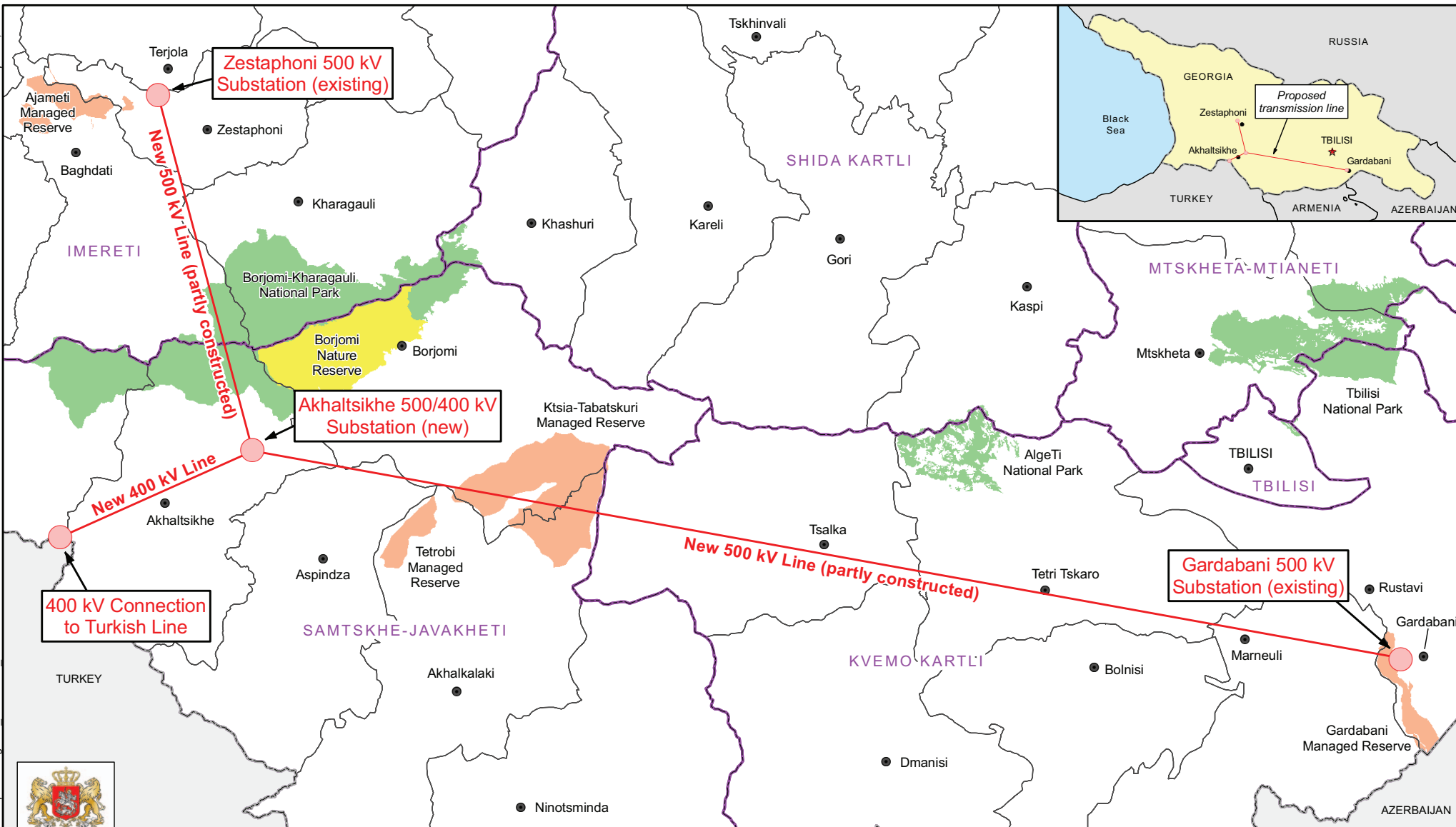
PURPOSE AND NEED FOR THE PROJECT

At present, electric power is generated in Georgia from hydropower and from burning fossil fuels. Georgia's energy strategy calls for 100 percent of power to come from hydropower and for Georgia to export power to regional allies, including Turkey. In addition, Georgia can become an important part of a regional electric power grid that would include Azerbaijan, Turkey, and other countries. As part of the grid, Georgia could take electricity from Azerbaijan and send it to Turkey.

In the 1980s and early 1990s, another line connecting Gardabani and Zestaphoni was designed and partly constructed, this one far south of the existing line. Over half of the foundations and towers for the new line were constructed between 1989 and 1992, when the project was abandoned. The Ministry of Energy now proposes to complete this line, and to extend it to the Turkish border. The reasons for the project include:

- **Energy security.** At present, Georgia has one 500 kilovolt (kV) transmission line that runs east to west, connecting Gardabani in the east to Ksani (northeast of Tbilisi) to Zestaphoni in the west. By constructing another line in the south, this would reduce reliance on a single line.
- **Balance energy demand** in Georgia. Most electricity is generated in northwest Georgia, while two-thirds of demand is in the east, and most export demand is in countries south of Georgia. This line would allow power to be balanced between supply and demand.
- **Increase energy reliability.** Any fault on the existing 500 kV line, especially in autumn and winter, causes power deficits in the east that often lead to total system blackouts. Another line would reduce deficits and blackouts.
- **Increase exports.** Turkey has unmet demand for power, and Georgia power could help fill this need and benefit Georgia's finances.
- **Strengthen regional power grid.** Joining the grid to Turkey, and allowing Azerbaijan electricity to transit Georgia on the way to Turkey, would strengthen ties with major allies.

The Project Execution Agency for the project is the Georgia State Electrosystem (GSE). GSE, through its daughter company EnergoTrans, will be responsible for designing and constructing the line together with the Technical Consultant hired through international tender. EnergoTrans already owns the existing line and will own the entire new line.



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0 5 10 15 20
Kilometers
WGS 1984 UTM Zone 38N

- District Capital
- Regions
- Districts

- National Protected Areas**
- National Park
 - Managed Reserve
 - Strict Nature Reserve

Black Sea Regional Transmission Project
Project Overview

Figure 1

SCOPE OF THE ESIA

This Environmental and Social Impact Assessment evaluates the following project components:

- Rehabilitation and reconstruction of about foundations and/or towers that have deteriorated or been damaged along the 260-kilometer route from Gardabani to Zestaphoni.
- Construction of foundations and towers for sections of the line that were not built on the Gardabani to Zestaphoni route and on the 30-kilometer route from Alkaltsikhe to the Turkish border.
- Conductoring (that is, placing wires is to conduct electricity) the entire line.
- Slight expansions of existing 500kV substations near Gardabani and Zestaphoni.
- Construction of a new 500/400/220kV substation near Akhaltsikhe

In the future, additional lines may be constructed from Azerbaijan to connect to the substation at Gardabani, and from the Georgia border to a substation near Borchka, Turkey. Environmental impacts from construction and operation of these lines would be covered in future impact assessments.

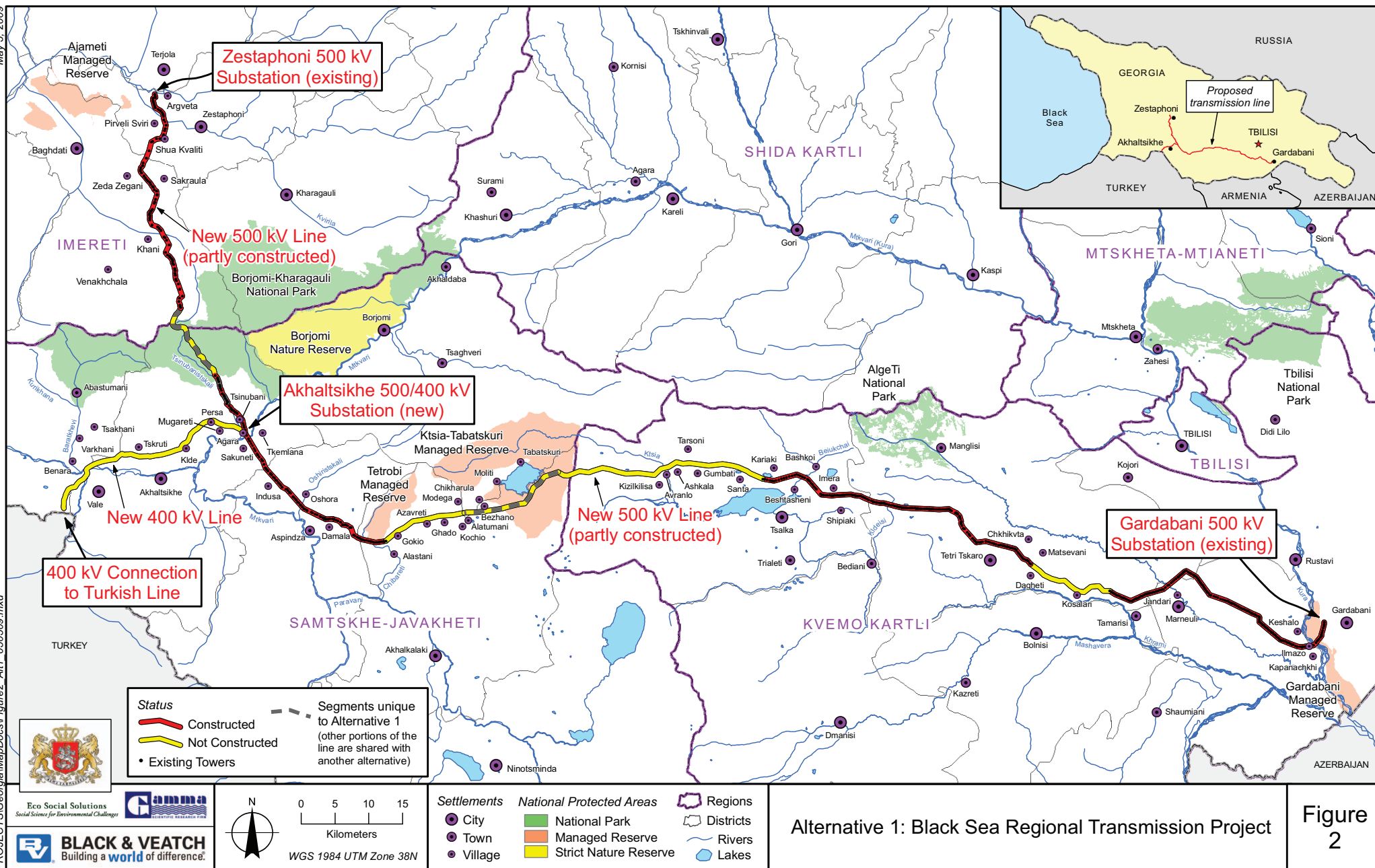
In keeping with Georgian law and EBRD requirements, the overall scope of the ESIA includes the following:

- Scoping and identification of key environmental and socioeconomic issues.
- Description of existing environmental and socioeconomic conditions.
- Evaluation of the potential impacts the project could have, positive and negative.
- Consultation with people who may be affected by the project and with other stakeholders to inform them, identify their concerns, and receive information.
- Development of design and operating practices that will avoid, reduce, or compensate for significant environmental and social impacts.
- Development of monitoring programs to verify the project is constructed and operated as intended, and to identify changes in environmental controls that may be needed.

THE PROPOSED TRANSMISSION LINE AND ALTERNATIVES

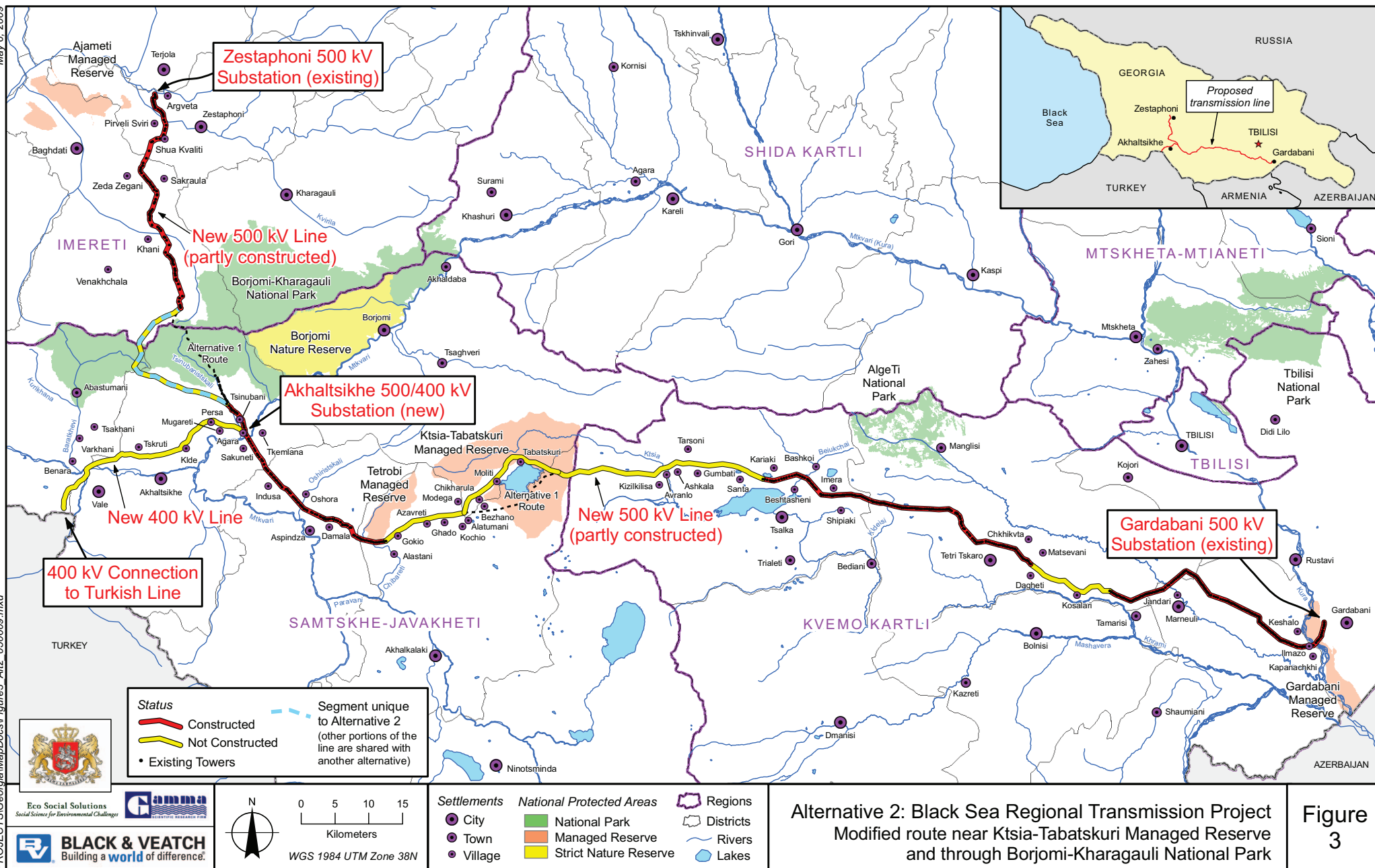
Four alternatives for power line construction have been considered:

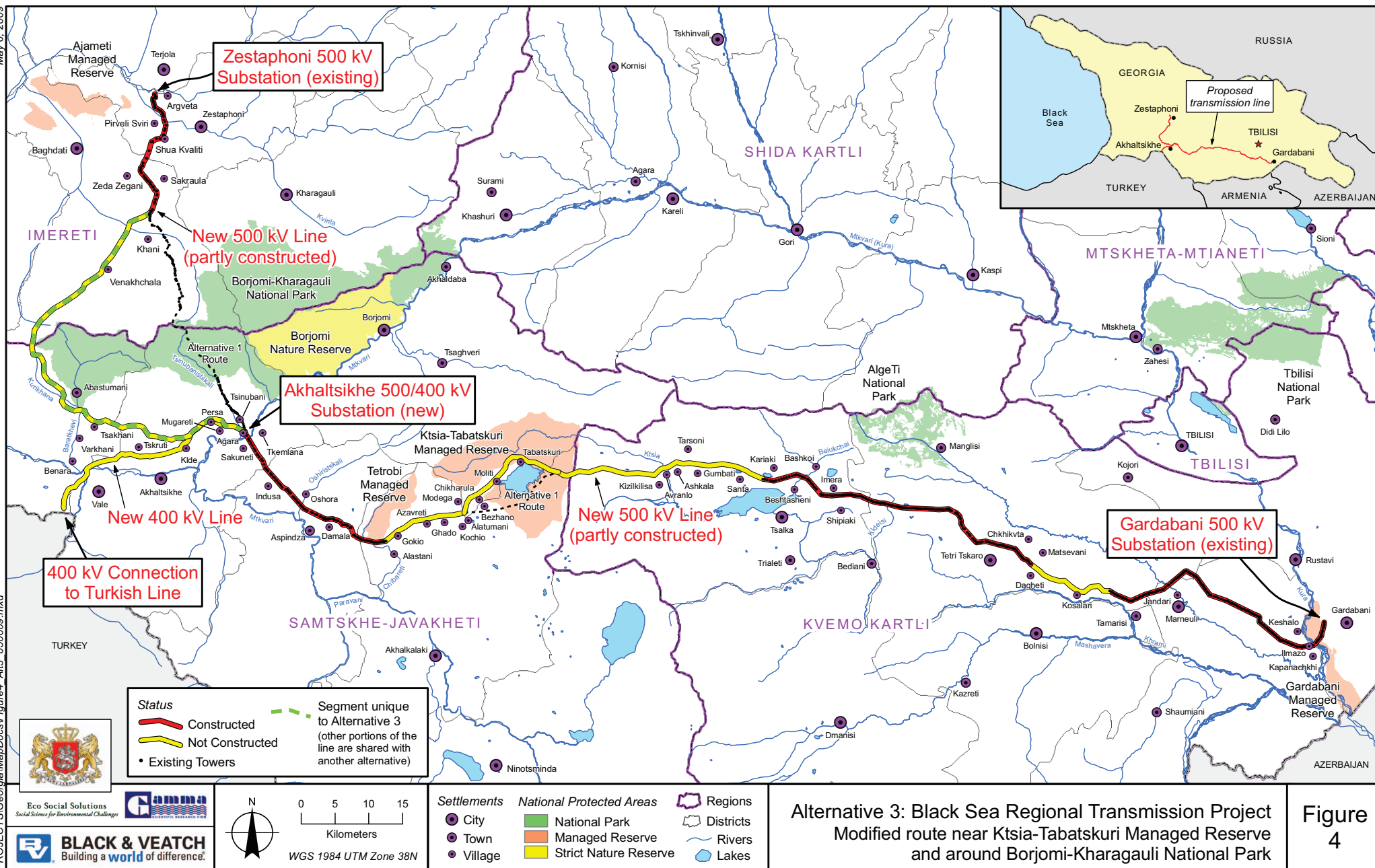
- Alternative 1: completion of the 500kV line as proposed in the late 1980s and partly constructed through 1992, plus a new substation at Alkaltsikhe and a new 400kV line to the Turkish border. **(Figure 2)** Construction would begin in 2010 and last through 2012.
- Alternative 2: the same as Alternative 1 except a modified route that passes north of Ktsia-Tabatskuri Managed Reserve and that takes a shorter route across Borjomi-Kharagauli National Park. **(Figure 3)**
- Alternative 3: the same as Alternative 1 except a modified route that passes north of Ktsia-Tabatskuri Managed Reserve and goes around Borjomi-Kharagauli National Park without crossing the park. **(Figure 4)**
- Alternative 4: No action. The line would not be completed. The towers that were built before 1992 would be left as they are.



Alternative 1: Black Sea Regional Transmission Project

Figure 2





Highlights of each alternative are shown in Table 1. As can be seen, the shortest route is Alternative 1, the longest is Alternative 3. The fewest new towers would be needed under Alternative 1, so this alternative would require less construction than the others. Alternative 2 was designed to reduce the effect on visitors to Ktsia-Tabatskuri Managed Reserve and to make the crossing of Borjomi-Kharagauli National Park as short as possible. Alternative 3 was designed so there would be no crossing of the park, although this would require an additional 60 kilometers of new transmission line. .

Table 1. Corridor Lengths and Tower Status for All Alternatives (all distances in kilometers)				
	<i>Alternative</i>			
	<i>1</i>	<i>2</i>	<i>3</i>	<i>4</i>
Total length of line	283.1	294.3	315.2	0
Total constructed length	161.4	156.6	135	161.4
Total length not constructed	121.7	137.7	180.2	0
Number of constructed towers used	554	514	366	554
Number of towers to be abandoned	0	40	188	554
Number of new towers needed	304	344	451	0
Length of Ktsia-Tabatskuri crossing	12.1	10	10	0
Length of Borjomi-Kharagauli crossing	11.5	4.7	0	0
Length of Gardabani crossing	3.1	3.1	3.1	3.1
Size of new Akhaltsikhe substation (hectares)	6	6	6	0

Project design and execution will be based on international standards as well as Georgia norms and standards. The existing substations at Zestaphoni and Gardabani will be extended slightly to accommodate the new 500kV circuits at each location. This will require minimal additional land space since most of the new equipment will be installed within the existing substations.

LEGAL FRAMEWORK

Project planning and execution will be guided by Georgian national legal requirement and laws and international requirements, policies and performance standards. Environmental considerations for the project will primarily be guided by the following key laws:

- *Law of Georgia on Protection of Environment* (enacted 1996, amended 2000, 2003, 2007).
- *Law of Georgia on Environmental Impact Permit* (adopted October 15, 1996, replaced by the law adopted in 2007).
- *Law of Georgia on Ecological Examination* (adopted on October 18, 1996, replaced by the law adopted in 2007).
- *Law of Georgia on Licenses and Permits* (adopted 23 June, 2005) and subordinate legislation.

The project will also be subject to many other environmental laws, including laws for protected areas, pollution control, protection of animals and plants, and for labor relations and employee protection. Section 3.1 of the ESIA gives a full listing. The project will also be subject to standards and practices for EBRD and other International Financial Institutions, including EIB and KfW. These are identified in section 3.2.1 of the ESIA.

Finally, many international treaties and standards will also apply to the project, including conventions on biodiversity, climate change, protection of migrating and rare birds and animals, protection of cultural resources, public consultation and information sharing, and protection of wetlands, and others shown in section 3.2.2 of the full ESIA.

PROJECT ACTIVITIES THAT COULD AFFECT THE ENVIRONMENT AND PEOPLE

The project will involve a variety of activities, many of which could affect environmental resources and people if they are not carefully designed and implemented. The activities that could cause the most important effects include:

- Construction of a corridor 100 meters wide for new sections of the right-of-way. As shown in Table 1, this would be necessary for 121.7 kilometers under Alternative 1, increasing to 180.2 kilometers for Alternative 3. In forested areas, trees would be cut so they could not touch the line or fall on the line. Construction would require clearing an area for vehicles and equipment to use in installing concrete and steel foundations and constructing the towers, which will be about 35 meter tall. **Figure 5** shows the types of towers that will be used.
- Repairs or reconstruction of many of the 554 existing towers. This could range from minor repairs to complete reconstruction.
- Clearing and maintenance of 4.5-meter-wide roads for vehicles and equipment to drive to tower locations. Roads will not be paved or covered in gravel. Instead, vehicles will travel across unimproved ground. In some steep areas, helicopters may be used so that heavy equipment does not have to carry towers to where they will be raised.
- Conductoring (placing wires between towers) the entire line. This would involve unrolling conductor wire from truck-mounted equipment and raising it to towers. When heavy equipment cannot cross some steep or rugged terrain, helicopters may be used for conductoring.
- Maintenance of the 100-meter-wide transmission line corridor. This would involve clearing or cutting back vegetation every few years and cutting trees every 10-25 years. It would also involve more frequent access, perhaps every 5-10 years, for detailed inspections.
- Construction and maintenance of a new substation. The new substation would require land-clearing, possibly blasting, and construction of buildings and installation of equipment. Expansion of two existing substations would require small extensions to existing facilities.

ENVIRONMENTAL AND SOCIOECONOMIC EFFECTS AND REQUIRED MITIGATION

Chapter 4 of the ESIA described the current conditions of water, land use, animals, plants, people and all other environmental and socioeconomic resources that the project could change. Chapter 5 then describes how the project would affect these resources, including the people.

Table 2 shows the resources examined in the ESIA.



H-Frame 2-point contact steel lattice tower. Used primarily for in-line conductors.



Single 4-point contact steel lattice tower. Used primarily for in-line conductors



H-Frame 2-point contact tower. Used primarily for in-line conductors.



Triple 4-point contact steel lattice towers. Used primarily for direction changes and high conductor stress situations.



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Types of Towers
Black Sea Regional Transmission Project

Figure
5

Table 2. Resources examined in the ESIA	
<i>Environmental</i>	<i>Socioeconomic</i>
• Air	• Demographics, including population and income
• Surface water and groundwater	• Infrastructure, including roads and power supply
• Land use	• Economic conditions
• Earthquakes, mudflows, and other geohazards	• Health, especially potential effects caused by exposure to electromagnetic fields near transmission line
• Geology and soils	• Worker and public health and safety
• Plants, including rare plants and habitat	• Cultural resources
• Animals and birds, including rare animals and birds and their habitat, and migrating birds	• Tourism

When the ESIA found that the project could cause moderate or major impacts, then actions or procedures were developed to avoid, reduce, or otherwise mitigate the effects and reduce their significance. The biggest potential impacts are described here. The things that will be done to protect people, property, and natural resources from being damaged are also summarized (these are called “mitigation measures”).

Health. There should be no effects on health to any person. Electromagnetic fields have been reported to cause leukemia or other diseases, although most scientists do not agree. Georgia and other Soviet states have the most stringent requirements in the world, and those will be followed for this project. That will prevent anyone from having any risks to their health. All people who live within 30 meters of the line will be moved to another house at least as good as the current one, or compensated at fair market value. People who work under the lines for short periods will have no effects at all. Also, EnergoTrans will measure the electromagnetic field in every building within 100 meters and if levels of energy are higher than is allowed, they will make the building safe by placing shields to keep the energy levels low.

Damage to land and crops. Crops and animals will not be hurt by the electricity in the wires. Anyone who owns land that the towers will be located on will be able to receive compensation for the loss of the land used by the towers. Although machines cannot be used under the towers, animals can graze and people can have hand-grown gardens right under the towers. Only the land under the small foundations (from 2 to 12 2m x 2m concrete foundations per towers). If crops are damaged or animals injured during construction or operation, the farmer will be compensated at a fair market value.

Safety. It is possible that a tower or wires could fall down in case of earthquake or very high winds. This should be very rare. However, this could hurt people or animals if they touch live wires, and a falling tower could harm people or animals if they are close enough to be hit. Every community will be told what to do in case of falling towers or wires before the line is placed in operation. Any animals that are hurt

Noise. Although the lines will produce a low buzzing sound that can be heard right under the lines and for a short distance to the sides, no one should be able to hear the sound after more than 10-20 meters.

Danger to rare plants and habitat. The transmission line will pass through Borjomi-Kharagauli National Park, the Ktsia-Tabatskuri Managed Reserve, the Gardabani

Managed Reserve, and other areas that have rare plants. The danger is that rare plants will be destroyed, or that the places they live will be damaged. Before the line is built, experts will survey the entire route to identify rare plants and their habitats that could be harmed. Then, ways to prevent or reduce the harm will be developed and implemented. Depending on which was best, these could include changing the route, changing where people will work or drive, collecting seeds or plants that can be used to restore the site when construction is complete, or other measures. If land where rare plants live is harmed by construction, it will be restored after construction is complete.

Danger to rare animals. The transmission line will pass through several areas where rare animals live. These include Borjomi-Kharagauli National Park, the Ktsia-Tabatskuri Managed Reserve, the Gardabani Managed Reserve, and other areas identified in the ESIA. The biggest danger is when construction will be during spring and summer when animals are raising their young, and also when construction will damage the places where rare animals live. Before the line is built, experts will survey the entire route to identify rare animals that live near the line, and their habitats. Then, ways to prevent or reduce the harm will be developed and implemented. Depending on which is found to be best, these could include changing the route, scheduling construction to before or after breeding season, changing where people will work or drive, or other measures. If land where rare animals live is harmed by construction, it will be restored after construction is complete.

Danger to birds and bats. Rare birds and bats could be hurt or killed when they hit towers or lines while migrating in spring and autumn or when flying near the line, and large birds such as hawks, eagles, vultures, and cranes could be electrocuted when they try to land on towers or wires. “Bird diverters”, which are shiny pieces of metal or plastic that spin, can be placed on wires so birds that migrate or fly near them in daytime can see and avoid the wires. Steps to reduce electrocution include placing wires far enough apart that a birds’ wings cannot touch two wires at once, and modifying tower designs to protect against electrocution. Other measures can be taken based on international guidance.

In addition, construction or other activities near the places where rare birds are nesting can cause adults to abandon their young or affect their ability to raise the young. Anytime construction is planned for spring and early summer, when birds are nesting, an expert will survey the site before construction begins to identify any rare birds that are nesting or raising young. If any are found within 0.5 kilometer of the line,, construction will be delayed until after young birds have left the nest, or the line will be moved at least 0.5 kilometer away from the nest.

Changes in visual landscape. For the sections of the line where no towers have been constructed, the new towers will change what people see. People who could be affected include those who live near the line, drivers on roads near the line, and visitors to Borjomi-Kharagauli National Park, Ktsia-Tabatskuri Managed Reserve, the and Gardabani Managed Reserve. In places where there are no trees, such as Ktsia-Tabatskuri, the towers and lines would be noticeable from a few kilometers away, probably for one or two kilometers. In places where there are trees, such as in most of Borjomi-Kharagauli National Park and Gardabani Managed Reserve, the towers and lines would be visible from only a short distance except when towers were on or near the top of a high hill or mountain. The towers are not solid structures but have a lattice-like structure (see Figure 5), and of course the wires are very thin. Therefore, they will not be too obtrusive except from very close. Alternatives 2 and 3 were selected to reduce the distance the line crosses Borjomi-Kharagauli (from 11.5 kilometers under Alternative 1 to 4.7 under Alternative 2 and zero under Alternative 3) and Ktsia-Tabatskuri Managed Reserve (from 12.1 kilometers under Alternative 1 to 10 kilometers under 2 and 3). This would reduce the number of visitors who would

see the line. Also, the route to the north of Tabatskuri Lake used for Alternatives 2 and 3 was selected on the recommendation of the Ministry of Environment Protection and Natural Resources in order to be farther from some bird-watching areas.

Table 3 further summarizes these potential impacts, the actions that could cause them, and the actions needed to prevent or reduce the impact. Besides the major and moderate impacts, the ESIA calls for best management practices or other forms of mitigation for many of the minor or even negligible impacts that the project could cause. These are summarized in Table 4.

Besides these potential negative impacts, the project would also have very important positive impacts. These include:

- Improved power supply to south Georgia, which would increase the potential for development of this isolated area.
- Increased reliability of power supply throughout Georgia.
- Integration into regional power grid and improved relations with key allies.
- Ability to increase use of renewable resources and decrease need for fossil fuels.
- Income from export of Georgia electricity to Turkey and transit of power from Azerbaijan to Turkey.
- Increased income for local workers hired for construction and/or maintenance (although not a major impact overall, this could be important locally).

CONCLUSION

Alternative 2 was determined to be the environmentally preferred alternative following evaluation of potential impacts for all alternatives. Key advantages of this alternative, and disadvantages of others, include:

- Much less disturbance of Borjomi-Kharagauli National Park than Alternative 1 -- 4.7 kilometers through the park compared to 11.5 under Alternative 1. This would reduce the number of towers and the associated land clearing and disturbance. This in turn would significantly reduce visual impacts to tourists.
- Less disturbance of Ktsia-Tabatskuri Managed Reserve – 10 kilometers through the Reserve compared to 12.1 under Alternative 1.
- Much less disturbance overall than Alternative 3, which runs an additional 50 kilometers in order to go all the way around Borjomi-Kharagauli to the west. The environmental resources along that route is similar to the park, although they are not protected.
- Much less potential impact to plants and animals, especially rare ones in Borjomi-Kharagauli and Ktsia-Tabatskuri.
- Intermediate cost¹: \$9,000,000 more than Alternative 1, due to longer distance to reach the short crossing of Borjomi-Kharagauli and the longer distance around Tabatskuri Lake; and \$21,000,000 cheaper than Alternative 3, which runs an additional 50 kilometers to go around Borjomi-Kharagauli.

It should also be noted that none of the benefits described above would be gained under Alternative 4.

¹ Kuljian Corporation. 2007. *Feasibility Study for the Georgia High Voltage Transmission Lines Project*. Prepared by Kuljian for the Ministry of Energy of Georgia under grant GH068105024 from the United States Trade and Development Agency.

Table 3. Moderate and major impacts: summary of potential impacts and actions to prevent, reduce, or control them

<i>Resource</i>	<i>Potential impact</i>	<i>Significance</i>	<i>Mitigation</i>
Plants	Damage to individual plants or communities	Potentially major for protected species or endemic species with small ranges. Largest risk from construction; more limited area disturbed, and for shorter periods, during maintenance.	- Survey by qualified expert of entire transmission line corridor to establish baseline and refine identification of sensitive areas in ESIA. - Prepare of Flora Conservation Plan to document survey findings, refine sensitive areas identified in ESIA, and identify mitigation needed to prevent or reduce impacts on protected species or habitat. Mitigation can be before, during, and after construction or other activities. - Submit Plan to Ministry of Environment Protection and Natural Resources for approval. - Implement measures specified in Plan. Note the wide range of mitigation measures specified in ESIA, including Appendix E. - As last resort, collect seeds or plants for reinstatement after construction is complete. - Conduct another survey after construction and mitigation to verify mitigation was successful, modify as needed to restore species.
	Destruction of modification of habitat	Potentially major on protected species or endemic species with small ranges	- Very limited areas will be affected, reducing potential impact. - Most towers are already constructed, reducing construction impact. - Fauna Conservation Plan (see above) will identify critical habitat and specify measures to prevent or reduce impacts during construction and also during future operation and maintenance. - When possible and appropriate, move tower relocation if towers are not constructed. - Monitor residual impacts after construction

Table 3. Moderate and major impacts: summary of potential impacts and actions to prevent, reduce, or control them

<i>Resource</i>	<i>Potential impact</i>	<i>Significance</i>	<i>Mitigation</i>
			and design mitigation to repair any damages.
Raptors and other large birds	Death or injury due to collision with towers or wires during spring or autumn migration	Potentially major impacts on protected species of raptors, scavengers, or cranes. Entire east-west transmission line corridor is crossed by migrants and presents a hazard.	- Bird “diverters” along east-west corridor - Monitoring to identify most dangerous areas for migrating large birds and addition of diversion measures in those areas. - Wider range of prevention/reduction measures in international guidance cited in ESIA.
	Death from electrocution while landing or perching on wires or towers	Over entire line, potentially major impacts on protected species of raptors, scavengers, or cranes.	- Design so lines are far enough apart to avoid having birds wings’ touch two wires (2-3+ meters or more). - Design towers so as to avoid electrocution risk (use international guidance). - Monitor line for deaths. Retrofit old towers if deaths occur.
Other birds, and Bats	Death or injury due to collision with towers or wires during spring or autumn migration (including night migrants), or during local movements by certain species (see ESIA)	Moderate to major for protected species. Minor for other species	- Relatively limited risk due to small silhouette of towers and small lines. - Monitor to identify areas with highest risk - Design mitigation based on international guidance cited in ESIA.
Raptors and other protected bird species	Destruction of nests or disruption of nesting birds	Potentially major impacts for protected species due to construction that damages or destroys nesting trees/habitat, or that is near enough for noise and activity to disrupt parents or young birds	- Breeding bird survey in all sensitive areas identified in ESIA. - Delay in construction within 0.5 kilometer of nesting protected species until after young birds have left nest, or move line farther away. - Whenever possible, conduct activities outside nesting season. - For every old nest within 0.5 kilometers of transmission line corridor, place at least 3 artificial breeding platforms over 0.5 kilometers distant.
Terrestrial animals	Disruption of breeding, injury or death to individual animals, damage or	Potentially major impacts to protected species, particularly in sensitive areas identified in ESIA.	- Prior to construction from April to July in any area, survey areas to be disturbed for

Table 3. Moderate and major impacts: summary of potential impacts and actions to prevent, reduce, or control them

<i>Resource</i>	<i>Potential impact</i>	<i>Significance</i>	<i>Mitigation</i>
	disruption to critical habitat.	Most risk would be during construction.	presence of protected species. - Prior to construction in any season in protected or sensitive area (see ESIA), conduct survey of areas to be disturbed for presence of protected species. - Prepare Fauna Conservation Plan to document survey findings, refine sensitive areas identified in ESIA, and identify mitigation needed to prevent or reduce impacts on protected species or habitat. Mitigation can be before, during, and after construction or other activities. - Submit Plan to Ministry of Environment Protection and Natural Resources for approval. - Implement measures specified in Plan. Note the wide range of mitigation measures specified in ESIA, including Appendix E. - As last resort, collect seeds or plants for reinstatement after construction is complete. - Conduct another survey after construction and mitigation to verify mitigation was successful, modify as needed to restore species. - Helicopters may be used in steep terrain in Borjomi-Kharagauli National Park and other area.
Land	Loss of use of land due to presence of towers	Potentially moderate for subsistence farmers, for whom any loss would be important; less significant for others.	- Very small areas, less than 300-400 square meters for any tower stile. - Compensation for loss of use of land to be negotiated with owner/farmer, with compensation at a value at least fair market value (for permanent crop loss, not necessarily land, as appropriate).
Crop	Crops could be damaged by vehicle	Potentially major for subsistence farmers or	- Schedule construction/maintenance before

Table 3. Moderate and major impacts: summary of potential impacts and actions to prevent, reduce, or control them

<i>Resource</i>	<i>Potential impact</i>	<i>Significance</i>	<i>Mitigation</i>
damage or animal injury/death	and equipment movement through fields, animals could be injured or killed in collisions.	herders, for whom any loss would be important; less significant for others.	- planting or after harvest whenever possible - Notice to landowners and farmers/herders so their activities can be managed to reduce impact - Compensation for any damages at agreed-upon price, no less than fair market value.
Residents near the corridor	Relocation necessary for residents within 30 meters of nearest wire/line.	Disruption of family life, change in household	- Negotiation and payment of at least fair market value for loss of use. - Negotiation and payment for alternative housing at least equivalent to lost housing. - In sections not yet constructed, planned line will be moved farther away from houses.
Cultural resources	Damage to cemeteries or other cultural resources	- Potentially major impacts on 1 or 2 cemeteries, including 1 under the line (Ilmazlo). Towers need repair but already constructed; this will limit impacts. - Very limited number of known resources close enough to corridor to be affected (3 within 50 meters, 30 within 500meters).	- No activities in cemeteries. At Ilmazlo, consult with local leader and citizens about protection. Possibly stabilize of cliff to avoid further erosion into river. - Mark off cemetery or other resources with fence or flagging to prevent access. - Avoid other cultural resources. If unavoidable, consult with Ministry of Culture, local leaders, and citizens about protection/mitigation/compensation.
		- Unlikely but potentially major impacts by construction on other cultural resources identified in ESIA. Limited possibility of impact due to distance from line.	Vehicles and equipment will avoid the cultural resources in traveling to the corridor.
		- Potentially major to artifacts or other resources at locations not yet identified, during excavation for towers or land-clearing	If artifacts or evidence of prehistoric or historic activities excavated or discovered: Notify Ministry of Culture immediately. Stop all activities near the area until approval is received from Ministry of Culture.
Visual landscape	New towers would intrude upon views of residents, travelers, and tourists	- Potentially moderate for residents in open	- Lattice-type towers and thin wires not visible

Table 3. Moderate and major impacts: summary of potential impacts and actions to prevent, reduce, or control them

<i>Resource</i>	<i>Potential impact</i>	<i>Significance</i>	<i>Mitigation</i>
		areas where no other towers are present. - Potentially major impact on tourists in Ktsia-Tabatskuri Managed Reserve area due to open terrain. - Potentially moderate impact on tourists in Borjomi-Kharagauli National Park, although area of impact is very small due to forested terrain.	for great distances, only a very few, likely much less than 5 kilometers in open land and only 10s of meters in forested terrain. - Towers have already been constructed in most of the line, or the line runs near other transmission lines, so residents and others will be used to the sight (but not in Borjomi-Kharagauli National Park). - Somewhat reduced impact under Alternatives 2 and 3 in Ktsia-Tabatskuri (16 percent less). - Greatly reduce impact in Borjomi-Kharagauli under Alternative 2 (60 percent less) and 3 (zero impact). - Towers are common across Georgia, so most people are acclimated.
Worker safety	Accidents during construction or maintenance	Unlikely but potentially major due to heavy equipment usage and heights	- Provide personal protective equipment for all workers and enforce safe practices. - Prepare health and safety plan to outline risks and best practices for avoidance/mitigation. - Have at least 2 workers trained in first aid at all times on each site. - Train all workers on safe practices. - Daily briefing for workers on activities, risks, and precautions. -
Public safety	Accidents during construction or by trespassers	Potentially major due to heavy equipment usage and heights	- Notify community leaders at least 15-30 days before all scheduled activities, give safety briefing. - Place "danger" signs on all sides of every tower.

Table 4. Minor impacts: summary of potential impacts and actions to prevent, reduce, or control them

<i>Resource</i>	<i>Potential impact</i>	<i>Significance</i>	<i>Mitigation</i>
Air	Dust from vehicle passage	Very minor and localized.	None needed other than slower speeds in dusty areas.
Geohazards - earthquake	Could cause towers to fall.	Limited potential for harm unless people were very close to tower or line.	Maintenance of 30-meter buffer zone for houses
Landslides	Could be caused by earthquake or blasting. Could cause towers to fall or impacts to nearby resources.	Limited potential for harm unless people were very close to tower or line.	Carefully controlled blasting by trained personnel. No blasting in wet weather in landslide areas.
Mudflows	Could be caused by rainfall on cleared land with bare ground in steep areas. Could cause towers to fall or impacts to nearby resources.	Very limited potential since cleared areas will be very small.	Following construction, cleared land will be revegetated.
Soil	Compaction caused by vehicles/equipment. Can prevent vegetation growth and lead to erosion	Minor. Limited potential in very small areas due to short-term nature of vehicle/equipment passage.	Ground will be broken up if needed to re-establish vegetation.
	Spills of fuel, lubricants, other chemicals could contaminate soils.	Minor. Limited amounts of fuel/lubricants and other chemicals in vehicles/equipment.	Crews will have materials for cleanup and decontamination in case of spills.
	Erosion caused by exposed soils due to land-clearing or compaction	Minor. Very limited areas will be affected, and for very short periods of time (days to a few weeks at any one location).	Bare ground will be revegetated (grasses) after construction is complete.
Groundwater and surface water	Contamination by large spills of fuel, lubricants or other chemicals.	Very limited potential during construction of line	- Standard operating procedures (non-leading gasoline tanks, covers on lubricant containers, etc.) will prevent impacts. - Crews will have materials for cleanup and decontamination in case of spills. - Keep very small quantities available, only enough for daily use.
Surface water	Disruption of flows if vehicles cross small streams. This could affect aquatic plants and animals.	Limited potential. Few vehicles will need to cross streams, and then only a few times.	Crossing points will be selected to avoid sensitive areas or areas prone to damage. Any damage to streambanks will be repaired when construction is complete.

Table 4. Minor impacts: summary of potential impacts and actions to prevent, reduce, or control them

<i>Resource</i>	<i>Potential impact</i>	<i>Significance</i>	<i>Mitigation</i>
	Increased sedimentation due to eroded soils entering water	Very limited potential. Bare areas that could be eroded will be small and short-lived.	Standard erosion control practices: hay bales, silt fences, etc., when working near water. Bare ground will be revegetated after construction.
Infrastructure: transportation	Disruption of traffic due to trucks and heavy equipment using and crossing roads when moving to tower locations or conducting	Very temporary disruption at any location since only a few vehicles/equipment will be needed at any one time	Trained personnel will direct traffic when vehicles or equipment are
Community functions	Noise, dust, presence of outsiders could disrupt community functions	Disruption would be very short at any one location due to temporary nature of construction.	- Dust to be controlled by slower vehicle speeds. - Foreman trained on local issues - Crews will be instructed on local issues, especially near minority villages - Crews to stay out of villages - Sanitary facilities to be provided for workers - Notice to community at least 15 days prior to activities or passage within 3km.
Health	Disease due to exposure to electromagnetic fields	Potential major impacts if EMF caused disease.	- Limited number of people live within 30-meter buffer zone recognized by the most conservative countries. - Those people will be relocated (see above). - Expert opinion concludes there is no evidence linking EMF and disease.