Environmental Monitoring Report

Final Report
September 2016

UZB: CAREC Corridor 6 (Marakand–Karshi) Railway Electrification Project

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Abbreviations

ADB	Asian Development Bank
DC	Design Consultant
EHS	Environmental Health & Safety
EIA	Environmental Impact Assessment
EMP/ SSEMP	Environmental Management Plan/ Site-Specific Environmental Management Plan
ES	Environmental Specialist
GoU	Government of Uzbekistan
GRM	Grievance Redress Mechanism
IEE	Initial Environmental Examination
SC	Supervision Consultant
BOD	Biological Oxygen Demand
COD	Chemical Oxygen Demand
TSS	Traction Substation
SP	Sectioning Post
OCS	Overhead Catenary System
LSES	Line Sanitary and Epidemiological Station
ПУОССУ	Environmental management at construction site
EMR	Environmental Monitoring Report
CBI	Computer based interlocking
HBD	Hot Box Detection system
CCTV	Video surveillance system
PAS	Public Address system
SCADA	Supervisory control & data acquisition
ИСМК	Quality management integrated system
API	Air pollution index
TWR 27,5kV	Two wires and rail line
NOKS	Capital construction department
RRB Karshi	Karshi railway regional branch

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Part I. Introduction

1. Construction Activities and Project Progress During Previous 6 Months

1.1 General Information about the project

CAREC Corridor 6 (Marakand-Karshi) Electrification Project of the Railway includes electrification of 140km of existing railway, including (i) traction substations (TSS), SCADA system, Signaling & Telecommunication, maintenance equipment & associated civil works; as well as (ii) institutional capacity strengthening and building by introduction of improved management methods.

2. From geographical aspect, Marakand-Karshi railway is located directly in the center of Uzbekistan Railway Network, at Kashkadarya (Guzar, Dekhkanabad regions) & southeast part of Samarkand province (Nurabad & partially Pastdargom regions). Though Marakand-Karshi section is located in Uzbekistan, but it is part of regional transportation network connecting Tajkistan with other countries as well connecting Afghanistan with other countries of Eurasian continent thru Uzbekistan crossing Galaba (Uzbekistan) – Hayraton (Afghanistan). Project zone encompasses remote administrative regions of Samarkand (Nurabad & Pastagrom) & Kashkadarya provinces (Chirakchi).

3. The following activities had been planned to be implemented under the project:
   (i) Construction of three traction substations – Marakand, Ayritam, Kashkadarya;
   (ii) Construction of special facilities for electrified railway, including: construction of OCS; installation of remote control equipment, arrangement of traction power supply using 10 kV power lines, disconnectors & CTC system; construction of CBI posts.
   (iii) Upgrading of Karshi depot to be used in future for electric locomotives maintenance and repair.

4. Expected benefits from Marakand-Karshi railway electrification include the following:
   (i) Reduce diesel fuel consumption, which deficit currently makes up about 33.6 thousand ton per year;
   (ii) Improvement of thru & carrying capacity of single-track line approximately by 1.5 – 2 times & three times in mountainous area;
   (iii) Power saving and reduction of brake equipment wear;
   (iv) From environmental point of view, upon introduction of electrical traction the following benefits are expected: (i) reduction of airborne contaminants, (ii) reduction and following cancellation of fuel depot & warehouses for environmentally unfriendly goods; & EL operation instead of DL that is safe for environment.

5. ADB loan funds have mainly been used for procurement of works, materials & equipment as well as consulting services. Based on the components described above, the said project falls within the category "B" as per ADB Safeguards Regulations, 2009. Environmental impact entailed from the project components implementation, mainly occurs at the stage of construction. At present civil works are completed. Environmental impact is reversible and mitigation measures have been easily implemented. Project implementation period is about 4.5 years.

6. Upon bidding results the following companies had been awarded with construction contracts:

   a) CNTIC-EEB Concern

      - Contract B021: Design, Supply, Installation & Commissioning of Transformer Substations, Section Posts & Catenary System

- Contract B01: Lot 1 – supply of depot equipment; Lot 2 – supply of OCS maintenance machinery

b) BELAM INC. (Contract B022) - Design, Supply, Installation & Commissioning of Signaling, Telecommunication & SCADA Systems

1.2. Overall Assessment of the Project Implementation

7. The main objective of the present report is furnishing of information on the progress of implementation of Environment Management Plans for construction sites, including environmental monitoring, aimed at reporting on any environmental issues if any, appeared during project implementation period. For the reporting period from January – August 2016 all installation works had been completed.
8. In this respect, the Employer, upon review of Draft Environment Impact Assessment report at respective state control bodies and taking into account all environmental requirements made hereto, all environmental measures have been included into design documents and observed in the course of construction.
9. Under UTY structure there is Track Department that includes protective afforestation division that dealing with landscaping of all railway sites (stations, loops, open lines, administrative and other buildings) as well as trees and bushes planting to prevent sanding and snowing up.
10. Besides, disturbed soils reclamation project had been developed by Uzbek State Research Institute on Land Management «Uzdaverloyikha» to be implemented in the course and upon completion of construction.
11. Composite relief, various lithological layers, development of physical and geological processes predetermine complexity of engineering – geological conditions of the construction site and create mainly unfavorable conditions for civil works. Consequently, construction of CBI modules foundations, HBD buildings and cable trenches required backfilling that resulted in disturbance of topsoil.
12. Since commencement of construction CNTIC & BELAM Contractors have been submitting Environmental reports to PIU-E and SYSTRA as well as LSES Samarkand and Karshi have been presenting reports on construction site monitoring.
13. Since construction works were finished, overall site inspection was arranged, including Karshi station (EL maintenance workshop), Kashkadarya, Ayritam, Marakand (construction of OCS duty posts, TSS, CBI posts) & Niguz, Alatun, Djam, Ulus, Gumbas stations (construction of CBI posts), construction of HBD (5 units) & CBI modules (17 pcs). Environmental monitoring was performed by the group of specialists consisted of UTY environmental experts, inspectors of LSES Samarkand (Mrs. Aziziva Feruza) & LSES Karshi (inspector Mr. Kurbanov Shodiyor) & SYSTRA experts.
14. There were no significant changes in the organizational structure of PIU-E, SYSTRA and Contractors for the period concerned.
15. Site visits have been arranged from 12 to 15 July 2016 from Marakand to Karshi stations. As stated in the attachment № 2 to the CM Resolution № 491 "On state Environmental Expertise" dated 31st December 2001, republican level railways fall within category No I in terms of environmental impacts (high risk). Comprehensive environmental monitoring had been performed for the section concerned.
16. CNTIC contractor had completed their scope of work under the Contact B021 «Design, development, delivery, installation and commissioning of TSS, SP & OCS» in December

2015 and handed over completed works to the Employer. At present the Contractor is within warranty period.

17. Besides, CNTIC also completed installation works for workshops TO-3 TP-1 at depot Karshi related to delivery of machinery under the Contract B01 in September 2015. At present, the Contractor is within warranty period.
18. Considering above, CNTIC Contractor will not prepare Environmental Management Plan under the Contracts B01, B021 for 2016 and, consequently, no environment expert is foreseen for the warranty period.
19. BELAM contractor had been performing construction and installation works from January to August 2016. At present, all works are finished. The Environmental Management Plan for 2016 had been prepared in compliance with Section IV «General Conditions» of Terms of Reference, Contract B022 – «Design, development, delivery, installation and commissioning of Signaling, Telecommunication & SCADA systems».
20. The Contractor representatives are obliged to observe strictly national and international standards and norms when performing the below mentioned works. All construction sites under the contract B022 are located beyond inhabited areas.
21. Works are implemented at all stations and open lines of Marakand-Karshi section.

1.2.1 Types of works performed by BELAM Contractor

22. When optical copper cables are laid, inductive markers are installed into cable trenches. Inductive markers are used for detection of telecom cable at coupling installation points where the route goes close to OCS poles and where cable route is changed. This method is environmentally friendly. Each type of markers provides certain type of signal (see pic. 1 & 2). Markers Omni Marker & Uni Maker produce uniform spherical radio-frequency field in all directions; Uni Maker produce signals in a form of dipole field, mainly, up and down (see pic. 1 & 2). This method is economical one for telecom cable & underground systems installation. It minimizes cable damage probability, emergencies and injuries as well as soil adverse impact.

23. Table № 1 below shows progress of civil works, done by Contractor for the reporting period:

Table 1. **List of works completed for the reporting period**

№	Description of works	Location	Progress (in %)
January 2016			
1	Cable couplings installation	Alatun-Niguz	100
2	Optical coupling installation	Alatun-Niguz	100
3	Installation of indoor Signaling, Telecom & SCADA equipment	All stations of Marakand-Karshi section	100
4	Installation of wayside Signaling, Telecom & SCADA equipment	All stations of Marakand-Karshi section	100
5	Installation of station duty officers workstations	Marakand-Karshi	100
February - 2016			

1	Cable couplings installation	Niguz-Kashkadarya	100
2	Optical coupling installation	Niguz-Kashkadarya	100
3	Telecom equipment at TSS	Kashkadarya, Marakand, Ayritam	100
4	Installation of PA system, radio communication & CCTV masts	All stations of Marakand-Karshi section	100
5	Installation of wayside Signaling, Telecom & SCADA equipment	All stations of Marakand-Kashkadarya section	100
March-2016			
1	Cable & optical couplings installation	Kashkadarya-Karsh	100
2	Installation of PA system, radio communication & CCTV	All stations of Marakand-Karshi section	100
3	Installation of LX loudspeaking communication columns	All stations of Marakand-Karshi section	100
4	Dragging gear detection system	Gumbaz-Ayritam	100
Апрель -2016			
1	Telecom equipment	Karshi station	100
2	LX loudspeaker columns installation	All stations of Marakand-Karshi section	100
3	PA system, radio communication and CCTV equipment installation	All stations of Marakand-Karshi section	100
May -2016			
1	Signaling, Telecom,SCADA equipment installation	Karshi station	100
2	Signaling, Telecom,SCADA equipment installation	CTC in Tashkent, power dispatcher center in Tashkent	100
June-2016			
1	Precommissioning of CBI equipment	Karshi station	100
July-2016			
1	Signaling, Telecom,SCADA equipment installation	Karshi station	100
August- 2016			
1	Commissioning of HBD system	All section (5 pcs)	100

2	Commissioning of radio stations, PA system & SCADA	Marakand station	100

24. A per ISO 14001:2004 standard, “Identification of environmental aspects” procedure had been developed aimed at detection of adverse environmental impacts. Besides, “Environmental aspects register” had been developed that specifies significant aspects for the office, warehouse and works carried out on site.
25. The following activities had been arranged by the Contractor at execution of works:
    - Processing of packing materials (carton, paper): transporting to specialized waste paper stations;
    - Processing of remains of products made of reinforcing bars, damaged parts of metal works: transportation to specialized metal stations;
    - Processing of plastic items (PE bottles, disposable PE tableware): transportation to specialized plastic stations
    - Removal of secondary wood (timber pallets & boxes) by local population to be used for their domestic needs;
    - Rubbish removal to specialized places.
26. In general, construction and installation works carried out by the Contractor under Marakand-Karshi railway line electriication project, had no adverse environmental impact, namely:
    - Water balance of the area is intact;
    - No pollutant emmissions;
    - Noise and vibration level is within permissible range
    - Local flora and fauna is intact

1.2.2 Environment protection measures by BELAM

27. At installation of optical & copper cables the following risks & environmental factors are considered:
    a) Damage of oil, gas and water pipes, heat & power trunk lines and other existing supply pipelines, utilities and structures;
    b) Endamagement of forestlands & wildlife habitat, in particular, at wildlife sanctuary areas and natural parks with rare & endangered animal species;
    c) Crossing of natural water arteries;
    d) Need to preserve existing water intake & protective structures or its relocation to more convenient places;
    e) Need to plan thoroughly “traffic windows” to avoid traffic jams at the roads and, accordingly, mitigate the risk of emergencies;
    f) Recycling of cable drums, packing materials and fastening materials.
28. In order to minimize adverse impact of the aforesaid factors the following is required:

    Prior to cable installation it is necessary to:

- Prepare construction site; prevent environment from adverse effect (noise, dust, contaminants) or to mitigate adverse impact as much as possible;

- Herb stratum must be recovered.

29. Welding of optical cables

At welding of optical cable the following issues, related to environmental risks must be addressed:

- Recycling of cable housing and insulation remainders as well as cable cores at cable forming and welding as well as remainders of color varnish & protective layer upon cores cleaning using spirit;

- Recycling of packing and fixing materials.
- To prevent environmental pollution when performing works

Upon completion of works, all materials and liquids residues must be removed from the site;

30. To mitigate adverse impact of the aforesaid factors the following is required:

- Prior to commencement of works respective preparation of the working place is required;
- To reduce probability of materials & technical fluids remainders penetration into the soil;
- To prevent environmental pollution while performing works;
- Upon completion of works all remainders of materials and fluids must be removed from the site;
- Recycling of materials and waste must be performed in compliance with requirements of integrated quality management system, occupational safety & environment protection.

31. At wayside equipment installation the following issues, related to environmental risks must be addressed:
    a) Damage of existing infrastructure & risk of emergencies;
    b) Recycling of materials at installation of wayside equipment;
    c) Recycling of packing and fixing materials.

32. At antennas and outdoor equipment installation the following issues, related to environmental risks must be addressed:
    a) Electromagnetic emission;
    b) Recycling of cable housing and insulation remainders as well as cable cores at it connection to antennas & outdoor equipment at the tower;
    c) Recycling of packing & fixing materials.

33. At installation of CCTV and PAS equipment the following environmental risks must be addressed:
    a) Noise level (for PAS system);

b) Recycling of cable housing and insulation remainders as well as cable cores at it connection to outdoor equipment installed at the towers, masts & OCS poles as well as at the platform;

c) Recycling of packing and fixing materials upon completion of works must be removed from the site;

d) To ensure that noise level of PA system is within technical requirements & legal code of Uzbekistan;

34. At installation of this type of equipment the following environmental risks must be addressed:

    a. Installation of equipment producing least noise in compliance to Terms of Reference & acting law of the Republic of Uzbekistan;

    b. Upon completion of works all remainders of materials must be removed from the site;

    c. Recycling of materials and waste must be performed in compliance with requirements of integrated quality management system, occupational safety & environment protection.

Part II. Environmental Monitoring

35. In compliance with the Environmental Management Plan (EMP), included into Environmental Impact Assessment (EIA), at the stage of construction the following parameters had to be monitored (Attachment 1):

- Air quality;
- Quality of potable water & sewage water;
- Noise;
- Solid waste;
- Hazardous materials;
- Soil erosion & rehabilitation;
- Avifauna.

36. Visual inspection and data acquisition as well as construction sites monitoring with regard to dustiness level had been performed by the environmental expert of the Contractor, PIU-E inspectors, the Employer, LSES of Samarkand & Karshi and SYSTRA expert. Contract should guarantee that all construction works are conducted from 7:00 AM to 18:00 PM to prevent noise at nighttime. Water and air quality had been inspected thru the whole section as well as noise and vibration level had been measured.

37. Besides, LSES Samarkand and Karshi inspectors are semiannually monitoring air quality at the working places, including offices and apartments of the staff. Inspection reports, water and air samples analysis, noise and vibration level measurements confirming compliance to national standards and norms are included in to the Attachment 5. Inspection of the site is planned to be continued until completion of all construction works and respective mitigation measures in terms of environment protection will be taken if any required.

38. At the time of monitoring of the whole project section from Marakand to Karshi all construction and installation works had been completed and handed over to the Employer

UTY (as described below) for further operation and clearance of remaining comments jointly with NOKS:

a. Marakand, Ayritam, Kashkadarya TSS – to Karshi power supply division;
b. CBI posts from Gumbaz to Karshi stations – to Karshi RRB;
c. CBI modules (17 pcs) – Karshi Signaing & Telecom Division;
d. HBD (5 psc) from Ayritam to Kashkadarya – Wagon division of Karshi Depot

39. The present report covers period of I & II quarters 2016 (project implementation and operation period) and based on the requirements of local legislation «On Environment protection», acting guidelines documents on construction, sanitary norms and regulations as well as environmental safety requirements included into the Feasibility Study of Marakand-Karshi railway electrification project, including:

(i) Environmental monitoring
(ii) Environment protection reports & scope of completed works (out of the total scope of Contractors' works)
(iii) Noise and vibration
(iv) Water quality
(v) Air quality
(vi) Flora and fauna monitoring

2.1. Climate

40. At the time of monitoring air temperature during daytime was +40°C, at nighttime +28 0C, hot, dry, no precipitation. Period concerned – from January to July 2016. Section concerned – Marakand-Karshi. Climate feature is smooth transition from winter to summer.

41. Climate is sharp continental, manifesting in considerable air temperature contract. Mean annual temperature - within the range of 13-16 0C. Summer is dry and hot, max. temperature +42 +48 0C. Mean air temperature in July +30 +39 0C. Daily global direct radiation at horizontal face makes up 23 MJ/(m2/day).

42. Average annual precipitation from 250mm to 357mm. Hot and dry at the same time. In summer precipitation level is low. Evaporation considerably exceeds precipitation level.

43. Cold period features by prevalence of continental air mass of temperature zone & is unstable. Absolute minimal temperature is -280C. Average air temperature of the coldest time is minus 2.8, minus 4 0C. Snowpack is non-persistent and short. Snow days with snowpack at the flatland is from 10 to 20.

44. Wind pattern is formed under influence of recirculation & physiographic factors. Northern and north-western winds prevail.

2.2. Air quality

45. Data on air quality was collected by 17 observation centers and used by "Uzhydromet" Department of Hydrometeorology Committee of Uzbekistan and also by Sanitary-Epidemiological stations of UTY.

46. In the course of site monitoring with participation of LSES Samarkand and Karshi it was concluded that ambient level of air pollution is negative only at Marakand station (as per lab

results) that is part of Samarkand industrial hub. At all other sections air pollution is within permitted range (see attachment A).

47. During construction and installation period CNTIC & BELAM Contractors have been using TOYOTA vehicles. Thus, vehicles emissions are evenly distributed along the whole section creating no hazardous concentration of emissions in air of inhabited areas.

48. Pursuant to climatic conditions, the electrified railway section refers to the zones 3-4 that are characterized by increased and high atmospheric pollution potential (APP) that is 2.7-3.5.

49. As per site monitoring results, it was concluded that electric traction is much beneficial versus diesel one:

50. Main benefits are as follows:

- No environment pollution since diesel fuel is not used anymore;
- No need to keep warehouses for storage of hazardous oil products;
- Repair and maintenance depot arranged in Karshi for electric locos is more environmentally friendly versus diesel loco depot.

51. Upon electrification of the railway sanitary-hygienic conditions for local inhabitants are improved, considering reduction of airborne emission and improved water, heat supply and sewage system of the region concerned.

52. Environmental monitoring included sampling along the whole project site. Sampling results are provided in protocols, acts and presented by the letter № 01/439 dated 26th July 2016 to PIU-E. All documents concerned are signed by chief inspectors of LSES Samarkand Mr. Haitov M. & LSES Karshi Mr. Imomov I.

- Water sampling to check chemical composition
- Water sampling to check bacteriological composition
- Sanitary inspection acts with regard to dust suspended particles & CO2 content at the stations (perrons, station territory)
- Sanitary inspection acts with regard to dust suspended particles & CO2 content indoors
- Station territory sanitary inspection acts (domestic waste, mercury/fluorescent lamps)

53. Sampling analysis results are in line with acting standards of the Republic of Uzbekistan of Dust, CO, NO2, SO2 therefore no additional mitigations are required (table 1,2. Annex A).

2.4. Noise and vibration

54. As it was mentioned earlier, upon electrification of the section concerned carrying and thru capacity of the railway is increased. For noise and vibration measurements during site monitoring and inspection noise meter RFT – 0026 was used, certified by the State Standard Committee of the RU (certificate of compliance). Results of measurements are given in Table 4, Annex A.

55. Upon completion of measurements, group of experts concluded that upon introduction of electric traction residential area concerned will not be affected by increased noise (versus existing situation), but noise and vibration frequency might be increased.

2.5. Site water supply monitoring

56. Visual inspection of warehouses and office premises of CNTIC & BELAM Contractors proved that contractors are observing all requirements of SanPiN and EIS.

57. In order to minimize any eventual oil pollution of underground waters CNTIC & BELAM contactors are performing maintenance and washing of vehicles only within the territory of their warehouses.

58. Routine maintenance and fueling of CNTIC & BELAM Contractors vehicles is performed at specialized maintenance centers and petrol stations.
59. For workers Contractors rent apartments at the hotel and dwelling house with all facilities.
60. Water supply is arranged mainly from centralized public water system. At Ayritam, Kashkadarya stations enhancement of existing water intake structures is provided.
61. Sewage water is collected and disposed through local sewage system. At Marakand, Ayritam and Kashkadarya TSS biological purification structures had to be provided for sewage water treatment and further subsurface discharge. Monitoring results revealed that biological treatment of sewage water is not applied since each operation unit is equipped with cesspool trucks.
62. At the stations with no sewage system, cesspools with waterproof tanks are provided. Cesspool wastes at Marakand, Gumbaz, Ulus, Djam, Ayritam, Alatun, Niguz stations are removed by cesspool trucks to newly built sewage disposal plants at Ayritam, Kashkadarya and to existing ones at Marakand station.
63. Heat supply of TSS is electric; CBI posts and OCS duty posts – from built-in boiler houses with hot water boilers АОТГ-23.2. Estimated capacity of boiler houses makes up 1.3 MWt, coal consumption - 912 t/year.
64. Drinking water had been sampled for bacteriological and chemical content along the whole section (salinization). Analysis results are included into Annex A, Table 3. According to data received in July 2016 the obtained results did not exceed the National Environmental Standard, therefore no additional mitigations are required. .
65. Visual inspection of TSS and CBI posts resulted in some insignificant comments to be cleared. At CBI posts at Gumbaz, Niguz stations water pump of water tower used for drinking water needs was inoperable. The reason of the fault was power voltage drops. To solve this issue the Employer installed the cable from 27,5kW TWR line up to water tower above the well at all CBI posts and TSS. Deadline for clearance of comments was fixed 10th August 2016.
66. Besides, for water saving and irrigation improvement at Marakand TSS capillary irrigation method was introduced for plants irrigation (using PE bottles).

Fig.3. At all CBI posts implantation is completed and water supply networks are in place

Fig. 4. Deep well pump for water tower at Niguz st.

Well with well pump for water tower at Niguz station. SYSTRA recommends at the territory of water tower completing construction works, installing metal hatches & providing landscaping. Fire tank must be filled with water.

67. At Marakand & Kashkadarya TSS sewage system was inoperable. LSES & SYSTRA provided recommendations on correction of non-compliances within 10 days, including sewage pipes cleaning and valve installation.

68. Besides, LSES & SYSTRA experts provided the following recommendations on underground waters protection from pollution:

- Prevent uncontrolled waste water disposal from service buildings;
- Provide natural protection of water-bearing stratums;
- Create protective sanitary zones around water supply & sewage structures;
- Secure continuous operation of sewage networks and structures.

69. Results of inspection reports with comments and LSES analysis results have been forwarded to the Employer - PIU-E, NOKS (letters № 417 dated 27.07.16 & 422 dated 29.07.2016). PIU-E replied to SYSTRA by the letter PIU-E/15-1112 dated 02.08.2016 on clearance of all comments by 10th September 2016.

2.6. Flora and Fauna

70. In vicinity of construction site there is no sensitive flora and fauna. The proposed project of construction/ rehabilitation works has no significant impact at flora and fauna of Samarkand and Kashkadarya provinces, since works had been carried out at existing already occupied regions, for instance, at the territory of the city and along existing railway.

2.7. Recycling of solid domestic wastes

71. At construction sites various types of solid domestic waste shall be produced, including timber, steel, plastic & carton boxes (packing materials). Measures, based on EMP include provision with containers for waste collection & second-hand containers to be further removed to specially dedicated places to be dumped and recycled.

72. Since only ready-made equipment was installed along the project site, no fuels and lubricants had been used.

Fig. 5,6 Delivered equipment and packing material (timber, plywood, cellophane)

73. As it was already mentioned in earlier reports, all wastes have been removed to specially dedicated places and for secondary use by local inhabitants.

74. In the course of site inspection it was detected that metal containers and containers for burnt fluorescent lamps are still not in place at Marakand, Ayritam and Kashkadarya TSS and OCS duty posts. In compliance with the letter received from PIU-E, burnt fluorescent lamps are stocked at timber boxes. Referring to the Cabinet of Ministers resolution No 266 dated 21/09/2011, RRB Karshi made an agreement with “Karshi Sanitar Tozalash” Ltd. (No 32-5 dated 15/01/2016) for collection and recycling of burnt fluorescent lamps.

75. At CBI posts small size containers are installed.

76. Upon completion of rehabilitation and construction works, all sites are cleaned and land improvement performed.

Fig. 7 Small size metal containers (bins) at CBI posts

2.8. Storage of backup transformer & transformer oil

77. During inspection of backup transformer it was detected that in order to minimize eventual pollution of ground waters by oil, TSS backup transformer is kept empty of oil and stocked at the territory of Kashkadarya TSS at specially dedicated place. Storage is arranged in line with instruction and is not connected to the network.

Fig. 7 - TSS backup transformer stocked at the territory of Kashkadarya TSS at specially dedicated place

78. Transformer oil is produced from oil products and is environmentally friendly. Transformer oil used in transformers installed at Marakand, Ayritam & Kashkadarya TSS is made in China (see below) & has certificate of compliance (State Standard of RU). In case of oil leakage or spill, environment, flora & fauna will not be toxically affected. Design documents provide for all respective safety measures, EMP requirements, KMK norms & regulations (construction regulations of the Republic of Uzbekistan).
79. With time at regular operation, oil is losing its properties due to increased temperature & deterioration. In this respect, as per manufacturer instruction, oil is sampled for testing and chemical analysis. If test results are unsatisfactory, oil is drained from transformer to special tanks by connecting pump to transformer drain tap. Drained oil is transported to specialized workshops under UTY or ”Uzbekenergo” (Ministry for Power) to be recovered. Upon oil recovery it is transported to chemical laboratory under UTY for analysis. Recovered oil is transported to TSS and pumped back to transformer. In case transportation of defected oil is not compulsive, oil can be refined just on site by connecting to transformer special pumping unit that recovers oil properties.
80. In case of emergency oil is drained to oil collector (V=30m2) under transformer and further through pipeline it is forwarded to oil receiver/sump (V=30m2).
81. Afterwards, this oil is transported to special workshops under UTY or Ministry for Power (Uzbekenergo) for purification, drying & regeneration to be reused. Upon recycling oil is transported for analysis to the chemical lab under UTY.
82. If oil analysis results are satisfactory transformer oil is transported to Oil Facilities of Power Division or to the plant for electric locos maintenance.
83. Pursuant to instruction, transformer oil is to be stocked at specially dedicated place in steel reservoirs under the shed protected from sun shine & rain. To minimize air access reservoirs are to be stocked plugs down in line with PUTEks instruction (operation and maintenance regulations).
84. As per the Punch List submitted to PIU-E, all comments and recommendations must be cleared and considered by 10th September 2016.

Fig. 8 – Spare transformer oil storage area

2.9 Land and Soil Impact

85. Soil disturbance occurs at land planning, structures construction, pipelines installation impacted by lifting and excavations machines and trucks on wheels and caterpillar driven.
86. Since railway capacity has been increased, UTY along with TSS, CBI posts, OCS duty posts, CBI modules foundations, LX construction, has completed a number of activities related to alignment and extension of side tracks of the stations. In this respect UTY, using its own funds, have developed design estimate documents on «Recultivation of disturbed lands at Marakand-Karshi section».
87. In the course of project implementation, 27.5 kW feeder line and its poles (of longitudinal power supply) have been constructed the right of the railway track, since power lines are located not more than 3.5m from the track centerline. In this respect no land clearing required &, consequently, no lands impact occurred. Communication cable trenches excavation had been performed manually, signaling equipment is installed along railway track. Thus, topsoil was not adversely impacted from construction machinery employment.
88. Earthing is performed at warm season during construction works or within the year.

2.10 Biological stage of land recultivation

89. As per design, biological stage of land recultivation is to be performed after technical stage at the territory of Postdargomskiy, Nurabadskiy regions of Samarkand province, Chirchik region of Kashkadarya province and Karshi city totaling to 50,1 ha. Period allocated for disturbed lands recultivation is 2 years. Within this period of time number of agricultural activities related to soil recultivation, its biological activity & structure of water-air conditions as well as organic substances accumulation & prevention of soil erosion.

2.11 Recommended agricultural crops for land recultivation and improvement

90. Biological land rehabilitation provides for alfalfa planting at reclamation period aimed at soil fertility and structure improvement. Alfalfa contributes to improvement of water-physical properties of soil and improves level of organic substances and nitrogen.

2.12 Norms and periodicity of soil fertilization and mineralization

91. Lack of nutrients in topsoil of rehabilitated lands should be replenished by organic & mineral fertilizers. Types of and norms for fertilizers applications are determined by the biological stage of recultivation, precipitation level, presence of fertile soil stratum & yield.

92. To replenish humus losses at recultivated areas, manure will be required, being mixed with superphosphates at the field. Manure can be mixed with superphosphates during loading or when palletized. Manure piles are to be compacted, consolidated by soil on top and 2-3 times watered in summer, providing for high quality compost (mixed manure).
93. Fertilizer dressing (ammonium nitrate, potassium salt, ammophos, superphosphate) provides for utilization of RUM-5 & 4AKU-4 mechanisms in set with tractor. All types of mineral fertilizers are to be prepared for soil application. Fertilizers preparation consists of mineral fertilizers grinding and mixing.
94. Fertilization rates recommended for 1ha & consumption rates are included into the table 2.
95. Earthing is performed at warm season during construction works or within the year. Total volume is included in to the table № 2.

Table 2. Materials requirements

#	Materials	Unit	Earthing section
1	Organic fertilizers:		
	- manure	ton	40
2.	Mineral fertilizers:		
	- ammonium nitrate	ton	1,270
	- ammophos	ton	0,365
	- potassium salt	ton	0,240
	- superphosphate	ton	1,200
3.	Toxic chemicals	kg	30
4.	Seeds:		
	- alfalfa	kg	20

96. At the period of biological recultivation of disturbed soil the comprehensive package of necessary process steps is to be performed.
97. Adequate soil treatment system is essential for good quality stand of grass. It starts from land leveling aimed at careful leveling of field topography, facilitating irrigation & improving quality of mechanical works.
98. The project also provides boardless plowing/subsoiling technique that ensures moisture conservation and prevention from soil erosion at winter and spring time.
99. Alfalfa seeding is performed right after using fertilizer grain drill. Seeding performed at rainy weather under or on the snow. Table 3 below shows scope of earthworks for recultivation and potentially rich soil layer.

Table 3. Scope of earthworks for recultivation & potentially rich soil layer

№	Name of area	Recultivation area (ha)		
		Total	At the railway	At TSS
I. Samarkand province				
1.	Postdargom distrct			
	(Marakand st.- Gumbaz st.)	2,48	1,34	1,14
2.	Nurabad district			
	(Gumbaz-Ulus-Djam st)	4,22	4,22	
II. Kashkadarya province				
3.	Chirokchi district			
	(Djam-Ayritam st.)	5,79	4,46	1,33
4.	Karshi town	1,61		1,61
	TOTAL	14,1		4,08

Fig. 9 - Soil rehabilitation upon recultivation, as per design. Ayritam TSS and Djam st

100. Besides, letter № PIU-E/15-1159 dated 12.08.2016 (as per SYSTRA requirement) had been sent with regards to the list of activities aimed at rehabilitation of soil natural flora at backfilling sites of CBI modules and HBD. Requested information had been sent by the letter № 1707/2411 dated 15.08.2016 as following:

101. For recultivation of disturbed soils of CBI modules soil is to be rehabilitated up to the initial level. Recultivation consists of two stages – technical and biological.

102. Technical stage provides for cutting of 20-30cm of topsoil and it storage to be used later as well as preparation of disturbed soils for earthing and leveling of topsoil.

103. Biological stage provides for seeding of grass that is mixture of alfalfa, Australian rye-grass & cocksfoot. Organic and mineral fertilizers are used for land rehabilitation improvement.

№	Seeds and fertilizers	Qty of seeds & fertilizers in gr./м2
1.	Group:	
	Alfalfa	2 gr
	Australian rye-grass	1,6 gr
	Cocksfoot	1,6 gr
2.	Fertilizers:	
	Organic (humus)	1 kg
	Nitrates	11 gr
	Phosphates	7 gr
	Potassium	4 gr
3.	Irrigation at the basis of:	10 liter

104. Thus, visual inspection revealed that soil restoration is in progress at the area of backfilling of CBI modules and HBD buildings foundations.

105. Upon completion of construction & backfilling earlier cut topsoil stratum had been put on top of embankment.

Fig. 9,10. CBI modules & HBD: backfilling and soil restoration works are completed

106. Soil recultivation & plantations tending is performed by UTY Shelterbelt Forest Division

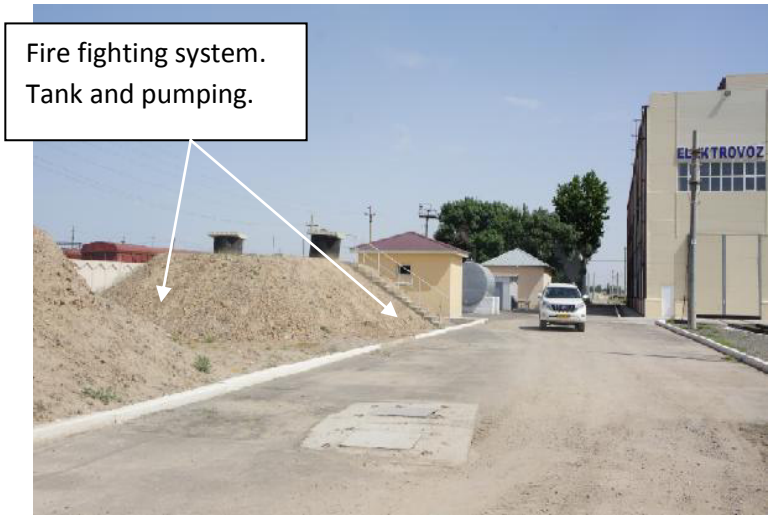
Depot Karshi territory

107. In the course of inspection it was detected that at the territory of depot more than 200 trees had been planted. Fire fighting system is installed at the territory of depot Karshi. Water supply system, landscaping and soil recultivation had been already completed.

Fig. 11 – New plantation of trees (over 200 pcs)

Fig 12. Irrigation system is installed

Fig 13. Fire fighting system is installed



2.13 Occupational safety and accidents prevention

108. Occupational safety and accidents prevention inspection included visual inspection and measurement of illumination intensity, humidity, temperature, dustiness of workplaces and sanitary condition of the buildings along the whole project site.

109. Preventive measures include fire hydrants, fire shields & 100m3 water tanks for firefighting at the stations, TSS, depot Karshi, CBI posts & OCS duty posts. Water tanks are used for firefighting using auto-pumps.

Fig. 14. Fire hydrants, panels, water tanks for 100m3 are provided

110. To prevent electric shocks the following safety measures were envisaged:

(i) Power lines distance, crossing inhabited areas - distance from bottom wire to the ground, to crossing pipelines and utilities, buildings and structures overhangs must comply with EIR-2007 requirements;
(ii) Power lines poles with installed equipment – all poles must be earthed;
(iii) TSS and OCS duty posts must be fenced by 2m fencing.

111. Besides, occupational safety and accidents prevention posters are installed throughout the project section. Staff is being instructed accordingly.

Part III - Environment Management

3.1 The Environmental Management System, site-specific environmental management plan (SSEMP) and work plans

112. Under the environment management plan prior to the Project commencement CNTIC & BELAM Contractors submitted their drafts on EMS and SEMP.

113. IEE for this project does not include requirements on development other environmental management plans.

3.2 Site inspections and Audits

114. Regular visual inspections and site monitoring visits were carried out during the reporting period by SYSTRA environmental expert and LSES inspector Mrs. Azizova Feruza. During the field visits a number of EHS issues were noted and brought to the attention of the

Environmental Consultant and the H&S manager of the Contractor under the project. Mitigation measures were then discussed with the contractor on-site and detailed instructions were given. Good Practice in compliance with national and international HS&E legislation was therefore enforced in accordance with the legislation and the Contractor's contract for the project.

115. Site inspection and audit during the reporting period have been carried out: in March, April, May, June, July and final environmental audit in August 2016. Monitoring Compliance and inspection monitoring forms have been filled in during the site visits (Final Monitoring Checklist is attached in Annex C).

116. The contractors were always informed on the detected non-compliances and were demanded to improve on the deadline set and send photos of improvements made together with the corrective action plans. Environmental specialist of SYSTRA monitored the improvements during the next monitoring visits. Unimproved environmental issues were qualified as non-compliances and notices issued to the contractor.

3.3 Non-compliance notices and Corrective Actions

117. During inspection the following non-compliances had been detected:

- Missing rubber strips at the doors and windows at new buildings next to the stations are to be installed.
- Water supply system should be installed and connected to newly built structures as per GOST 950: 2011.
- Canteens should be equipped with respective equipment.
- Premises should be allocated for shower rooms to be arranged in new buildings and equipped with respective inventory as per SanPiNof RUN№ 0154-04.
- Toilets are to be equipped in compliance with sanitary norms SanPiN № 0151-04.
- Cesspools must be replaced by waste containers in line with sanitary norms.
- Timely removal of fluorescent lamps to specially dedicated placed must be arranged.

118. All corrective actions requested after the monitoring of sites were mostly improved by the contractor in due time.

119. For the purpose of resolving the observed issues, the corrective action plans have been developed by the contractor. The regular Environmental Meetings were also carried out with the participation of SYSTRA and contractor. During the meetings environmental issues and implementation of the mitigation measures were discussed. Agreements were reached that contractor should respond to the findings of the compliance monitoring carried out by SC.

PART IV – Conclusion and Recommendations

- Strict observance of requirements included into Initial Environmental Examination, recommended institutional mechanisms and monitoring program included into EMP is recommended.
- SYSTRA recommends that design of electrified railways at the Republic of Uzbekistan should also include respective measures aimed at provision of free movement of livestock at pastures to contribute to agricultural and cattle breeding development in the area concerned.
- Besides, SYSTRA recommends providing new railway sections with crossovers (underpass/overpass) for free movement of inhabitants and motor vehicles.

ANNEXES

Annex A: measurements & monitoring data

Monitoring results of LSES Samarkand and Karshi

Table 1. Air quality (waste gases quality)

Description	Unit	Measured value (max)	Republican standards	Contract standards	International standards	Notes
Air CO_2	mg/m3	not detected	0,5		0,5	Marakand, Gumbaz, Ulus, Djam, Ayritam, Alatun, Niguz, Kashkadarya, Karshi stations
Dust, air	mg/m3	0,61 0,51	0,5		0,5	Marakand
		0,65 0,46	0,5		0,5	Gumbaz
		0,44 0,43	0,5		0,5	Ulus
		0,66 0,74	0,5		0,5	Djam
		0,60 0,47	0,5		0,5	Ayritam
		0,51 0,64	0,5		0,5	Alatun
		0,56 0,54	0,5		0,5	Niguz
		0,64 0,66	0,5		0,5	Kashkadarya
		0,58 0,47	0,5		0,5	Karshi

O_2			Content by volume in dry air made up 20,94%			
CO	mg/m 3	1.6 1,2 0,53	5,0		5,0	
O_2			Content by volume in dry air made up 20,946%			

Table 2. Dust content indoors

Description	Unit	Measured value (max)	Republican standards	Contract standards	International standards	Notes
Dust inside premises (indoors)	mg/m3	0,46 0,42 0,44 0,48	0,5		0,5	Marakand
		0,47 0,44 0,60 0,49	0,5			Ulus
		0,64 0,52 0,65 0,51	0,5			Gumbaz
		0,51 0,50 0,57 0,57	0,5			Ayritam
		0,54 0,61 0,60 0,61	0,5			Alatun
		0,63 0,53	0,5			Djam

		0,53 0,47				
		0,59 0,48 0,47 0,51	0,5			Niguz
		0,47 0,55 0,52 0,51	0,5			Kashkadarya
		0,48 0,71 0,47				Karshi

CO_2		No	0,5		0,5	Marakand
CO_2		No	0,5		0,5	Ulus
CO_2		No	0,5		0,5	Gumbaz
CO_2		No	0,5		0,5	Ayritam
CO_2		No	0,5		0,5	Alatun
CO_2		No	0,5		0,5	Djam
CO_2		No	0,5		0,5	Niguz
CO2		No	0,5			Kashkadarya
CO_2		No	0,5			Karshi

Table 3. Water quality (quality of effluents /sewage / spring waters)

Description	Unit	Measured value (average)	Measured value (max)	Republican standards	Contract standards	International standards	Notes
Water supply from Artesian well water supply from delivered water tank Running water supply							Marakand, Ulus, Kashkadarya
PH	mg/l	6,5	7,0	6,5-8,5	6,5-8,5	6,5-8,5	Marakand, Ulus, Kashkadarya
Total nitrogen	mg/l	no no no	2,5				Marakand, Ulus, Kashkadarya
Chlorides	mg/l	18 25 40					Marakand, Ulus, Kashkadarya
Oxidability	mg/l	1,33 1,88 1,96					Marakand, Ulus, Kashkadarya
Transparence	mg/l	>30 >30 >30					Marakand, Ulus, Kashkadarya
Ammonia	mg/l	No No No					Marakand, Ulus, Kashkadarya
Hardness		3 5,6 5,8					Marakand, Ulus, Kashkadarya
Residual chlorine		0 0 0					Marakand, Ulus, Kashkadarya

Smell		No No No					Marakand, Ulus, Kashkadarya
Iron		>30 >30 >30					Marakand, Ulus, Kashkadarya
Temperature	C^0	+25 +25 +25					Marakand, Ulus, Kashkadarya

Table 4. Noise / Vibration

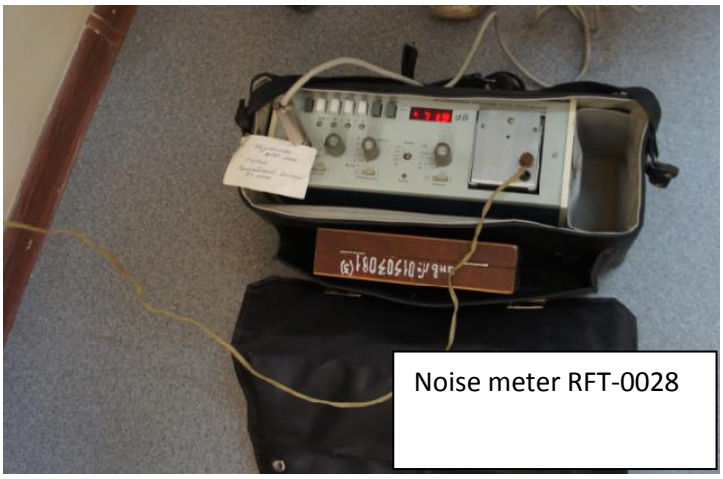
Description	Unit	Measured value (average)	Measured value (max)	Republican standards	Notes
Noise level. Distance from residential area to the railway is more than 100m	dB	65 60	70 70	100/850 7.00 - 23.00: 70 dB	Marakand
Noise level. Distance from residential area to the railway is more than 100m	dB	63 58	70 70	100/850 7.00 - 23.00: 70 dB	Ulus
Noise level. Distance from residential area to the railway is more than 100m	dB	67 65	70 70	100/850 7.00 - 23.00: 70 dB	Gumbaz
Noise level. Distance from residential area to the railway is more than 100m	dB	62 55	70 70	100/850 7.00 - 23.00: 70 dB	Ayritam
Noise level. Distance from residential area to the railway is more than 100m	dB	69 56	70 70	100/850 7.00 - 23.00: 70 dB	Alatun
Noise level.	dB	68	70	100/850	Djam

Distance from residential area to the railway is more than 100m		51	70	7.00 - 23.00: 70 dB	
Noise level. Distance from residential area to the railway is more than 100m	dB	63 56	70 70	100/850 7.00 - 23.00: 70 dB	Niguz
Noise level. Distance from residential area to the railway is more than 100m	dB	63 61	70 70	100/850 7.00 - 23.00: 70 dB	Kashkadarya
Noise level. Distance from residential area to the railway is more than 100m	dB	63 60	70 70	100/850 7.00 - 23.00: 70 dB	Karshi

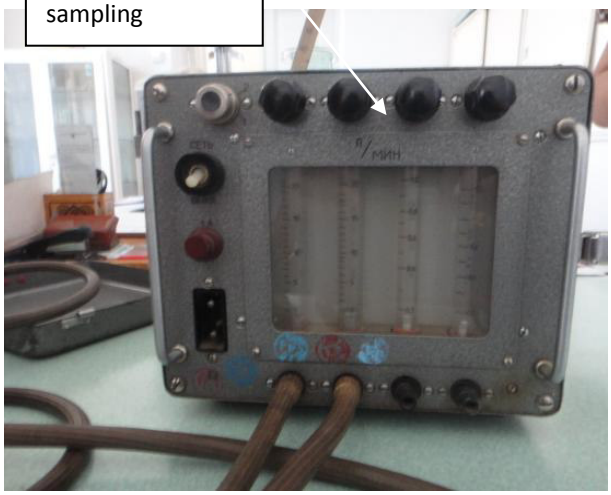
Annex B. Site inspection pictures

27. In the course of environmental monitoring all measurements had been made using the following tools at the lab of LSES Samarkand and Karshi:

28. Below tools are used for monitoring of dust suspended particles, background noise, vibrations, temperature, air humidity and illumination level. All tools have certificate of compliance of State Standardization Committee of RU (“Gosstandart”).



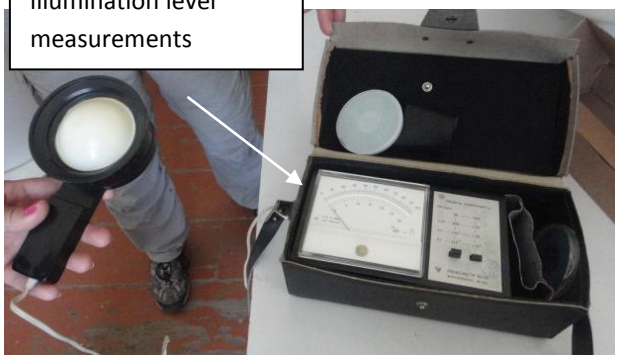
Aspirator for air sampling



Dust filters

Scales and weight in grams for suspended particles

Luxmeter for illumination level measurements



Humidity meter – to measure air humidity and temperature

Besides, in this laboratory water quality is inspected.

Kashkadarya TSS: Soil recultivation and rehabilitation results.

ANNEX C: *Post-Construction Environmental Audit Checklist/ Suggested Post-Construction Environmental Audit Checklist*

Marakand-Karshi Railway Electrification Project

Time: 24th August 2016

No.	Activity	Impacts	Measure/s suggested as per EIA/SSEMP/EMP	Check	Measures Implemented
1	Project site vegetation rehabilitation (re-vegetation)	Change of land cover, erosion resulting from the construction activities	Plantation and vegetation measures (trees, grass etc.)	Land rehabilitation measures at Marakand, Ayritam, Kashkadarya TSS,CBI posts, HBD & CBI modules	Operating entities of UTY (RRBs, depot etc) are implementing all measures as per design requirements.Recultivation and crop tending is performed by Shelterbelt forest Division of UTY.
			Proper landscaping with drainage	Landscaping works are completed. Trees, alfalfa and other landscaping had been performed under land rehabilitation segment.	Water towers and drainage systems are installed at all CBI posts, TSS & depot Karshi.
2	Demolishing old buildings	Exposure to Asbestos dust causes cancer	Asbestos containing roofing materials not broken, removed in sealed packages and disposed in designated sites (under control of PIU and supervision consultant)	As per design, asbestos containing materials cannot be used under the project.	Old housebreaking is not envisaged by the project. Only new buildings and structures had been constructed.
			Other construction debris removed	N/A	N/A
3	Oil management (PCB, Used oils)	Hazardous PCB oils from old transformers (manufactured before 1992) Equipment and machinery repairing	The transformers labelled. Oil release banned. Transformers collected by Uzebekenergo to dispose according regulations (under control of PIU and supervision consultant)	At TSS new transformers are installed (made in China) – 6 pieces.	Backup transformer (1 pc) is located at specially allocated area at Kashkadarya OCS duty post.
			Avoid oil spill to open soil. Repair works to be taken on concrete cover area.		When oil change is required or in emergency cases, oil is drained to oil basin under

					transformer. When oil is drained it is fed to oil reservoir thru emergency pit and pipeline. Later this oil is transported special workshops under UTY or Power Supply Ministry for further treatment, drying and regeneration. Upon positive results of oil analysis transformer oil is transported to Oil Facilities Depot under Power Supply Division of UTY or to the plant to be used for electric locos maintenance needs.
4	Waste management	Waste accumulation, air and soil pollution	Collect and disposal all wastes at designated location;	At all TSS, CBI posts large & small size containers are installed	Upon handing over procedure operating entities made an agreement with “Maxustrans” (waste disposal) & “Karshi sanitary tozalash” (mercury lamps recycling) organizations for waste removal and recycling of solid domestic waste and mercury lamps. Construction waste had been removed to specially dedicated places for recycling and use by local population. It is permitted to stock burnt-out mercury lamps at undamaged packing of new mercury lamps, preventing any damage of the lamps and potential mercury inlet to air, water, soil or food.

			Scrap metals properly stored to be sent to designated organization for recycling	No scrap metal on site	No scrap metal on site
5	Remove disabled equipment, including old transformers from the area	Housekeeping matters	Contractor equipment and machinery removed;	N/A	N/A
6	Road reinstatement	Road damages causing pollution, traffic disturbance and accidents	Streets with installed network reinstated to pre-construction or better conditions,	N/A	N/A
			Trees replanted as needed	N/A	N/A
			Access road reinstated to pre-construction or better conditions	Reconstructed	At CBI post Kashkadarya 2m long pathway had been reconstructed fully (asphalt paving
7	Borrow sites and quarries	Land slide, soil erosion, change in riverbed and landscape, accidents	Borrow sites and quarries restored	Reconstructed	Lands recultivation works as per design are in progress
8	Existing Infrastructure facilities (comunications)	Damage or disturbance to existing services (supply of electricity, water, gas, telecom etc.)	Reinstatement to pre-construction conditions or proper relocation, to be certified by the service companies	N/A	N/A
9	Camp site facilities	Residual pollution and disturbance to the localities	All temporary facilities removed and cleaned up	N/A	During project implementation, workers lived at the hotel & at rented flats.