

Project ISTC - K-1240p

“Post-containment Management and Monitoring of Mercury
Pollution in Site of Former PO “Khimprom” and Assessment
of Environmental Risk Posed by Contamination of
Groundwater and Adjacent Water Bodies of the Northern
Industrial Area of Pavlodar”

Quarterly technical report

on the work performed from 1 July 2008 - to 30 September 2008

Quarter 12

Non-profit JSC “Almaty Institute of Power Engineering and
Telecommunication”, BG Chair of Environmental Technology

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Project manager

Ilyushchenko M.A.
PhD (Chemistry)



11.11.2008

Signature / Data

1. Summary of Technical Progress

1.1. Current Technical Status

Task Subtask	Start (quarter)	End (quarter)	Status / Comments
1.1.	1	4	Has postponed till 13-15 quarters (when the project is extended) as a result of delay in funding due to replacement of Participant Institution PCP by Participant Institution Kaustik in the project.
1.2.	4	8	Completed.
1.3.	1	12	Implementing /The field works have been completed. Chemical and analytical works and data processing will be conducted in 13-15 quarters (when the project is extended).
2.1.	1	2	Completed
2.2.	3	4	Completed
2.3.	5	6	Completed
2.4.	7	12	Completed
2.5.	10	12	Completed.
2.6.	8	8	Has not been implemented as a result of delay in funding due to replacement of Participant Institution PCP by Participant Institution Kaustik in the project. The task will be replaced with different works in 13-15 quarters (when the project is extended).
2.7.	8	8	Has not been implemented as a result of delay in funding due to replacement of Participant Institution PCP by Participant Institution Kaustik in the project. The task will be replaced with different works in 13-15 quarters (when the project is extended).
2.8.	9	10	Has not been implemented as a result of delay in funding due to replacement of Participant Institution PCP by Participant Institution Kaustik in the project. The task will be replaced with different works in 13-15 quarters (when the project is extended).
2.9.	9	10	Completed
3.1.	1	2	Has postponed till 13-15 quarters (when the project extended) as a result of delay in funding due to replacement of Participant Institution PCP by Participant Institution Kaustik in the project.
3.2.	4	6	Implementing/the data have been collected for production of the local model, estimating the direction of movement of groundwater contaminated with oil products. The further work will be implemented in 13-15 quarters (when the project is extended)
3.3.	8	8	Has not been implemented as a result of delay in funding due to replacement of Participant Institution PCP by Participant Institution Kaustik in the project. The task will be replaced with different works in 13-15 quarters (when the project is extended).
3.4.	8	8	Completed/Groundwater sampling as well as their analysis for oil products have been conducted.
3.5.	9	11	Implementing/The data have been collected for production of the local model characterizing the groundwater pollution with oil products beyond Pavlodar Oil refinery. The further work will be carried out in 13-15 quarters (when the

			project is extended).
3.6.	11	12	Has not been implemented. Postponed 13-15 quarters (when the project is extended) as a result of delay in completion of the task 3.4 as well as the tasks 3.2 and 3.5.
4.1.	1	2	Completed
4.2.	2	10	Completed
4.3.	3	11	Completed
4.4.	4	8	Completed
4.5.	4	9	Completed
4.6.	10	12	Implementing/Publication has been prepared on mercury pollution of biota of the wastewater storage pond Balkyldak. In 13-15 quarters (when the project is suspended) recommendations on mitigation of the risk from mercury contamination of fish inhabiting the wastewater storage pond Balkyldak will be discussed and prepared.
5.1.	1	12	Implementing/Fall monitoring of groundwater for mercury content has been conducted together with Pavlodar company "Izyskatel" after the company was provided with methods and skills in hydro-geological works. In 13-15 quarters (when the project is suspended) the final report on K-1240 and its resume as well as recommendations on conducting further monitoring and clean-up works will be send to the local authority.
5.2.	1	12	Implementing /The presentations for two international conferences have been prepared and accepted by Stirring Committees of the conferences: "Remediation of Contaminated Sediments" (USA, Florida. 2-5 February, 2009) and "Mercury as a Global pollutant"(China, Guayan, 1-4 June, 2009). The presentations will be presented in 14-15 quarters (when the project is suspended)

1.2 Tasks of the work plan

Task 1: Study of the movement of mercury in the groundwater rise in depressed area in saturated and unsaturated zones and its accumulation in the shallow ponds and vegetation. Development of management strategy to contain the risk to population in the vicinity and livestock.

Subtask 1.1: To facilitate the Laboratory of environmental protection of PCP with the equipment for conduction of mercury monitoring, and to train the local staff

▪ Results by the end of the current quarter

The equipment purchase could not be done within all duration of the project due to the bankruptcy of Pavlodar Chemical Plant and conducting the procedure of the Participant Institution replacement by JSC "Kaustic" which was started in 4th quarter and completed only in 11th quarter (the equipment had to be purchased from the budget of the Participant Institution PCP/Kaustic). The list of laboratory equipment necessary to acquire for the Laboratory of the Nature Protection of JSC "Kaustic" in 13-15 quarters when the project is extended was discussed and approved by Eun Joo Yi, the project curator and Paul Randall, the project coordinator during their visit to Pavlodar in September, 2008.

Task 1: Study of the movement of mercury in the groundwater rise in depressed area in saturated and unsaturated zones and its accumulation in the shallow ponds and vegetation. Development of management strategy to contain the risk to population in the vicinity and livestock.

Subtask 1.3.: To carry out 3-year monitoring program (sampling and analysis), including the

monitoring of soils, surface and ground water, aquatic biota, milk, and grazing grass in the close vicinity of groundwater contamination. To measure the hydrogeological parameters (water levels in boreholes, pH, temperature, redox potential) simultaneously with groundwater sampling.

- **State / Situation at the beginning of the current quarter**

Field works have been conducted on investigation of groundwater mercury contamination: groundwater samples have been taken from 81 observation boreholes (in total 101 observation boreholes have been investigated, including 2 boreholes from where samples were taken twice, but from 18 ones it was impossible to take the samples at all) together with scientists from Oxford University, UK Dr. Donald Parchelli and PhD student Arany Kajenthira as well as with Paul Randall, the project coordinator (US EPA). When sampled the water was tested for the temperature and pH.

Groundwater tables were measured in 154 observation boreholes.

4 integrated samples of grazing grass have been taken at the pasture for livestock belonging to the inhabitants of Pavlodarskoe village in places of mercury contaminated groundwater possible rise.

- **Fulfilled work**

From 15th August to 25th September, 2008 field works were conducted on investigation of mercury pollution in the Northern outskirts of Pavlodar City: (i) AIPET together with Pavlodar company "Izyskatel" which won the regional tender for conducting mercury monitoring of groundwater in the Northern industrial area of Pavlodar have sampled groundwater from 74 observation boreholes for their analysis for total mercury content; (ii) AIPET has taken 5 samples of surface water out of the wastewater storage pond Balkyldak using membrane filter with diameter of 0.45 µm for separate determination of total and dissolved mercury; (iii) AIPET has measured the groundwater tables in 150 boreholes; (iv) Kaustic has taken 240 samples of topsoil (0-10 cm soil layer) according to the regular grid within the demercurization area at the territory of the former PO "Khimprom", Pavlodar.

- **Results by the end of the current quarter**

Samples of groundwater and surface water taken by AIPET were treated with bromide-bromate mixture in situ (as it was done before when digesting samples in laboratory conditions) and sent to the laboratory in Almaty. The samples taken by the "Izyskatel" company were sent to the laboratory of the company in Pavlodar without any preservation and digested with mixture of nitric acid and potassium dichromate at the same day and analyzed as it is recommended by the method of the factory producer of the instrument AAC KBAHT-Z.ЭТА, Russia used for the analysis.

The results of analyses of the AIPET laboratory implemented using AFS "Millennium Merlin" 10.025 have given in the Annex. In 80% cases the results are very close to those obtained by the "Izyskatel" company.

The results of groundwater tables' measurement have been delivered to Participant Institution IHH; the results of the groundwater analysis for mercury have been compiled in the Summary table.

When taken soil samples were homogenized and divided into duplicates: one duplicate was sent to Stepnogorsk Laboratory of Biomonitoring of Participant Institution BMP; another one - to AIPET Laboratory in Almaty.

- **Personnel Commitments**

Name	Category	Work days
Caustic		
Akhmetov Arthur Darazhatovich	1	41
Karimov Sharapat Sattarovich	1	48
Merenkova Lyudmila Borisovna	1	30
Sedlekaya Natalia Ivanovna	1	24
Kosyashnikova Ol'ga Mikhailovna	1	24
Tskhay Aleksandra Ivanovna	1	10

Solov'eva Nadezhda Vassilievna	1	44
Putikova Lyudmila Yurievna	1	19
Shelkoplyas Lidiya Vassilievna	1	19
AIPET		
Kuzmenko Larissa Vitalievna	1	10
Ilyushchenko Mikhail Alexeevich	1	8
Uskov Grigoriy Aleksandrovich	2	5
Stepanov Vladimir Aleksandrovich	2	4

**Task 2: Assessment of possibility for mercury-polluted groundwater flow to change its direction; study of interaction of contaminated groundwater with bearing strata and underlying aquifers:
Subtask 2.6: To construct additional observation boreholes reaching the second aquifer in the area of mercury pollution**

▪ **Results by the end of the current quarter**

Local subcontractor – Pavlodar Hydro-geological Expedition had to fulfill drilling boreholes within the area of mercury contamination. These works had to be paid from the budget of Participant Institution PCP/Kaustic. However it was impossible to pay such a work timely since because of bankruptcy of JSC “Pavlodar Chemical Plant” the procedure of replacement of this Participant Institution by JSC “Kaustic started in the 4th quarter was finished only in the 11th quarter of the project. On agreement with Kaustic’s administration it was suggested to replace these works by additional sampling of soils (these works were implemented in the 12th quarter, see the section 1.3 of this report), their analysis for total mercury content and mapping of the topsoil mercury pollution of the area around the former chlor-alkali production (these works shall be fulfilled in 13-15 quarters when the project is extended).

**Task 2: Assessment of possibility for mercury-polluted groundwater flow to change its direction; study of interaction of contaminated groundwater with bearing strata and underlying aquifers:
Subtask 2.7: To take samples of bearing strata during drilling of additional boreholes and samples of groundwater after drilling for subsequent laboratory experiments.**

▪ **Results by the end of the current quarter**

Local subcontractor – Pavlodar Hydro-geological Expedition had to drill boreholes within the area of mercury pollution, to take samples of bearing strata as well as samples of groundwater after pumping of the new boreholes. These works had to be paid from the budget of Participant Institution PCP/Kaustic. However it was impossible to pay such a work timely since because of bankruptcy of JSC “Pavlodar Chemical Plant” the procedure of replacement of this Participant Institution by JSC “Kaustic started in the 4th quarter was finished only in the 11th quarter of the project. On agreement with Kaustic’s administration it was suggested to replace these works by additional sampling of soils (these works were implemented in the 12th quarter, see the section 1.3 of this report), their analysis for total mercury content and mapping of the topsoil mercury pollution of the area around the former chlor-alkali production (these works shall be fulfilled in 13-15 quarters when the project is extended).

**Task 2: Assessment of possibility for mercury-polluted groundwater flow to change its direction; study of interaction of contaminated groundwater with bearing strata and underlying aquifers:
Subtask 2.8: To analyze the samples of groundwater for the concentration of total Hg and major anions.**

▪ **Results by the end of the current quarter**

Local subcontractor – Pavlodar Hydro-geological Expedition had to drill boreholes (as well as to analyze groundwater samples for total mercury content taken after pumping the new boreholes)

within the area of mercury pollution. These works had to be paid from the budget of Participant Institution PCP/Kaustic. However it was impossible to pay such a work timely since because of bankruptcy of JSC “Pavlodar Chemical Plant” the procedure of replacement of this Participant Institution by JSC “Kaustic started in the 4th quarter was finished only in the 11th quarter of the project. On agreement with Kaustic’s administration it was suggested to replace these works by additional sampling of soils (these works were implemented in the 12th quarter, see the section 1.3), their analysis for total mercury content and mapping of the topsoil mercury pollution of the area around the former chlor-alkali production (these works shall be fulfilled in 13-15 quarters when the project is extended).

Task 3: Study of the spread of groundwater plume contaminated with oil products from the territory of Pavlodar Oil Refinery; development of model and assessment of environmental risk posed by oil-products contamination of groundwater in the Northern industrial area of Pavlodar. Subtask 3.1: To facilitate the Laboratory of environmental protection of PCP with the equipment to monitor contamination of groundwater with oil products, and to train the local staff.

- **Results by the end of the current quarter**

The equipment purchase could not be done within the project duration due to bankruptcy of JSC “Pavlodar Chemical Plant” and the procedure of replacement of this Participant Institution by JSC “Kaustic” started in the 4th quarter was finished only in the 11th quarter of the project (the equipment had to be purchased from the budget of Participant Institution PCP/Kaustic). The list of laboratory equipment necessary to acquire for the Laboratory of the Nature Protection of JSC “Kaustic” in 13-15 quarters when the project is extended was discussed and approved by Eun Joo Yi, the project curator and Paul Randall, the project coordinator during their visit to Pavlodar in September, 2008.

Task 3: Study of the spread of groundwater plume contaminated with oil products from the territory of Pavlodar Oil Refinery; development of model and assessment of environmental risk posed by oil-products contamination of groundwater in the Northern industrial area of Pavlodar. Subtask 3.2: Basing on the hydrogeological model of Northern industrial area of Pavlodar to estimate the most likely direction of the plume of oil products with groundwater..

- **Fulfilled work**

Based on the analysis of archival data and the general model of the Northern industrial area of Pavlodar the maps of level surface within the industrial area of Pavlodar Oil Refinery (POR) for the period of 1987–2007 have been produced.

- **Results by the end of the current quarter**

Possible direction of spread of the plume of oil products groundwater pollution from the underground contaminating spot of oil products at the territory of Pavlodar Oil Refinery has been estimated.

- **Personnel Commitments**

Name	Category	Work days
IHH		
Panichkin Vladimir Yurievich	2	10
Miroshnichenko Oxana Leonidovna	2	10
Trushel' Lyudmila Yurievna	2	4
Zakharova Nonna Maximovna	2	5

Task 3: Study of the spread of groundwater plume contaminated with oil products from the territory of Pavlodar Oil Refinery; development of model and assessment of environmental risk posed by oil-products contamination of groundwater in the Northern industrial area of Pavlodar.

Subtask 3.3: To construct the cross-section of boreholes at right angle to plume direction at the distance of 1-1.5 km from pollution source in order to detect the plume of contamination. To use concurrent drilling of new boreholes and sampling & chemical analysis of groundwater

▪ **Results by the end of the current quarter**

Local subcontractor – Pavlodar Hydro-geological Expedition had to drill boreholes within the area of oil products pollution. These works had to be paid from the budget of Participant Institution PCP/Kaustic. However it was impossible to pay such a work timely since because of bankruptcy of JSC “Pavlodar Chemical Plant” the procedure of replacement of this Participant Institution by JSC “Kaustic started in the 4th quarter was finished only in the 11th quarter of the project. On agreement with Kaustic’s administration it was suggested to replace these works by additional sampling of soils (these works were implemented in the 12th quarter, see the section 1.3), their analysis for total mercury content and mapping of the topsoil mercury pollution of the area around the former chlor-alkali production (these works shall be fulfilled in 13-15 quarters when the project is extended).

Task 3: Study of the spread of groundwater plume contaminated with oil products from the territory of Pavlodar Oil Refinery; development of model and assessment of environmental risk posed by oil-products contamination of groundwater in the Northern industrial area of Pavlodar. Subtask 3.4: To contour the plume by creation of the network of observation boreholes in the plume direction. To use concurrent drilling of new boreholes and sampling & chemical analysis of groundwater

▪ **State / Situation at the beginning of the current quarter**

In the 4th quarter of the project the depth of occurrence of upper boundary of underground contaminating spot of oil products and its spread to the west direction were investigated in the vicinity of the fence around the industrial area of Pavlodar Oil Refinery 500 m far from its north-west corner. For that using a hand-held soil auger four boreholes 5.5 m deep have been drilled at 10 m interval along the profile of sub-latitudinal strike. The first borehole was located 3 m far from the observation borehole No.54 (5 m far from the fence of POR) where groundwater contamination with oil products had been found before (2001-2002). The groundwater table in the observation borehole No.54 was 4.8 m during the field works conducting. When drilling the first and the second boreholes starting from the depth of 2.6 m from the ground surface strong smell of oil products appears what the evidence of the pollution was. In the third and fourth boreholes the oil products were not found. Thus at present the spot of oil products pollution is 1 m thick and has spread 25-30 m far to the west from the industrial area of Pavlodar Oil Refinery.

▪ **Fulfilled work**

Since it has turned out impossible to fulfill drilling of new boreholes at the area of oil products groundwater contamination (see the section 3.3) in August-September, 2008 AIPET team took groundwater samples from 80 accessible boreholes belonging to the existing network of observation boreholes of the Northern industrial area of Pavlodar. The method of sampling was similar to that for total mercury determination, groundwater samples were placed into new non-used glass bottles acquired at the local vodka distillery. In the middle of September without preservation, just been cooled the groundwater samples were sent to Participant Institution BMP to Stepnogorsk Biomonitoring Laboratory where during a week the samples were analyzed for recoverable petroleum carbohydrates using the gas chromatographer "Hewlett Packard", USA with flame-inductive detector Hewlett Packard 6890, method MADEP-EPH-98-1 of Environmental Protection Agency of Massachusetts state, USA.

▪ **Results by the end of the current quarter**

In none of the groundwater samples taken at the Northern industrial area of Pavlodar the oil products dissolved in water have been found.

- **Personnel Commitments**

Name	Category	Work days
AIPET		
Kuzmenko Larissa Vitalievna	1	5
Ilyushchenko Mikhail Alexeevich	1	6
Uskov Grigoriy Aleksandrovich	2	2
Stepanov Vladimir Aleksandrovich	3	4
BMP		
Smirnova Svetlana Yurievna	1	19
Prikhodko Tatyana Vladimirovna	1	37,5
Starodubova Valentina Fedorovna	1	16
Zhulikova Xeniya Sergeevna	2	11
Mukanov Kassym Kassenovich	2	11
Abeldenov Sailau Kassenovich	2	11
Balpanov Darkhan Serikovich	2	7
Volkov Oleg Efimovich	2	22

Task 3: Study of the spread of groundwater plume contaminated with oil products from the territory of Pavlodar Oil Refinery; development of model and assessment of environmental risk posed by oil-products contamination of groundwater in the Northern industrial area of Pavlodar. Subtask 3.5: To draw up the forecasts for the spread of oil products with groundwater using the hydrogeological model in the Northern industrial area of Pavlodar

- **Fulfilled work**

The archival data analysis has been conducted. The boundaries of the local model of the area of oil products contamination have been chosen. Detailed hydro-geological cross-sections of the modeled area have been constructed. Hydro-geological conditions have been schematized (number of layers of the local model has been determined, their boundaries have been drawn at the hydro-geological cross-sections, internal and external boundary conditions have been established for the local model etc.). The cross-sections and the results of schematization have been introduced in Geographic Information System (GIS) produced by means of MapInfo software as well as in the data base produced by means of FoxPro software. Using MapInfo software the hydro-dynamic scheme has been constructed.

- **Results by the end of the current quarter**

The results of schematization have been transformed to formats used by GMS modeling system.

- **Personnel Commitments**

Name	Category	Work days
IHH		
Panichkin Vladimir Yurievich	2	20
Miroshnichenko Oxana Leonidovna	2	20
Trushel' Lyudmila Yurievna	2	10
Zakharova Nonna Maximovna	2	10

Task 3: Study of the spread of groundwater plume contaminated with oil products from the territory of Pavlodar Oil Refinery; development of model and assessment of environmental risk posed by oil-products contamination of groundwater in the Northern industrial area of Pavlodar. Subtask 3.6: To assess the risks posed by groundwater contamination with oil products for the

population of Northern outskirts of Pavlodar and for river Irtysh floodplain

▪ Results by the end of the current quarter

Since it has turned out impossible to fulfill drilling of new boreholes at the area of oil products groundwater contamination (see the section 3.3) and monitoring of oil products dissolved in groundwater on the existing network of observation boreholes has given no results (see the section 3.4) it has turned out possible to assess the risk of groundwater contamination with oil products from the underground contaminating spot at the area of Pavlodar Oil Refinery for population inhabiting Pavlodar outskirt and the Irtysh River floodplain only by the way of computer modeling.

The computer modeling was started in the 12th quarter of the project (see the section 3.2 and 3.5) and will be continued in 13-15 quarters when the project is extended.

Task 4: Assessment of possibility to contain the risk posed by mercury pollution of lake Balkyldak including the fish within it:

Subtask 4.6: To identify the pathways of Hg bioaccumulation and to develop the possible solutions to break these pathways.

▪ State / Situation at the beginning of the current quarter

Analysis of possible food chains as well as pathways of Hg bioaccumulation has been conducted.

▪ Fulfilled work

The results of study of mercury contamination impact upon the biota of the wastewater storage pond Balkyldak have been summarized during preparation of the abstract and presentation on the risk assessment posed by mercury contamination of the pond.

▪ Results by the end of the current quarter

Presentation M. Ilyushchenko, P. Randall, R. Tanton, L. Yakovleva, A. Ubas'kin, R. Kamberov. "Mercury risk assessment from a wastewater storage pond in Pavlodar city, Northern Kazakhstan", which has been accepted at Fifth Battelle International Conference on Remediation of Contaminated Sediments (Florida, February 2-5, 2009).

▪ Personnel Commitments

Name	Category	Work days
PSU		
Malkov Igor Viktorovich	1	11
Kuzmin Valery Sergeevich	1	30
Pastukh Viktor Petrovich	1	25
Kalieva Aida Akhmetbekovna	2	22
AIPET		
Ilyushchenko Mikhail Alexeevich	1	8
Kamberov Rustam Irkenovich	2	15
Yakovleva Lyudmila Vassilievna	2	10

Task 5: To draw up and discuss with local stakeholders the recommendations for the 2nd stage of demercurization and other remediation activities in the area of the former PO "Khimprom" (Northern industrial area of Pavlodar), including the recommendation for abolishment or further safe use of the wastewater storage pond – lake Balkyldak:

Subtask 5.1: To discuss the work program and obtained results with Pavlodar regional

department of environmental protection and with the managers of Pavlodar Chemical Plant

▪ State / Situation at the beginning of the current quarter

The results obtained on ISTC K-1240p project have been presented at three international conferences.

▪ Fulfilled work

On agreement with the local authority the field works of 2008 have been conducted in cooperation with Pavlodar company “Izyskatel” which won the regional tender on monitoring of groundwater mercury pollution in the Northern industrial area of Pavlodar city (the company has involved T.V. Tolskyh and N.V. Volyneys, the weapon scientists – former employees of the Laboratory of the Nature Protection of Pavlodar Chemical Plant). The methods and skills of groundwater sampling for their analysis for mercury contamination have been provided.

Original materials and methods of field works on ISTC K-1240 p project have been delivered to Pavlodar Hydro-geological Expedition which is preparing the updated Program of Mercury Monitoring of the Northern industrial area of Pavlodar city by request of the regional authority as well as the assistance has been rendered in development of goals and objectives of the mercury monitoring.

▪ Results by the end of the current quarter

The results, methods and skills of work on ISTC K-1240p project have been delivered to the regional organizations which will continue the field works on mercury monitoring in the Northern industrial area of Pavlodar city.

▪ Personnel Commitments

Name	Category	Work days
AIPET		
Kuzmenko Larissa Vitalievna	1	10
Ilyushchenko Mikhail Alexeevich	1	8
Uskov Grigoriy Aleksandrovich	2	3
Stepanov Vladimir Aleksandrovich	3	4

Task 5: To draw up and discuss with local stakeholders the recommendations for the 2nd stage of demercurization and other remediation activities in the area of the former PO “Khimprom” (Northern industrial area of Pavlodar), including the recommendation for abolishment or further safe use of the wastewater storage pond – lake Balkyldak:

Subtask 5.2: To hold the workshops, press-conferences and presentation in order to discuss the interim results

▪ State / Situation at the beginning of the current quarter

Abstracts and presentations have been prepared for two international conferences.

▪ Fulfilled work

Three presentations have been prepared for two international conferences:

1. M. Ilyushchenko, P. Randall, T. Tanton, L.Yakovleva, A.Ubas'kin, R.Kamberov. “Mercury risk assessment from a wastewater storage pond in Pavlodar city, Northern Kazakhstan” for Fifth Battelle International Conference on Remediation of Contaminated Sediments (Florida, February 2-5, 2009)

2. M.A.Ilyushchenko, L.V.Yakovleva. Problems of demercurization of industrial objects within the former USSR for 9th International Conference on Mercury as a Global Pollutant (Guiyang, China June 7-12, 2009)

3. O.L.Miroshnichenko, V.Yu.Panichkin, M.A.Ilyushchenko, P.Randall, T.W.Tanton. Mathematical modeling of groundwater mercury pollution, post-demercurization monitoring and evaluation of clean-up efficiency (case of Northern industrial area of Pavlodar City, Kazakhstan) for 9th International Conference on Mercury as a Global Pollutant (Guiyang, China June 7-12, 2009)

- **Results by the end of the current quarter**

The results obtained on ISTC K-1240p project have been submitted as presentations at two international conferences.

- **Personnel Commitments**

Name	Category	Work days
AIPET		
Ilyushchenko Mikhail Alexeevich	1	8
Yakovleva Lyudmila Vassilievna	2	3
Kamberov Rustam Irkenovich	2	20
IHH		
Panichkin Vladimir Yurievich	2	10
Miroshnichenko Oxana Leonidovna	2	10

Task 0.: Project Management

- **Fulfilled work**

In August-September, 2008 field works have been conducted in Pavlodar; possibility of ISTC K-1240p project extension for 13-15 quarters was discussed with Eun Joo Yi, the project curator and Paul Randall, the project coordinator during their visit to Kazakhstan in September, 2008; the technical report for the 12th quarter of the project has been prepared.

- **Personnel Commitments**

Name	Category	Work days
AIPET		
Ilyushchenko Mikhail Alexeevich	1	8
Yakovleva Lyudmila Vassilievna	2	10
Kamberov Rustam Irkenovich	2	20
Ibraeva Alma Abylkasymovna	3	17

2. Summary of Personnel Commitments

	Number of persons	Total days	Total grants (US\$)
Category I	17	468.5	11460
Category II	13	281	8223
Category III	2	29	520
Category IV			
Total:	32	778.5	20203

2.1. Change in the project personnel

no

3. Preparation of reports and publications

1. The Report for Quarter XII has been prepared.

4. Significant Travel and Meetings

4.1. Travel and meetings inside CIS

1. Pavlodar 13.08.08-11.09.08 V.Stepanov, N.Zyryanova
2. Pavlodar 13.08.08-5.09.08 M.Ilyushchenko, L.Yakovleva
3. Pavlodar 15-30.09.08 V.Stepanov, N. Zyryanova
4. Pavlodar 9-11.09.08 M.Ilyushchenko, L.Yakovleva
5. S.Peterburg 18-27.09.08 M.Ilyushchenko, L.Yakovleva

4.2. Travel and meetings outside CIS

no.

5. Cooperation with foreign collaborators

Paul Randall, the project coordinator has visited Kazakhstan (Almaty and Pavlodar cities), participated in discussion of the results of ISTC K-1240p and possibility of its extension for 13-15 quarters.

6. Procurement

Number in accordance with Work Plan	Name	Status
	no	

7. Questions, suggestions

(Including plans for the next quarter(s), if initial Work Plan has been changed significantly).

Due to delay in the project funding in 2007-2008 field works in Pavlodar in 2008 was conducted later than it was scheduled in the Work Plan and drilling of new boreholes has not been done at all. In this connection a part of chemical analytical works, data processing, production of maps and models, summarizing of the material and development of recommendations have not been completed by the end of the Quarter XII. Also most of equipment has not been purchased.

It was suggested to extent K-1240p project for three quarters at the cost of its unspent budget.

A N N E X

Results of determination of total mercury in PCP boreholes in summer-fall, 2008 (and their comparison with those obtained in 2004-2007). AIPET data							“Izyskatel” company data	
Borehole number	Total mercury content	Total mercury content	Total mercury content	Total mercury content	Borehole number	Total mercury content	Borehole number	Total mercury content
	ng/L	ng/L	ng/L	ng/L		ng/L		ng/L
	2004	2005	2006	2007		2008		2008
C-16-03	129		144	121		not tested		
C-17-03	223		171	71.2	C-17-03	80.8	C-17-03	52.9
C-18-03	36		46	42.3		not tested		
C-19-03	175		229	98.1	C-19-03	93.9	C-19-03	53.4
C-20-03	97		140	83	C-20-03	246	C-20-03	185.8
C-21-03	4425		1630	734	C-21-03	535	C-21-03	940
C-SLED	3195		Impossible to pump out	Impossible to pump out		not tested		
C-22-03	1400		1200	593	C-22-03	731	C-22-03	707
C-24-03	2995		Impossible to pump out	Impossible to pump out		not tested		
C-26-03	19		Impossible to pump out	Impossible to pump out		not tested		
C-29-03	58		Impossible to pump out	Impossible to pump out		not tested		
C-30-03	45250		23500	19100	C-30-08 2m far from C-30-03	19800	C-30-08	16046
C-SLED-2	90650		Impossible to pump out	Impossible to pump out		not tested		

C-28-03	5390	Impossible to pump out	Impossible to pump out		not tested		
C-23-03	648	Impossible to pump out	Impossible to pump out		not tested		
C-25-03	2455	2180	1160	C-25-03	1580	C-25-03	1302
C-27-03	24450	12500	11900	C-27-03	22000	C-27-03	10895
C-15-03	1625	11800	15000	C-15-03	25400	C-15-03	14283
C-14-03	2875	7450	12600	C-14-03	17200	C-14-03	6010
C-13-03	6175	4700	4080	C-13-03	3780	C-13-03	3430
C-11-03	29550	16400	7400	C-11-03	6560	C-11-03	6385
C-12-03	28850	31500	20600	C-12-03	25600	C-12-03	25200
C-8-03	35400	43500	38000	C-8-03	37200	C-8-03	844,6
C-9-03	27200	17600	14400	C-9-03	20700	C-9-03	3370.5
C-NN3-03	6025	Impossible to pump out	Impossible to pump out		not tested		
C-34-03	80	86	57	C-34-03	47.2	C-34-03	49.2
C-35-03	171	737	387	C-35-03	118	C-35-03	72.8
C-33-03	943	941	536	C-33-03	719	C-33-03	310.8
C-32-03	43850	40600	49300	C-32-03	129000	C-32-03	13560
63-02	5050	3950	3190	63-08 2m far from 63-02	2060	63-08	1946.5
62-02	35	21	22.9	62-02	15.2	62-02	63.9
C-6-03	21	138	235		not tested		
84-02	28850	30800	33600	84-02	44500		
67-02	854	493	439	67-02	326		
83-02	798	493	445	83-02	322	83-02	692
72-02	69	44	31.9	72-02	32.3	72-02	45.6
90-02	140	140	74.2	90-02	67.5	90-02	53.6
74-02	1435	338	164		not tested		
87-02	9315	6150	3990	87-02	4580	87-02	3045

70-02	105	307	232		not tested			
73-02	479	744	763	73-02		1560	73-02	183.2
79-02	126	919	2760	79-02		3200	79-02	216.5
55-02	50	59	163	55-02		28.3	55-02	55.8
89-02	76	38	Very low flow rate of the well		not tested			
88-02	468	504	262		not tested			
682	3160	Impossible to pump out	Impossible to pump out		not tested			
P-6	50	10	10.3	P-6		21.50	P-6	55.1
565-00	29	52	35.5	565-00		20.8	565-00	30.9
522-00	<5	<5	<5	P28 (522)		10.6	522-00	127
78-02	32	111	?	78-02		330	78-02	30.4
81-02	14	9	13.8	81-02		5.60	81-02	44.3
566-00	3055	5100	2870	566-00		2690	566-00	702
86-02	1775	287	104	86-02		63.2	86-02	172,2
85-02	6	<5	<5	85-02		<5	85-02	27.5
P-1	23	83	56.3	P-1		9.75	P-1	46.6
6-P	39	29	32.1	6-P		32.6	6-P	38.3
5-P	12	<5	6.19	5-P		10.7	5-P	34.7
C-5-03	121	160	200	C-5-03		213	C-5-03	197.3
C-4-03	517	354	195	C-4-03		722	C-4-03	236.9
P-3	24700	14700	low flow rate of the well		not tested			
C-2-03	137000	36500	42700	C-2-03		48500	C-2-03	883
C-1/1-03	2135	5600	3820	C-1/1-03		2990		
B-22	1255	4780	2240	B-22		3290	B-22	515.3
8-P	<5	Impossible to pump out	Impossible to pump out		not tested			
7-P	3875	2490	2810	7-P		1770	7-P	2739.5
B-23	946	442	440	B-23		626	B-23	253.1
C-1-03	212	Impossible to pump out	Impossible to pump out		not tested			

B-14	4030		Impossible to pump out	Impossible to pump out		not tested	
B-13	2845		724	215	B13	255	B-13 166.3
P-4	159		72	28	P-4	51.2	P-4 39.1
75-02	166		364	273		not tested	75-02
76-02	8		<5	9.25	76-02	27.9	76-02 56.2
61-02	17600		5420	2260	61-02	1880	
B-21	12150		27300	33300	B-21	35900	
60-02	15		Impossible to pump out	Impossible to pump out		not tested	
C-10-03	41300		39300	40900	C-10-03	37800	C-10-03 2574
B-21a	126000		Out of operation	Out of operation		not tested	
567-00	47000		23400	48900	567-00	58200	567-00 3358
P-8	102750	18000	14200	14500	P-8	23400	P-8 21750
82-02	57550		44600	34500	82-02	42200	
66-02	85300		167000	108000	66-02	90400	
59-02	41100		32400	24900	59-02	14600	59-02 28800
68-02	36700		57200	65200	68-02	71700	
69-02	153500	165000	154000	137000	69-02	81200	
29-P	not tested		449	Out of operation		not tested	
165-04	not tested		10500	8980	165-04	7220	
166-04	not tested		3380	2830	166-04	4170	
167-04	not tested		3310	2420	167-04	2580	
169-04	not tested		28200	32300	169-04	31400	
170-04	not tested		6880	7970	170-04	16000	
168-04	not tested		7220	7410	168-04	6880	
171-04	not tested		270	95.2	171-04	65.1	
162-04	not tested		295	Impossible to pump out		not tested	
164-04	not tested		123	139	164-04	375	
529	not tested		44	61.6	529-00	42.5	

64-02	not tested	7	27.4	64-02	21.8	64-02	35.9
24-91 (93)	not tested	71	87	24-91	62.7	24-91	44.9
77-02	not tested	<5	9.49	77-02	<5	77-02	62.7
23-91 (92)	not tested	11	21	23-91	5.87	23-91	32.6

Comments. The following are colored: (i) in columns “*Borehole number*”: by **red** – increase in Hg concentration, by **green** – decrease in Hg concentration, by **blue** – absence of dynamic; (ii) in columns “*Total Hg content*”: by **red** – excess of MPCw (i.e. 500 ng/L)