ACWA Power Sirdarya 1,500MW CCGT Power Plant (IPP)
Republic of Uzbekistan

Environmental and Social Impact Assessment

Volume 4 – Appendices

Prepared for:

October 2020

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5CS PROJECT MANAGER	Eva Muthoni Kimonye
5CS PROJECT DIRECTOR	Ken Wade

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5 Capitals Environmental and Management Consulting
Principal office: PO Box 119899 Sheikh Zayed Road, Dubai, UAE
☏+971 4 343 5955 🖷+971 4 343 9366

APPENDIX A – MINISTRY OF ENERGY COMMUNICATION ON DECOMMISSIONING OF 4 UNITS AT SYRDARYA TPP

"ТАСДИҚЛАЙМАН"
Ўзбекистон Республикаси
Энергетика вазири
_____ А. Султанов
2020 йил "___" май

2020-2030 йилларда иссиқлик электр станцияларда эскирган қурилмаларни фойдаланишдан чиқариш
ДАСТУРИ

(Ўзбекистон Республикаси Президенти Ш.М.Мирзиёев ҳузурида 2020 йил 4 май куни ўтказилган йиғилиш 27-сон (06.05.2020й., 02-1037 хдфу-сон) баёни 10-банди)

№	Станция номи	Фойдаланишдан чиқариладиган			Амалга ошириладиган чора тадбирлар	Масъул
		қурилма рақами	қувват, *МВт*	мудлат		
1	"Сирдарё ИЭС" АЖ	энергоблок № 7,8	520	2023й.	1. Қурилмаларни республикада амал қиладиган коидаларга ва ҳужжатларга асосан ўрнатилган тартибда технологик консервацияга чиқариш. 2. Асосий ва ёрдамчи ускуналарни ҳатловдан ўтказиш ва сақланишини таъминлаш.	Энергетика вазирлиги *(Ходжаев)*, "ИЭС" АЖ *(Мубаракшин)*
		энергоблок № 1,2	650	2024й.		
2	"Тошкент ИЭС" АЖ	энергоблок № 7	145	2021й.	1. Ўрнатилган тартибда қурилмаларни боскичма-боскич фойдаланишдан чиқариш. 2. Асосий ва ёрдамчи ускуналарни ҳатловдан ўтказиш.	Энергетика вазирлиги *(Ходжаев)*, "ИЭС" АЖ *(Мубаракшин)*
		энергоблок № 5,6	275	2022й.		
		энергоблок № 1,2,8,9	525	2023й.		

		энергоблок № 10,11	280	2024й.	1. Қурилмаларни республикада амал қиладиган қоидаларга ва ҳужжатларга асосан ўрнатилган тартибда технологик консервацияга чиқариш. 2. Асосий ва ёрдамчи ускуналарни ҳатловдан ўтказиш ва сақланишини таъминлаш.	
		энергоблок № 3,4,12	405	2025й.		
3	"Навоий ИЭС" АЖ	энергоблок № 3,8	250	2021й.	1. Ўрнатилган тартибда қурилмаларни фойдаланишдан чиқариш. 2. Асосий ва ёрдамчи ускуналарни ҳатловдан ўтказиш.	Энергетика вазирлиги *(Ходжаев)*, "ИЭС" АЖ *(Мубаракшин)*
		энергоблок № 4,9	260	2023й.	1. Ўрнатилган тартибда қурилмаларни республикада амал қиладиган қоидаларга ва ҳужжатларга асосан технологик консервацияга чиқариш. 2. Асосий ва ёрдамчи ускуналарни ҳатловдан ўтказиш ва сақланишини таъминлаш.	
		энергоблок № 11,12; турбоагрегат № 5,7	350	2024й.		
4	"Талимаржон ИЭС" АЖ	энергоблок № 1	780	2025й.	1. Ўрнатилган тартибда қурилмани республикада амал қиладиган қоидаларга ва ҳужжатларга асосан технологик консервацияга чиқариш. 2. Асосий ва ёрдамчи ускуналарни ҳатловдан ўтказиш ва сақланишини таъминлаш.	Энергетика вазирлиги *(Ходжаев)*, "ИЭС" АЖ *(Мубаракшин)*
5	"Тахиатош ИЭС"	турбоагрегат № 1,3	170	2020й.	1. Ўрнатилган тартибда қурилмаларни республикада амал қиладиган қоидаларга ва ҳужжатларга асосан технологик консервацияга чиқариш.	Энергетика вазирлиги *(Ходжаев)*, "ИЭС" АЖ *(Мубаракшин)*
		энергоблок № 7	170	2023й.		

		энергоблок № 8	180	2024й.	2. Курилманинг асосий ва қўшимча ускуналарини сақланишини таъминлаш.	
6	"Фарғона ИЭМ" АЖ	турбоагрегат № 1	0	2020й.	1. Ўрнатилган тартибда курилмани фойдаланишдан чиқариш.	Энергетика вазирлиги *(Ходжаев)*, "ИЭС" АЖ *(Мубаракшин)*
7	"Янги-Ангрен ИЭС" АЖ	энергоблок № 6,7	480	2023й.	1. Ўрнатилган тартибда курилмаларни республикада амал қиладиган қоидаларга ва ҳужжатларга асосан технологик консервацияга чиқариш. 2. Асосий ва ёрдамчи ускуналарни хатловдан ўтказиш ва сақланишини таъминлаш.	Энергетика вазирлиги *(Ходжаев)*, "Янги-Ангрен ИЭС" АЖ *(Свамбаев)*
8	"Ангрен ИЭС" АЖ	турбоагрегат № 1,2,5,6	100	2023й.	1. Ўрнатилган тартибда курилмаларни фойдаланишдан чиқариш. 2. Асосий ва ёрдамчи ускуналарни хатловдан ўтказиш.	Энергетика вазирлиги *(Ходжаев)*, "Ангрен ИЭС" АЖ *(Макеев)*

Изоҳ: Фойдаланишдан чикариладиган энергетик курилмаларнинг жадвали 1 иловада келтирилган.

"Иссиклик электр станциялари" АЖ
Бошқарув раиси

Р. Мубаракшин
2020 йил "____" май

Энергетика вазирининг
ўринбосари

Ш. Ходжаев
2020 йил "____" май

2020-2030 йилларда иссиқлик электр станцияларда эскирган қурилмаларни фойдаланишдан чиқариш дастурига
1-ИЛОВА

2020-2030 йилларда иссиқлик электр станцияларда эскирган қурилмаларни фойдаланишдан чиқариш ЖАДВАЛИ

МВт

№	Номи	2020й.	2021й.	2022й.	2023й.	2024й.	2025й.	2026-2030й.
	ЖАМИ	**170**	**565**	**840**	**2 895**	**4 355**	**5 540**	**5 540**
1	"Сирдарё ИЭС" АЖ				-520 *ЭБ-7,8*	-650 *ЭБ-1,2*		
2	"Тошкент ИЭС" АЖ		-145 *ЭБ-7*	-275 *ЭБ-5,6*	-525 *ЭБ-1,2,8,9*	-280 *ЭБ-10,11*	-405 *ЭБ-3,4,12*	
3	"Навоий ИЭС" АЖ		-250 *ЭБ-3,8*		-260 *ЭБ-4,9*	-350 *ЭБ-11,12 ТГ-5,7*		
4	"Талимаржон ИЭС" АЖ						-780 *ЭБ-1*	
5	"Тахиатош ИЭС" АЖ	-170 *ТГ-1,3*			-170 *ЭБ-7*	-180 *ЭБ-8*		
6	"Фаргона ИЭМ" АЖ	*0* *ТГ-1*						
7	"Янги-Ангрен ИЭС" АЖ				-480 *ЭБ-6,7*			
8	"Ангрен ИЭС" АЖ				-100 *ТГ-1,2,5,6*			

Шундан, технологик консервацияга чиқариладиган қувватлар

	ЖАМИ	**170**	**170**	**170**	**1 600**	**3 060**	**4 245**	**4 245**
1	"Сирдарё ИЭС" АЖ				520	650		
2	"Навоий ИЭС" АЖ				260	350		
3	"Янги-Ангрен ИЭС" АЖ				480			
4	"Тахиатош ИЭС" АЖ	170			170	180		
5	"Тошкент ИЭС" АЖ					280	405	
6	"Талимаржон ИЭС" АЖ						780	

Изоҳ: *Фойдаланишдан чиқариладиган энергетик қурилмаларнинг тартиб рақами ва муддати энергетика тизимининг ҳолатига кўра ўзгариши мумкин.*

APPENDIX B- LETTER & CONCLUSIONS FROM STATE COMMITTEE ON ECOLOGY & ENVIRONMENTAL PROTECTION

STATE COMMITTEE OF THE REPUBLIC OF UZBEKISTAN ON ECOLOGY AND ENVIRONMENTAL PROTECTION

2a Toytepa street, Yashnabad district, Tashkent city, 100047. Tel.: 71 207-11-03, fax: 71 236-02-32, website:http://www.eco.gov.uz, email: info@uznature.uz

"4" April 2020 №01-01/10-525 Tashkent city

"Juru Energy"

In response to the letter №20/20/13

Dated on 19th of March, 2020

The State Committee of the Republic of Uzbekistan for ecology and environmental protection has studied your request on regarding the official confirmation on the following procedures of national EIA for the construction of CCGT with a total capacity of 1,500 MW in Shirin town, Syrdarya region. We hereby to confirm the followings.

The company received a positive conclusion from the State ecological expertise No. 01-01 / 10-08-815 dated on 05.05.2019. for the construction of **4 CCGT with a total capacity of 2600 MW** for JSC "SYRDARYA TPP". One of the requirements of this conclusion was submission of Statement of Environmental Consequences Prior to commissioning the CCGT.

Considering the above stated, and in accordance with the Articles 13 and 15 of the law "On environmental expertise" you need to develop a Preliminary Statement of the Environmental Impact and submit it in the manner prescribed by law for the construction of a new CCGT with a total capacity of 1,500 MW in Syrdarya region.

Chairman

Sh. Abdurazakov

ЎЗБЕКИСТОН РЕСПУБЛИКАСИ ЭКОЛОГИЯ ВА АТРОФ-МУҲИТНИ МУҲОФАЗА ҚИЛИШ ДАВЛАТ ҚЎМИТАСИ

100047, Тошкент ш., Яшнобод т., Той-тепа кўчаси, 2а-уй. тел.:71 207-11-03, факс:71 236-02-32
веб-саҳифа:http://www.eco.gov.uz, электрон почта:info@uznature.uz

"4" апреля 2020й. № 01-01/10-525 Тошкент ш.

«Juru Energy»

На письмо №20/20/13
от 19 марта 2020 года

Госкомэкологии Республики Узбекистан, рассмотрев Ваше обращение касательно в получении информации относительно дальнейшей процедуры прохождения процесса оценки воздействия на окружающую среду для строительства парогазовой установки мощностью 1500 МВт на территории Сырдарьинской ТЭС, расположенной в Сырдарьинской области, сообщает следующее.

Вашим предприятием было получено положительное заключение государственной экологической экспертизы №01-01/10-08-815 от 3.05.2019г. для **строительства 4-х парогазовых установок общей мощностью 2600 МВт** на АО "СЫРДАРЬИНСКАЯ ТЭС". Одним из требований данного заключения, предъявляемых к заказчику экологической экспертизы было, до ввода в эксплуатацию разработать и представить на государственную экологическую экспертизу проекта ЗЭП.

Учитывая вышеизложенное Вам необходимо для строительства новой парогазовой установки мощностью 1500 МВт на территории Сырдарьинской ТЭС в соответствии со статьями 13 и 15 Закона Республики Узбекистан «Об экологической экспертизе» разработать проект заявления о воздействии на окружающую среду (ПЗВОС) и представить в управление по экологии и охране окружающей среды в установленном законодательством порядке с целью проведения государственной экологической экспертизы.

Председатель **Ш. Абдуразаков**

Исп. Ш.Рихсиев
тел: 207-07-70 (2020#)

ЎЗБЕКИСТОН РЕСПУБЛИКАСИ ЭКОЛОГИЯ ВА АТРОФ-МУҲИТНИ МУҲОФАЗА ҚИЛИШ ДАВЛАТ ҚЎМИТАСИ

100047, Тошкент ш., Яшнобод т., Той-тепа кўчаси, 2а-уй. тел.:71 207-11-03, факс:71 236-02-32
веб-саҳифа:http://www.eco.gov.uz, электрон почта:info@uznature.uz

"4" апреля 2020й. № 01-01/10-525 Тошкент ш.

«Juru Energy»

На письмо №20/20/13
от 19 марта 2020 года

Госкомэкологии Республики Узбекистан, рассмотрев Ваше обращение касательно в получении информации относительно дальнейшей процедуры прохождения процесса оценки воздействия на окружающую среду для строительства парогазовой установки мощностью 1500 МВт на территории Сырдарьинской ТЭС, расположенной в Сырдарьинской области, сообщает следующее.

Вашим предприятием было получено положительное заключение государственной экологической экспертизы №01-01/10-08-815 от 3.05.2019г. для **строительства 4-х парогазовых установок общей мощностью 2600 МВт** на АО "СЫРДАРЬИНСКАЯ ТЭС". Одним из требований данного заключения, предъявляемых к заказчику экологической экспертизы было, до ввода в эксплуатацию разработать и представить на государственную экологическую экспертизу проекта ЗЭП.

Учитывая вышеизложенное Вам необходимо для строительства новой парогазовой установки мощностью 1500 МВт на территории Сырдарьинской ТЭС в соответствии со статьями 13 и 15 Закона Республики Узбекистан «Об экологической экспертизе» разработать проект заявления о воздействии на окружающую среду (ПЗВОС) и представить в управление по экологии и охране окружающей среды в установленном законодательством порядке с целью проведения государственной экологической экспертизы.

Председатель **Ш. Абдуразаков**

Исп.:Ш.Рихсиев
тел: 207-07-70 (2020#)

ЎЗБЕКИСТОН РЕСПУБЛИКАСИ ЭКОЛОГИЯ ВА АТРОФ-МУҲИТНИ МУҲОФАЗА ҚИЛИШ ДАВЛАТ ҚЎМИТАСИ

100047, Тошкент ш., Яшнобод т., Той-тепа кўчаси, 2а-уй. тел.:71 207-11-03, факс:71 236-02-32
веб-сахифа:http://www.eco.gov.uz, электрон почта:info@uznature.uz

"13" июль 2020й. №01-01/10-08-969 Тошкент ш.

З А К Л Ю Ч Е Н И Е

Государственной экологической экспертизы

По объекту:	Оценка воздействия на окружающую среду на строительства двух парогазовых установок (ПГУ) ACWA POWER SIRDARYA общей мощностью 1500 МВт в Сырдарьинской области (Проект ЗВОС).
Заказчик:	ООО «JURU ENERGI CONSALTING».
ИНН:	303454532
Категория:	1. п. 35, ПКМ РУз. №949 от 21.11.2018 г.
Разработчик:	ООО «JURU ENERGI CONSALTING».
Эксперт:	Рудовой О.А.

Директору
ООО «JURU ENERGI CONSALTING»
Ж.У. Якубову

копия: Управлению по экологии и охране окружающей среды Сырдарьинской области.

На государственную экологическую экспертизу представлены материалы первого этапа оценки воздействия на окружающую среду строительства двух парогазовых установок (ПГУ) ACWA POWER SIRDARYA общей мощностью 1500МВт в Сырдарьинской области.

Строительство двух ПГУ и находящейся на с ними на одной площадке ОРУ-500/220 кВ предназначено для замены, находящейся 4-х энергоблоков по 300 МВт Сырдарьинской ТЭС.

Ранее для Сырдарьинской ТЭС был разработан проект ЗВОС строительства 4-х парогазовых установок общей мощностью 2600 МВт и было получено положительное заключение Государственной экологической экспертизы №01-01-8-815 от 03.05.2019г. Но на земельном участке, где ранее планировалось строительство 4-х парогазовых установок общей мощностью 2600 МВт и будет размещены две парогазовых установок (ПГУ) ACWA POWER SIRDARYA общей мощностью 1500 и ОРУ- 500/220 кВ.

Площадка строительства 2-х ПГУ общей мощностью 1500 МВт и ОРУ-500/220 кВ намечена с северо-западной стороны существующей Сырдарьинской ТЭС, на правом берегу Южно-Голодностепского канала (ЮГК).

Координаты угловых точек площади рассматриваемого участка 2-х ПГУ: 1)$40^0$14'8.04"СШ $69^0$6'15.63"ВД; 2)$40^0$14'31.50"СШ; $69^0$6'50.28"ВД; 3)$40^0$14'24.10"СШ $69^0$7'13.63"ВД; 4)$40^0$13'54.67"СШ $69^0$6'37.89"ВД, координаты угловых точек площади рассматриваемого участка размещения ОРУ-500/220 кВ: 1)$40^0$14'32.06" СВ $69^0$6'50.80"ВД; 2)$40^0$14'36.06"СШ $69^0$6'53.72"ВД; 3) $40^0$14'46.75" СШ $69^0$6'40.10" ВД; 4)$40^0$14'54.28" СШ $69^0$6'48.44"ВД; 5)$40^0$14'37.25" СШ $69^0$7'13.06"ВД; 6)$40^0$14'24.97" СШ $65^0$7'3.06"ВД.

Для размещения 2-х ПГУ общей мощностью 1500 МВт со вспомогательными зданиями и сооружениями потребуется отвод участка земли площадью 85,0 га. Под строительство отводятся земли сельскохозяйственного назначения, принадлежащие Баяутскому району и городу Ширин Сырдарьинской области.

Следует отметить, что рассматриваемый участок находиться на орошаемых землях, которые согласно Статьи 44 Земельного кодекса Республики Узбекистан, подлежат особой охране и перевод этих земель в неорошаемые угодья производится в исключительных случаях с учетом почвенно-мелиоративных и экономических условий, водообеспеченности земель, наличия водных ресурсов и лимитов на них, решением хокима области в соответствии с Заключением Министерства сельского хозяйства Республики Узбекистан, по земельным ресурсам, геодезии, картографии и государственному кадастру по согласованию с Кабинетом Министров Республики Узбекистан.

Границами участка строительства являются: с севера – пахотные земли; с востока – ВЛ-220 кВ, далее пашня и на расстоянии 400 м жилая застройка г.Ширин; с юга – ВЛ-220 кВ, выходящие с существующей Сырдарьинской ТЭС, автодорога, ЮГК, за каналом железная дорога Джизак-Хаваст-Коканд; с юго-запада и запада – дачный поселок, за ним две нитки газопровода, которые соединяют существующую Сырдарьинскую ТЭС и ГРС, автодорога, ЮГК, за ним территория Сырдарьинской ТЭС.

Размер водоохраной зоны ЮГК, в районе строительства дополнительных ПГУ, согласно ПКМ № 981от 11.12.2019 г. «Положение о водоохранных зонах водохранилищ и других водоемов, рек и магистральных каналов и коллекторов, а также источников питьевого и бытового водоснабжения, лечебного и культурно-оздоровительного назначения в Республике Узбекистан» установлен 300 м, исходя из расхода воды в канале 350 $м^3$/с. Площадка под строительство 2-х дополнительных ПГУ выделена с учетом соблюдения водоохраной зоны канала ЮГК.

Ближайшая частная жилая застройка ширкатного хозяйства «Ширин» Баяутского района расположена в 320 м к северу от участка строительства и на расстоянии 1,1 км от дымовых труб проектируемых ПГУ.

Район расположения электростанции характеризуется сейсмичностью до 8 баллов, сильными ветрами до 40-45 м/с, высоким стоянием (1,5 м) и высокой агрессивностью грунтовых вод, высокой минерализацией и повышенной жесткостью воды поверхностных водотоков. В поверхностных водотоках

отмечается повышенное солесодержание уже до сбросов ТЭС, увеличивающееся после сбросов станции. Состояние поверхностных вод характеризуется III классом умеренно загрязненных вод.

На участке, выделяемом под строительство, имеются зеленые насаждения подлежащие вырубке в процессе подготовительных к строительству работ. Согласно обследования участка строительства вырубке подлежат 1231 ед. деревьев (5 шт. тутовник, 55 шт. джида, 250 шт. туранга, 129 шт. акация, 6 шт. тополь, 786шт. тамариск).

В связи с этим сообщаем, что вырубка деревьев, кустарников, уничтожение растительности оказывает отрицательное влияние на баланс экосистемы (изменение климата, связанное с увеличением содержания углекислого газа в атмосферном воздухе и перепадами температур, как суточных, так и годовых, исчезновению плодородного слоя почвы, потерей биоценоза и т.д.). При организации добычных работ следует руководствоваться требованиями ПКМ РУз №290 от 20.10.2014г. «Об урегулировании использования биологических ресурсов и о порядке прохождения разрешительных процедур в сфере природопользования», ПКМ РУз №43 от 17.01.2019г. «О мерах по дальнейшему совершенствованию порядка упорядочения использования деревьев и кустарников, не входящих в государственный лесной фонд, а также выдачи разрешений в сфере их использования» и Указом Президента Республики Узбекистан № 5863 от 30.10.2019г. «Об утверждении Концепции охраны окружающей среды Республики Узбекистан до 2030 года» в установленном порядке.

Проектом необходимо предусмотреть выкорчевывание и пересадку имеющейся растительности на использованные земли после добычных работ, без осуществления вырубки. Следует отметить, что современные технологии позволяют переместить древесные посадки с применением специальных машин без вреда корневой системе. Производить вырубку растительности на территории отведенного земельного участка категорически запрещается.

Ввод в эксплуатацию двух ПГУ по 750 МВт с применением передовых технологий сжигания топлива в дополнение к преимуществам за счет реализации программы модернизации позволит: увеличить КПД выработки электроэнергии – КПД ПГУ класса J мощностью 750 МВт выше 60%; снизить расход условного топлива на отпуск электроэнергии на на 25-30г/кВт*ч, достичь ежегодной экономии природного газа; улучшить экологическую обстановку в зоне воздействия станции путем снижения валовых выбросов ТЭС и уровня загрязнения атмосферного воздуха в зоне воздействия ТЭС, при этом эмиссия оксидов азота ПГУ составит 50 мг/нм^3, что в 8,8 раза ниже их максимальных концентраций в дымовых газах существующих энергоблоков ТЭС; значительно снизить эмиссию парниковых газов CO_2 и CH_4.

Вместе с двумя парогазовыми установками мощностью 1500 МВт также будет построена ОРУ 550/220 кВ, предназначенная для подачи электроэнергии потребителям. ОРУ 55/220 кВ запроектирована в составе: трансформаторы, резервуары хранения трансформаторного масла, операторская пульта управления, механическая мастерская.

Каждый из двух энергетических блоков дополнительных ПГУ ACWA POWER SIRDARYA 1500 МВт будет иметь мощность 750 МВт. ПГУ-750 является

моноблочной парогазовой установкой, предназначенной для производства электроэнергии в базовом режиме работы, при одновременном покрытии теплового графика производственных и отопительных нагрузок.

В состав ПГУ-750 МВт входят: газотурбинная установка с электрогенератором – 2 ед.; котел-утилизатор – 2 ед.; паротурбинная установка с электрогенератором; деаэраторная установка; газодожимная компрессорная станция с газодожимными компрессорами; компрессорная сжатого воздуха, азотогенераторная, электролизная с ресиверами, резервный дизель-генератор, ХВО подпитки блока, теплосети и системы оборотного техводоснабжения, комплекс очистки производственных стоков, баковое хозяйство; градирни с насосной станцией водоснабжения ПГУ; склад масла в таре.

Количество работающих после пуска в эксплуатацию ПГУ и ОРУ-500/220кВ – 80 человек, режим работы – 8255 ч/год.

Предполагается работа блоков ПГУ с использованием в качестве топлива природного газа. Подача газа на территорию участка 2-х ПГУ общей мощностью 1750 МВт будет осуществляться по вновь построенным магистралям.

Ожидается, что КПД новых ПГУ составит более 60%. Годовой расход природного газа на одну ПГУ составит 789600 т/год, потребление природного газа двумя ПГУ – 1579200 т/год.

Проектируемые энергоблоки являются парогазовыми, то есть объединяют два цикла паровой и газовый – тепловая энергия, имеющаяся в газах, образующихся в процессе сгорания топлива, используется для производства пара с энергией, достаточной для использования в паротурбине. Каждая ПГУ состоит из одной газотурбины, котла-утилизатора (КУ) и одной паротурбины. Первый цикл представлен газотурбиной, в которой вращение ротора осуществляется газами, образующимися в процессе сгорания топлива. Электрогенератор газотурбины вырабатывает около 2/3 электричества. Второй цикл – газы, образовавшиеся в первом цикле, подаются в котел-утилизатор, в котором тепловая энергия дымовых газов передается воде для производства пара при высоком давлении, пар используется для приведения в действие паротурбины. Электрогенератор паротурбины вырабатывает около 1/3 электричества. Отработанный пар, сразу после расширения в паротурбине, направляется в конденсатор, где между паром и охлаждающей водой происходит теплообмен. Конденсат откачивается в КУ, где повторно преобразовывается в пар, замыкая паровой цикл.

Использование комбинированных парогазовых установок позволяет применять энергию, имеющуюся в газах, образующихся в результате сгорания топлива, что существенно снижает затраты энергоносителей и соответственно отрицательное воздействие на окружающую среду.

Для отвода дымовых газов вновь строящиеся ПГУ планируется оснастить индивидуальными дымовыми трубами высотой по 60 м и диаметром устья 9,18 м. Параметры газовоздушной смеси составят: объем дымовых газов 82,2 $м^3$/сек, скорость выхода отходящих газов 14,88 м/с, температура отходящих газов 82,2^{0}С.

В результате проведения модернизации имеющихся блоков СД ТЭС и строительства дополнительных блоков ПГУ качественный состав выбросов в атмосферу предприятия не изменится, в атмосферный воздух выбрасываются вещества 23-х наименований, количество источников выброса останется прежним.

Количество выбросов, ожидаемых после проведения модернизации имеющихся блоков Сырдарьинской ТЭС, ориентировочно составит 20961,49910т/год.

Выброс загрязняющих веществ, после ввода в эксплуатацию блоков ПГУ ACWA PAWER SIRDARYA 1500 МВт, ориентировочно составит 2915,533978т/год, выбросы от эксплуатации ОРУ-500/220 кВ – 4,594402 т/год.

Ввод в эксплуатацию двух блоков ПГУ мощностью по 750 МВт, с учетом проведенной модернизации существующих энергоблоков АО «Сырдарьинская ТЭС» приведет к улучшению экологической обстановки в зоне влияния станции путем снижения валовых выбросов ТЭС.

Общий валовой выброс при проведении строительных и монтажно-наладочных работ по ПГУ 1500 МВт и ОРУ 200/500 составит 22,866 т.

Начало строительства ПГУ 1500 МВт – сентябрь/октябрь 2020 г., ОРУ-500/220 – 2020г.

На промплощадке новых ПГУ предусматривается устройство двух раздельных водопроводных систем: хозяйственно-питьевой водопровод, обеспечивающий питьевые нужды промплощадки ПГУ и для подпитки теплосети; производственно-противопожарный водопровод, обеспечивающий технические-противопожарные нужды промплощадки ПГУ.

Вода для хозпитьевых целей работников будет подаваться из хозпитевого водопровода Сырдарьинской ТЭС, которая в свою очередь подается из водозаборных сооружения «Навои», которые имеют расчетный расход забора воды 711 тыс.м^3/мес. или 987,5 м^3/час, что покрывает потребности Сырдарьинской ТЭС и г.Ширин. Для обеспечения хозпитьевой водой ПГУ в объеме 3 м^3/час производительности водозабора «Навои» вполне достаточно. Для доставки питьевой воды будет проложен новый водовод. Питьевая вода, подаваемая с водозаборных сооружений, будет поступать на промплощадку ПГУ в проектируемые резервуары чистой воды.

Подаваемая на площадку ПГУ питьевая вода также используется для подпитки теплосети. В качестве резервуаров противопожарного водопровода предполагается использовать бассейн градирен системы оборотного водоснабжения, противопожарный запас воды принят согласно п.9.4 КМК 2.04.02.

На проектируемой промышленной площадке планируется организация следующих канализационных систем: хозяйственно-бытовая, дождевая, аварийных маслостоков, производственной канализации. Хозяйственно-бытовые стоки предполагается без предварительной очистки перекачивать на городскую хозяйственно-фекальную станцию г. Ширин, дождевые стоки планируется сбрасывать в канал ЮГК, стоки, загрязненные нефтепродуктами, предполагается очищать при помощи нефтеловушек, и далее подавать на испарение в пруды-испарители.

Согласно закону Республики Узбекистан №837-XII от 06.09.1993 г. «О воде и водопользовании», система технического водоснабжения двух дополнительных ПГУ предусматривается оборотная. К установке принимаются вентиляторные градирни, технические характеристики которых будут уточняться при детальном проектировании. Восполнение потерь в оборотной системе (капельный унос, испарение, продувка) предусматривается подачей воды из ЮГК.

Для обеспечения работы 2-х новых ПГУ предусматривается строительство: отстойника добавочной воды; шламоотвалов КОПС; пруда-испарителя кислотной

промывки котлов; шламоотвала для временного складирования замазученного ила; шламоотвала сбросных вод ХВО; шламоотвала продувки осветлителей ХВО.

Для восполнения потерь в цикле ПГУ и в системе оборотного водоснабжения предусматривается строительство новой водоподготовительной установки. Производительность ХВО по обессоленной воде для подпитки пароводяного цикла энергоблоков ПГУ будет уточняться при детальном проектировании. В качестве предварительной обработки воды предполагается применить процесс содо-известкования с последующей коагуляцией в осветлителе. Для глубокого обессоливания подпиточной воды основного цикла ПГУ предполагается применение двухступенчатого умягчения осветленной воды на Na-катионитовых фильтрах с последующей обработкой воды на установке обратного осмоса и фильтрах смешанного действия (ФСД).

Сточные регенерационные воды от водоподготовительных установок планируется подавать в дренажную насосную станцию ХВО и далее на установку КОПС (Комплексной очистки производственных стоков), включающую в себя узел нейтрализации кислых и щелочных стоков ВПУ подпитки пароводяного цикла и узел обработки соляных стоков обеих водоподготовительных установок. Обработку соленых стоков планируется осуществлять по следующей схеме: дозирование соды в баки-усреднители, фильтрация отстоянной воды на механических фильтрах с последующей обработкой на установке обратного осмоса. Соленые стоки (рассол), после установки обратного осмоса, будут направляться в пруд-испаритель, очищенная вода будет возвращаться в цикл ВПУ подпитки циркуляционной системы и пароводяного цикла.

Ориентировочный расход технической воды из ЮГК на нужды двух ПГУ составит 1965 м^3/час или 16352,73 тыс. м^3/год, ожидаемый расход водопроводной воды на хозяйственно-питьевые нужды двух ПГУ – 3 м^3/час, 24,765 тыс.м^3/год, всего водопотребление на нужды 2-х ПГУ составит 16377,495 тыс. м^3/год. Сброс продувочных вод градирен в ЮГК прогнозируется на уровне 340 м^3/час (2829,48тыс.м^3/год).

Согласно представленного на экспертизу проекта после ввода в эксплуатацию 2-х ПГУ будут образовываться следующие виды отходов: черный металлолом (не опасные V класс), отход шлама от очистки котлов (малоопасные IV класс) (малоопасные IV класс), отход шлама от ХВО (малоопасные IV класс), отход шлама от очистки сточных вод (малоопасные IV класс), отход замасленного ила (умеренно опасный III класс), отход полиэтиленовых мешков из под хим. реагентов (малоопасные IV класс), отход бумажных мешков из под хим. реагентов (малоопасные IV класс), ветошь промасленная (умеренно опасный III класс); отходы электродов (не опасные V класс), макулатура (не опасные V класс), ТБО (малоопасные IV класс), пищевые отходы (не опасные V класс).

До ввода рассматриваемого объекта в эксплуатацию следует представить на рассмотрение **заявление об экологических последствиях**, в котором **следует разработать экологические нормативы для всех видов воздействия намечаемой деятельности на окружающую среду.**

Государственный комитет Республики Узбекистан по экологии и охране окружающей среды **согласовывает** проект Заявления о воздействии на окружающую среду строительства двух парогазовых установок общей мощностью 1500 МВт.

Управлению по экологии и охране окружающей среды Сырдарьинской области – необходимо взять под контроль выполнение требований природоохранного законодательства в период проведения строительных работ.

Не следует допускать ввода в эксплуатацию объекта без положительного заключения на Заявление об экологических последствиях.

Председатель **Ш. Абдуразаков**

Unofficial translation

State Committee of the Republic of Uzbekistan
on Ecology and Environmental Protection

website: http://www.eco.gov.uz; email: info@uznature.uz

Reference No.01-01/10-08-969

Date: 5 May 2020

CONCLUSION
of the State Environmental Expertise

Project: Environmental Impact Assessment (EIA) for the construction of 2 CCGTs ACWA POWER SYRDARYA with a total capacity of 1500 MW located in Syrdarya Region (Preliminary EIA project)

Client: Juru Energy Consulting LLC

Category: I, p. 35, Decree of the Cabinet of Ministers of the Republic of Uzbekistan, № 949, 21.11.2018

Developer: Juru Energy Consulting LLC

Expert: O.A. Rudovoy

To the director of
Juru Energy Consulting LLC
J.U. Yakubov

Copy: Department of Ecology and Environmental Protection of the Syrdarya region

Project documentation for the first stage of environmental impact assessment for the construction of 2 CCGTs ACWA POWER SYRDARYA with a total capacity of 1500 MW in Syrdarya region were submitted for state environmental expertise.

The construction of two CCGTs including a 500/220kV switchgear station located on the same site is aimed at replacement of the existing 4 power units of 300MW each at Syrdarya TPP.

Previously, an EIA for the construction of 4 CCGTs with a total capacity of 2600 MW was developed for Syrdarya TPP and a positive conclusion of the State environmental expertise №01-01-8-815 (03.05.2019) was issued. However, instead of the previously planned 4 CCGTs with a total capacity of 2600 MW, the land plot will be allocated for 2 CCGTs ACWA POWER SYRDARYA with a total capacity of 1500 MW including a 500/220 kV switchgear.

The construction site for 2 CCGTs with a total capacity of 1500 MW and 500/220kV switchgear station will be located at the north-western side of the existing Syrdarya TPP, on the right bank of the Yuzhny-Golodnostepsky (YG) canal.

Coordinates of 2 CCGTs site:

Latitude	Longitude
40°14’8.04”N	69°6’15.63"E
40°14’31.50”N	69°6’50.28,”E

40°14’24.10”N	69°7’13.63”E
40°13’54.67”N	69°6’37.89”E

Coordinates of the 500/220 kV switchgear station:

Latitude	Longitude
40°14’32.06”N	69°6’50.80”E
40°14’36.06”N	69°6’53.72”E
40°14’46.75”N	69°6’40.10”E
40° 14’54.28”N	69°6’48.44”E
40°14’37.25”N	69°7’13.06”E
40°14’24.97”N	65°7’3.06"E

Allocation of 2 CCGTs with a total capacity of 1500 MW with auxiliary buildings and structures will require a land acquisition of 85.0 hectares. Agricultural lands belonging to Bayavut district and Shirin town of Syrdarya region will be acquired for construction.

It should be noted that the planned construction site is in an irrigated land, which in accordance with Article 44 the Land Code of the Republic of Uzbekistan, are subject to special protection, under which conversion of these lands to non-irrigated land is made in exceptional cases, taking into account land development and economic conditions, level of water supply, availability of water resources and restrictions, and by the decision of the khokim[1] of the region in accordance with the Conclusion of the Ministry of Agriculture of the Republic of Uzbekistan, Geodesy, Cartography and State Cadastre, and in agreement with the Cabinet of Ministers of the Republic of Uzbekistan.

The boundaries of the construction site are: from North – arable land; from the East - 220kV overhead power lines, arable land, and a Shirin town residential development at a 400m distance; from South – 220kV overhead power line exiting the existing Syrdarya TPP, a highway, YG canal, with the canal railroad Jizzakh-Khavast-Kokand; from southwest and West – country village, followed by two gas pipelines that connect existing Syrdarya TPP and GDS (gas distribution station), a highway, YG canal, followed by the territory of the Syrdarya TPP.

In accordance with the Decree of Cabinet of Ministers No. 981 dated 11.12.2019 “The regulation on water protection zones of reservoirs and other reservoirs, rivers and main channels, as well as sources of drinking and domestic water supply, medicinal and cultural-recreational purposes in the Republic of Uzbekistan”, and based on the flow of water in the channel 350 m^3/s, a 300m water protection zone of YG canal at the construction area of additional CCGTs has been established. The site for the construction of 2 additional CCGTs was allocated in accordance with the water protection zone of YG canal.

Nearest private residential development of “Shirin” cooperative farm in Bayavut district is located 320m to the North of the construction site and 1.1 km from the exhaust stack of the projected CCGT.

The area of the power plant is characterized by seismicity of up to 8 points, strong winds of up to 40-45 m/s, high level (1.5 m) and high aggressivity of ground water, high salinity and increased water hardness of surface watercourses. There is increased salt content in surface watercourses existent before the TPP discharges,

[1] Mayor

with salinity increasing more after the discharges. The state of surface waters is characterized as Class III – moderately polluted waters.

Allocated area for construction has green spaces to be cut down in the process of preparatory work for construction. According to the survey at the construction site, 1231 units of trees are subject to felling (5 mulberry trees, 55 Russian olive (Elaeagnus angustifolia), 250 Euphrates poplars, 129 acacias, 6 poplars, 786 tamarisk).

In this regard, we inform you that the cutting down of trees, shrubs, and vegetation poses a negative impact on the balance of the ecosystem (climate change associated with an increase in the content of carbon dioxide in atmospheric air and temperature changes, both daily and annually, the disappearance of the fertile soil layer, loss of biocenosis, etc). When organizing mining operations, works should be guided by and in the established order as required by the Decree of the Cabinet of Ministers of the Republic of Uzbekistan No. 290 dated 20.10.2014 "On the regulation of the use of biological resources and the procedure for passing licensing procedures in the field of nature management", the Decree of the Cabinet of Ministers of the Republic of Uzbekistan No. 43 dated 17.01.2019 "On measures to further improve the procedure for regulating the use of trees and shrubs that are not part of the state forest fund, as well as issuing permits for their use", and the Decree of the President of the Republic of Uzbekistan No. 5863 dated 30.10.2019 "On approval of the Concept of environmental protection of the Republic of Uzbekistan until 2030".

The project should provide for uprooting and replanting of existing vegetation on used land after mining operations, without felling. It should be noted that modern technologies allow to move tree plantings using special machines without harming the root system. It is strictly forbidden to cut down vegetation on the territory of the designated land plot.

The commissioning of two CCGTs with a capacity of 750 MW each using advanced fuel combustion technologies, in addition to the advantages of the modernization program, will allow: to increase the efficiency of power generation – the efficiency of CCGTs J class with a capacity of 750 MW above 60%; to reduce the consumption of conventional fuel for electricity supply by 25-30 g/kWh, to achieve annual savings of natural gas; to improve the environmental situation in the plant's impact zone by reducing the total TPP emissions and the level of atmospheric air pollution at the TPP impact zone, while the emission of nitrogen oxides by the CCGT will be 50 mg/Nm^3, which is 8.8 times lower than their maximum concentrations in the flue gases of existing TPP power units; and significantly reduce the emission of greenhouse gases – CO_2 and CH_4.

A 500/220 kV switchgear station will also be built in addition to the two CCGTs with a capacity of 1500 MW, which is designed to supply electricity to consumers. As part of its design, the 500/220 kV switchgear station will include transformers, storage tanks for transformer oil, operator's control panel, technical workshop.

Each of the two additional 1500 MW ACWA POWER SYRDARYA CCGT power units will have a capacity of 750 MW. CCGT-750 is a single block combined-cycle gas power plant designed to produce electricity in basic operating mode, while simultaneously covering the thermal schedule of production and heating loads.

The components of the CCGT 750 MW are: gas turbine unit with an electric generator

– 2 units; waste-heat boiler – 2 units, steam turbine with an electric generator; deaerator plant; gas booster plant with gas compressors; air compressor utility house, gas generator, electrolysis plant with receivers, backup diesel generator, water chemical treatment recharge unit, heating and circulating water supply systems, industrial wastewater treatment complex, tank farm; cooling towers with a pumping station for water supply to the CCGT; oil storage in containers.

The number of employees after commissioning of CCGT and 500/220 kV switchgear station – 80 employees, working hours – 8255 hours/year.

It is planned to operate CCGT units using natural gas as fuel. Gas supply to the site of 2 CCGTs with a total capacity of 1500 MWt will be carried out via newly built gas main line.

It is expected that the efficiency of the new CCGTs will be higher than 60%. The annual consumption of natural gas for one CCGT will be 789,600 t/year, and the consumption of natural gas for two CCGTs will be 1,579,200 t/year.

The designed power units are steam-gas, that combine the steam and gas cycles, i.e. the thermal energy, generated during fuel (gas) combustion, is used to produce steam with energy sufficient for use in a steam turbine. Each CCGT consists of one gas turbine, waste-heat boiler and one steam turbine. The first cycle is represented by a gas turbine, in which the rotor rotation is carried out by gases formed during fuel combustion. The gas turbine generator generates about 2 /3 of electricity. The second cycle – gases formed in the first cycle are fed to the waste-heat boiler, in which the thermal energy of the flue gases is transferred to the water to produce steam at high pressure, which is then used to power the steam turbine. The steam turbine generator generates about 1/3 of electricity. The exhaust steam, immediately after expansion in the steam turbine, is sent to the condenser, where heat exchange occurs between the steam and the cooling water. Condensate is pumped to the condensate unit, where it is re-converted to steam, closing the steam cycle.

The use of combined steam and gas installations allows to use the energy available in the gases formed as a result of fuel combustion, which significantly reduces the fuel expenses and, consequently, the negative impact on the environment.

To remove flue gases, it is planned to equip the new CCGTs with individual chimneys with a height of 60m and a diameter of 9.18m at the mouth. The parameters of the gas-air mixture will be: the volume of flue gases – 82.2 m/s, exit speed of the exhaust gases – 14.88 m/s, the temperature of the exhaust gases – 82.2°C.

As a result of the modernisation of the power units at the existing TPP and the construction of additional CCGTs the qualitative composition of the emissions will not change with 23 air pollutants emitted, and the number of emission sources will remain the same. The amount of emissions expected after the modernization of the existing units of Syrdarya TPP is approximately 20961,49910 t/year.

The emission of pollutants, after commissioning CCGT ACWA POWER SYRDARYA 1500 MW, will amount to approx. 2915,53978 t/year, and the emissions from the operation of 500/220 kV switchgear station – 4,594402 t/year.

Commissioning of two CCGTs with a capacity of 750 MW, taking into account the modernization of existing JSC "Syrdarya TPP" will improve the environmental situation in the zone of influence of the station by reducing the gross emissions of TPP.

The total gross emission during construction and installation and commissioning of

1500 MW CCGT and 500/220 kV switchgear station will be 22,866 tons.

Commencement of construction for 1500 MW CCGT – September/October 2020; for the 500/220 kV switchgear station – 2020.

Two separate water supply systems will be installed at the CCGT industrial site – the utility and drinking water pipeline, which provides for the drinking needs of the CCGT industrial site and for feeding the heating system; and the industrial and fire-fighting water main, which provides for the technical fire-fighting needs of the CCGT industrial site.

Water for the employees' household purposes will be supplied from the Syrdarya TPP water supply pipeline, which in turn is supplied from the Navoi water intake facilities, which have an estimated water intake flow of 711 thousand m^3/month or 987.5 m^3/hour, which covers the needs of the Syrdarya TPP and Shirin town. The Navoi water intake capacity is sufficient to provide the CCGT with drinking water in the volume of 3 m^3/hour. A new water duct will be built to supply drinking water. Drinking water supplied from water intake facilities will be delivered to the CCGT industrial site to the designed clean water reservoirs.

Drinking water supplied to the CCGT site is also used to feed the heating system. Tanks of the of the cooling tower circulating water system are intended to be used as fire main reservoirs, where the fire water-supply is adopted in accordance with the article 9.4 of KMK 2.04.02.

The sewage systems planned to be installed at the planned industrial site include: domestic, rainwater, emergency oil drains, industrial sewage. Domestic wastewater is envisaged to be pumped to the city's fecal sewage station in Shirin town without preliminary treatment, rainwater is planned to be discharged into the YG canal, wastewater contaminated with oil products is planned to be cleaned using oil traps, and then fed to evaporation ponds.

In accordance with the Law "on Water and Water Use" of the Republic of Uzbekistan No. 837-XII dated 06.09.1993, the circulating type of technical water supply system is planned for the two additional CCGTs. Mechanical-draft towers are accepted for installation, the technical specifications of which will be specified during detailed design. Compensation of the losses in the circulating system (droplet entrainment, evaporation, purging) is provided for by the supply of water from the YG canal.

To ensure the operation of 2 new CCGTs, it is planned to build the following – a sump for make-up water; a waste disposal site (for waste resulting from use of well flushing equipment); a pond-evaporator for acid washing of boilers; a waste disposal site for temporarily stored oiled silt; a disposal site for waste water resulting from chemical water treatment; a disposal site for purging clarifiers post chemical water treatment.

To compensate losses in the CCGT cycle and in the circulating water supply system, it is planned to build a new water treatment plant. The productivity of chemical water treatment for desalinated water to feed the CCGT steam-water cycle will be specified during detailed design. For pre-treatment of water, it is planned to apply the lime-soda water softening process followed by coagulation in the clarifier. For deep desalination of make-up water of the main CCGT cycle, it is planned to use two-stage softening of clarified water on Na-cationic filters, followed by water treatment on a reverse osmosis system and mixed-bed filters.

Waste regeneration water from water treatment plants is planned to be supplied to the

drainage pumping station of the chemical water treatment plant and further to the integrated wastewater treatment unit, which includes a unit for neutralizing acid and alkaline wastewater from the water treatment plant for feeding the steam-water cycle and a unit for processing saline run-off of both water treatment plants. Treatment of saline run-off is planned to be carried out according to the following scheme: dosing of soda into averaging tanks, filtration of settled water on mechanical filters with subsequent treatment at the reverse osmosis system. Saline run-off (salt water), after reverse osmosis is installed, will be sent to the evaporator pond, and the treated water will be returned to the cycle of water treatment plants for making up the circulation system and the steam-water cycle.

Approximate industrial water consumption from YG canal for the needs of the two CCGTs will be 1965 m^3/h or 16352,73 thousand m^3/year, the expected consumption of water for drinking and sanitary needs of 2 CCGTs – 3 m^3/hour, 24,765 thousand m^3/year, total water consumption for the needs of the 2 CCGTs will be 16377,495 thousand m^3/year. The discharge of purge water from the cooling towers into YG canal is projected at the level of 340 m^3/hour (2829,48 thousand m^3/year).

Based on the submitted EIA, the following types of waste will be generated: black metal scrap (non-hazardous V class), sludge waste from boiler cleaning (low-hazardous IV class), sludge waste from waste water treatment (low-hazardous IV class), sludge waste from oiled sludge (moderately dangerous class III), plastic bags waste from chemical reagents (low-hazardous class IV), waste paper bags from chemical reagents (low-hazardous class IV), oiled rags (moderately dangerous class III); waste of electrodes (non-hazardous class V), waste paper (non-hazardous class V), solid waste (low-hazard class IV), food waste (non-hazardous class V).

Prior to commissioning the facility, a **statement on environmental consequences** should be submitted for review, which should specify **environmental standards to be developed for all types of environmental impacts from the proposed activity**.

State Committee of the Republic of Uzbekistan on Ecology and Environmental Protection **agrees** with the draft Statement on Environmental Impact Assessment for the construction of two combined cycle gas turbines with a total capacity of 1500 MW.

To the attention of **the Department of Ecology and Environmental Protection of the Syrdarya region** – should follow up and establish control over adherence to the requirements of environmental legislation during the construction period.

Commissioning of the facility should not be granted without a positive conclusion to the Statement on environmental consequences.

Signed and stamped
Abdurazakov Sh.
Chairman

APPENDIX C – PROJECT APPROVED OFFICIAL PLAN

СИТУАЦИОННЫЙ ПЛАН РАСПОЛОЖЕНИЯ IFC-ПГУ И ACWA-ПГУ

масштаб 1 : 60 000

Руководитель предприятия Ш. Отаркулов

Государственный инспектор Д. Нуриев

Подпись подтверждаю

APPENDIX D– TERMINATION OF LAND LEASE AGREEMENTS

REPUBLIC OF UZBEKISTAN

KHOKIMIYAT (ADMINISTRATION) OF BOYAVUT DISTRICT OF SYRDARYA REGION

ORDER

12th of February, 2020 *№96* *Boyavut district*

Order on the reduction (change) of land area of the farm "Janiqul" which is located on the territory of "T. Latipov" Water Consumers Association.

Based on the application of the head of the farm "Joniqul" K.Rustamov operating in the Bayavut district, and part 1 of Article 32 of the Law of the Republic of Uzbekistan "On Farming"

KHOKIMIYAT DECIDES:

1. To satisfy the application of K.Rustamov, the head of the farm "Joniqul" operating in the territory of T. Latipov WCA.

2. To return the land total of 10.0 hectares to the reserve fund, including 10.0 hectares of irrigated land, from the contour No. 254 of the farm "Joniqul" operating on the territory of T.Latipov WCA.

3. To lease a land of total 101,1 hectares for 48 years to the farm "Joniqul" from the territory of T. Latipov WCA as it indicated on the contour map according to contours number 239, 241, 254. The land total 101.0 hectares, includes irrigated lands 96.0 hectares, mulberry 2.0 hectares, lands occupied by ditches and ditches 2.7 hectares of land occupied by roads, 0.3 hectares of land.

4. District department Land Resources and State Cadastre should register the new long-term lease agreement of the farm "Joniqul" with the Bayavut district khokimiyat for a total of 101.0 hectares as per the documents submitted by the director of the "Joniqul" farm.

5. To instruct the State Tax Inspectorate of the district, the district statistics department: to make appropriate changes to the reports in accordance with the changes in the land of the farm "Joniqul".

6. To ask the district Council of People's Representatives to approve this order[1].

7. Control for implementation of this order is assigned to the deputy khokim (mayor) of the area concerning agriculture and water economy O.Turdiev.

Khokim (mayor) of district **O. Madaminov**

[1] Please note that according to the current legislation (Resolution of the Council of the Senate of the Oliy Majlis of the Republic of Uzbekistan No.154-II, dated on December 30, 2010) order of Khokim (mayor) will enter into force after approval of district Council of People's Representatives

REPUBLIC OF UZBEKISTAN

KHOKIMIYAT (ADMINISTRATION) OF SHIRIN TOWN OF SYRDARYA REGION

ORDER

30th of January, 2020 №20 Shirin town

Order on the return of the land plot temporarily attached to "Sarvinoz Servis Jaloliddin" Ltd by the decision of the khokim (mayor) of Shirin city dated September 19, 2018 No 470 to the reserve land fund of the city Khokimiyat (administration).

Considering the official request of the Ministry of Energy of the Republic of Uzbekistan dated January 16, 2020 No. 03-10-271 on the allocation of land for the construction of CCGT in Shirin, Syrdarya region; and in accordance with paragraph 3 of Resolution No. 470 of September 19, 2020 and the legal opinion of the Chief Legal Adviser of the Shirin city khokimiyat (administration) of January 29, 2020; in accordance with Article 25 of the Law "On local government"

KHOKIMIYAT DECIDES

1. To accept as the basis the warning letter No. ZA-4 / 03-83 sent by "Shirin city khokimiyat" to "Sarvinos Servis Jaloliddin" LLC on January 27, 2020 and the legal conclusions of the chief legal adviser of Shirin city khokimiyat (administration) on January 29, 2020.

2. To return the land territory which was temporary allocated to “Sarvinos Servis Jaloliddin” Ltd on the territory of V.Ulugbek makhalla of Shirin city with total area 17.0 hectares for cultivation of agricultural products by the decision of the khokim (mayor) of Shirin town on September 19, 2018 No. 470 to the reserve land fund of the city khokimiyat (administration) .

3. To cancel the decision of the khokim (mayor) of the city from September 19, 2018 of No. 470 due to the return of the land area to the reserve land fund of the city khokimiyat (administration).

4. To B.Akhmadov, the leading specialist of the city administration, should :

-Instruct the head of "Sarvinos Servis Jaloliddin" Ltd Muminov Bakhtiyor and relevant organizations about termination of the decision of the khokim (mayor) of the city dated September 19, 2018, No 470.

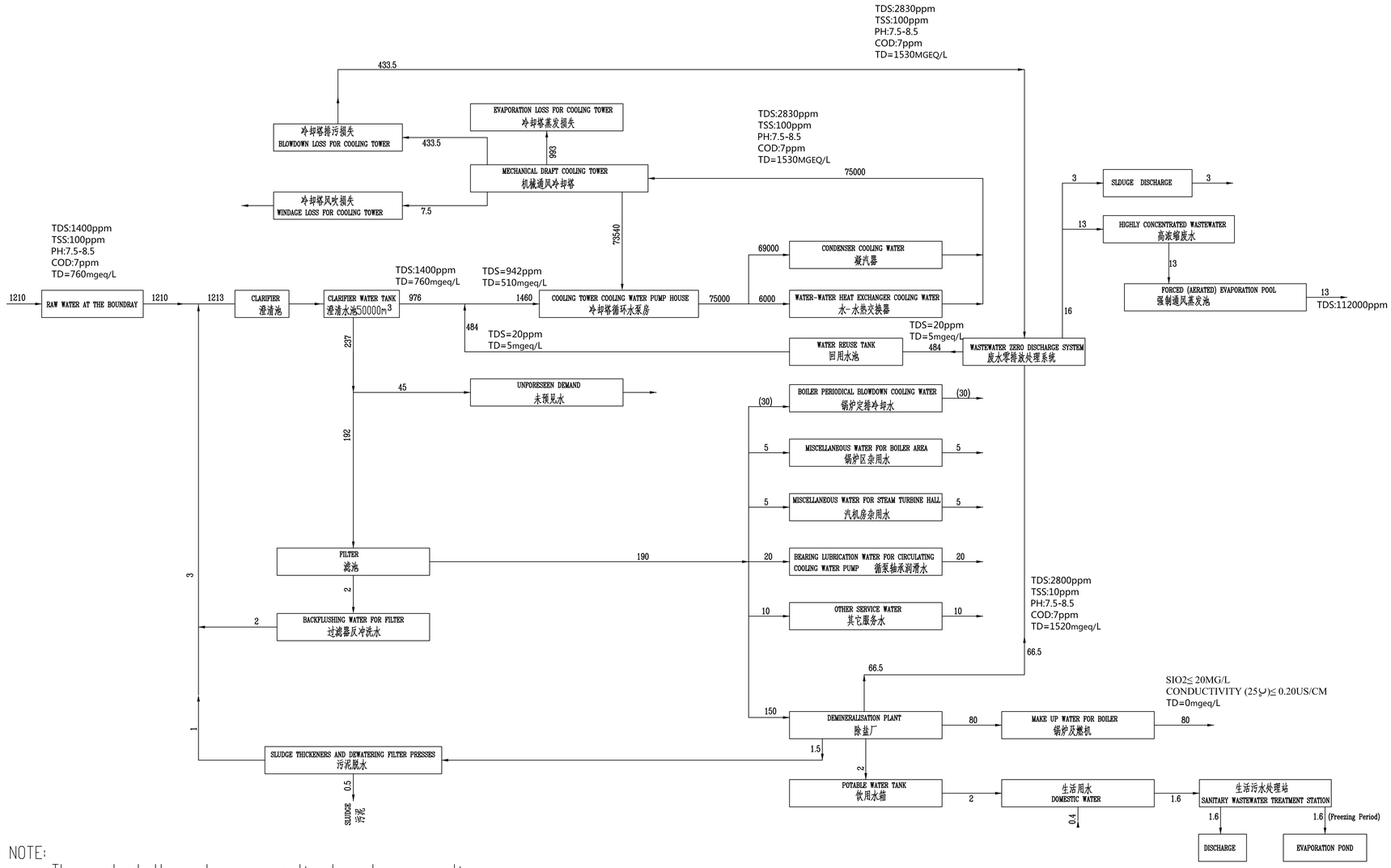
5. Control of implementation of this resolution to assign to the deputy khokim (mayor) Z.Abduvahidov.

Khokim (mayor) of the city **A.Khojimatov**

APPENDIX E – OVERALL PROJECT LAYOUT

EXISTING TRANSMISSION LINE
EXISTING TRANSMISSION LINE
EXISTING TRANSMISSION LINE

APPENDIX F– WATER BALANCE DIAGRAM



NOTE:

The content the water consumption based on operation of natural gas condition during 15℃,60%RH, 977hpa

TD REFERS TO TOTAL HARDNESS

说明:

该水量平衡图基于15℃,60%RH, 977hpa燃气工况时计算。

FOR REFERENCE

ACWA Power

UZBEKISTAN COMBINED CYCLE POWER PROJECT

CGGC INTERNATIONAL LTD

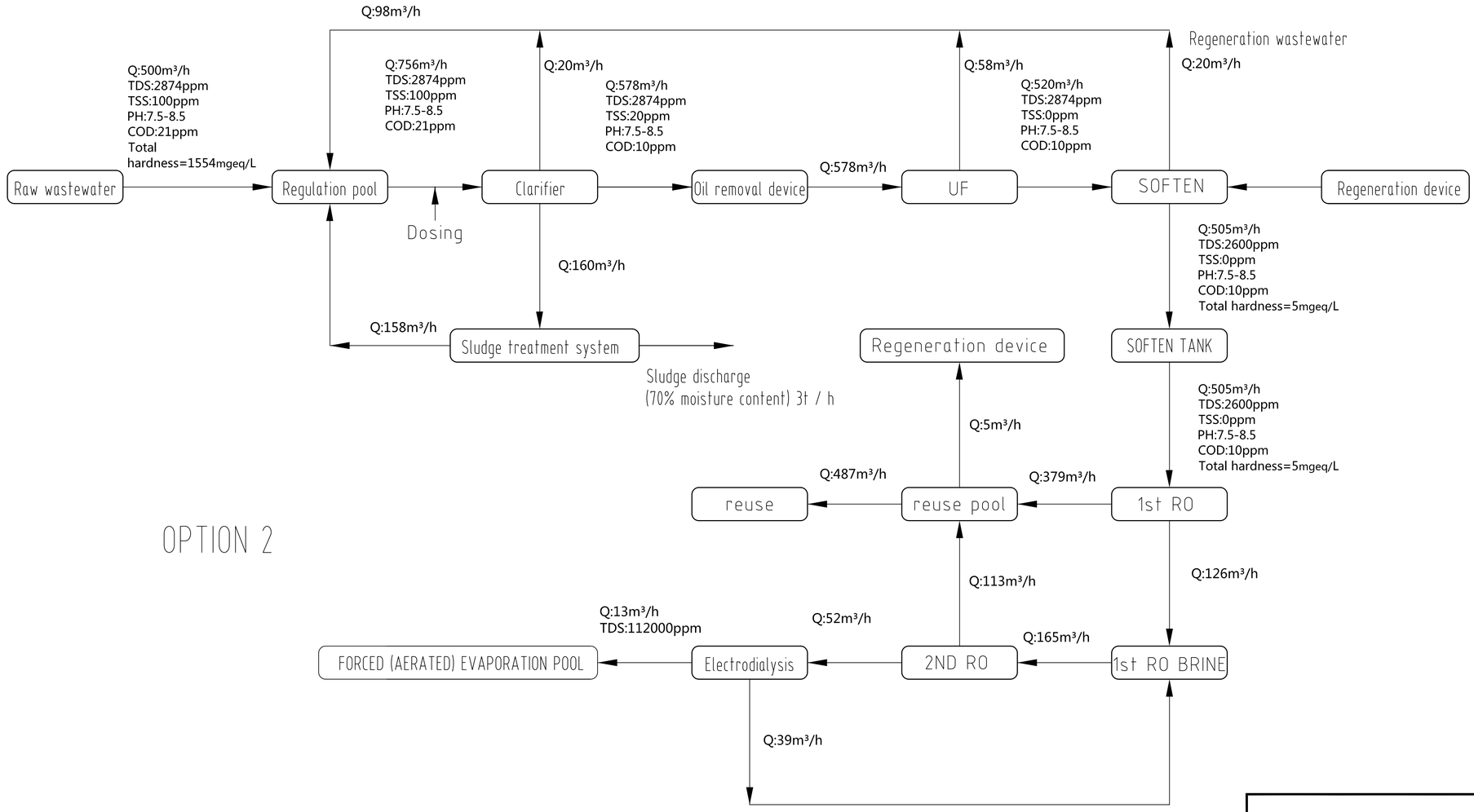
CHINA ENERGY ENGINEERING GROUP
ZHEJIANG ELECTRIC POWER DESGIN INSTITUTE CO., LTD

APP'D BY		DSN'D BY		TITLE: WATER BALANCE DIAGRAM IN THE WHOLE PLANT
REV'D BY		SCALE	/	
CHK'D BY		DATE		DWG NO: S-01 REV: C

CERTIFICATE OF DESIGN & EVALUATION A133007109 B133007109 LITP2220700G4

SIZE A1

MASS FLOW(ZERO DISCHARGE SYSTEM)



OPTION 2

FOR REFERNCE

ACWA Power

UZBEKISTAN COMBINED CYCLE POWER PROJECT

CGGC INTERNATIONAL LTD

CGGC

CHINA ENERGY ENGINEERING GROUP
ZHEJIANG ELECTRIC POWER DESGIN INSTITUTE CO., LTD

APP'D BY		DSN'D BY	
REV'D BY		SCALE	/
CHK'D BY		DATE	

TITLE: MASS FLOW(ZERO DISCHARGE SYSTEM)

DWG NO: S-05 REV: 0

SIZE A2

CERTIFICATE OF DESIGN & EXPLORATION A133007109 B133007109 工许证[2122007004]

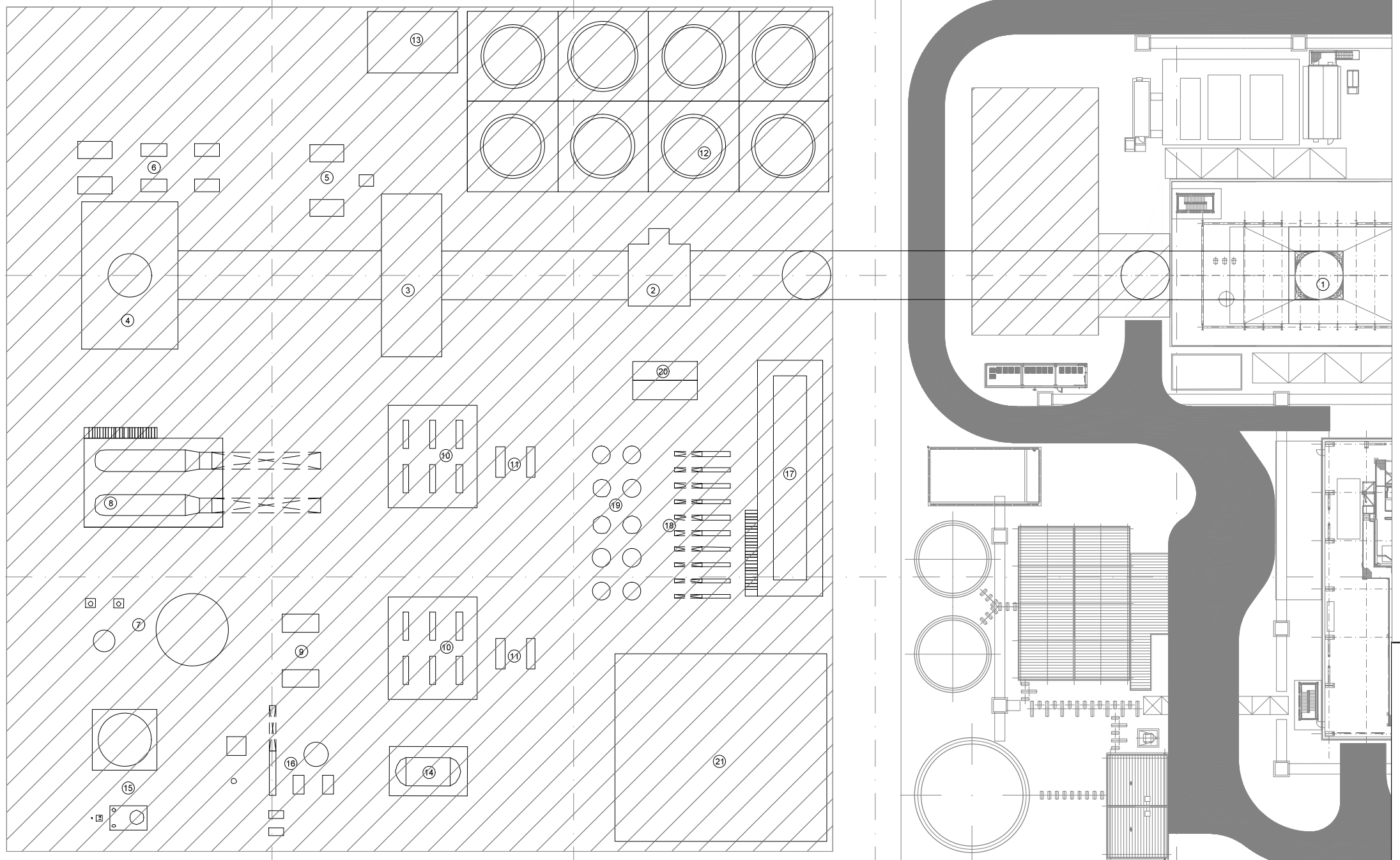
APPENDIX G - PROJECT CARBON CAPTURE STORAGE LAYOUT

GENERAL NOTES:

PRELIMINARY ARRANGEMENT OF MAIN CARBON CAPTURE EQUIPMENT IS SHOWN IN THIS DRAWING. REQUIRED RESERVE SPACE FOR CARBON CAPTURE PLANT SHALL BE RE-EVALUATED DURING DETAILED ENGINEERING PHASE.

REFERENCE DOCUMENTS:

BENGIE_V-IDO-RG-0855_00 Power Plant Carbon Capture Readiness



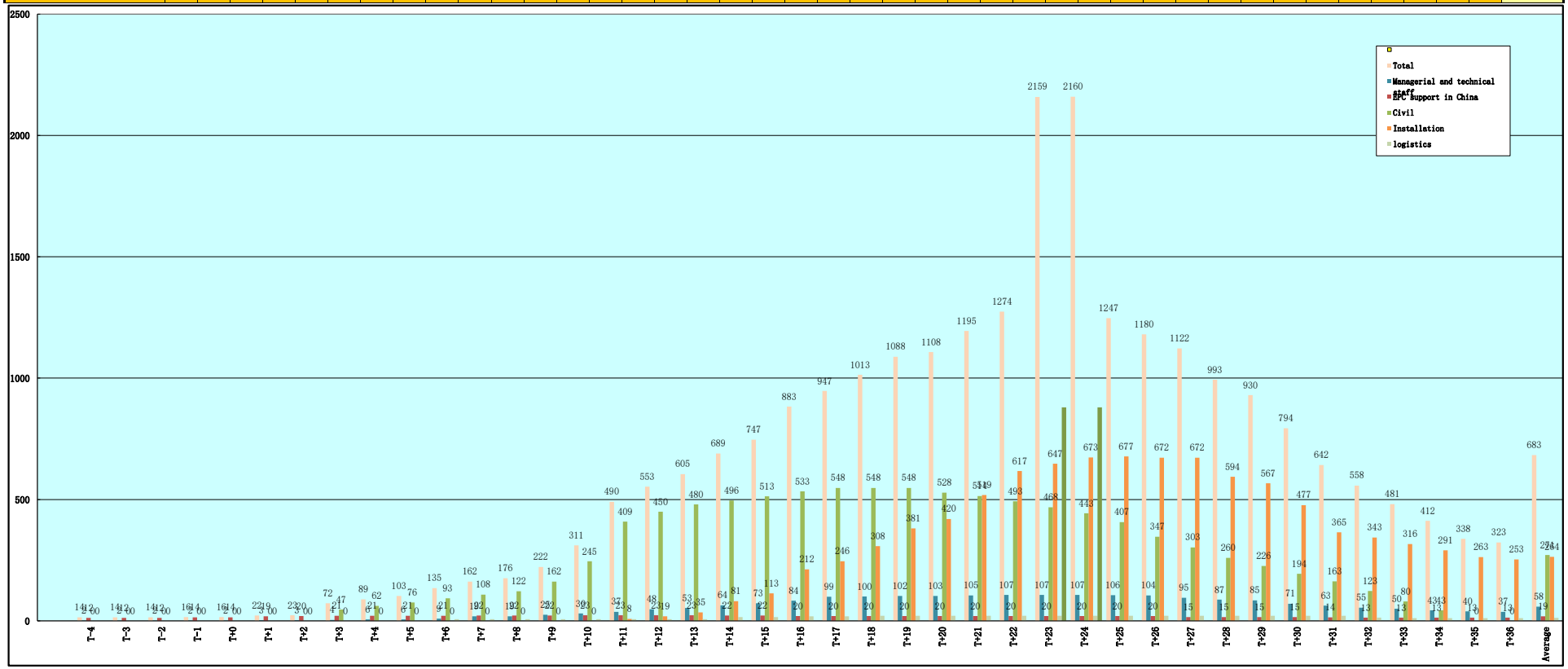
ID	DESCRIPTION
1	HRSG STACK
2	EXHAUST GAS FAN
3	DIRECT CONTACT COOLERS (DCC)
4	ABSORBER COLUMN
5	DCC PUMPS AND COOLERS
6	ABSORBER COLUMN PUMPS (RICH SOLVENT PUMPS) AND COOLERS
7	STRIPPER COLUMN
8	REBOILER
9	LEAN SOLVENT PUMPS
10	REGENERATIVE HEAT EXCHANGER
11	LEAN SOLVENT COOLERS
12	COOLING TOWER
13	COOLING TOWER PUMPS
14	RECLAIMER SYSTEM
15	SOLVENT STORAGE TANK
16	SOLVENT STORAGE PUMPS
17	CO2 COMPRESSOR BUILDING
18	COMPRESSOR INTERSTAGE COOLERS
19	KNOCKOUT DRUMS
20	CO2 PURIFICATION SYSTEM
21	WATER TREATMENT PLANT

APPENDIX H– PROJECT MANPOWER HISTOGRAM

Uzbekistan Syrdarya Project Manpower Schedule

28.25%

Type	T-4	T-3	T-2	T-1	T+0	T+1	T+2	T+3	T+4	T+5	T+6	T+7	T+8	T+9	T+10	T+11	T+12	T+13	T+14	T+15	T+16	T+17	T+18	T+19	T+20	T+21	T+22	T+23	T+24	T+25	T+26	T+27	T+28	T+29	T+30	T+31	Average
Total	14	14	14	16	16	22	23	72	89	103	135	162	176	222	311	490	553	605	689	747	883	947	1013	1088	1108	1195	1274	2159	2160	1247	1180	1122	993	930	794	642	683
Chinese	14	14	14	16	16	22	23	42	54	64	81	97	105	132	193	308	341	386	450	503	620	686	734	810	839	940	1024	1037	1043	1026	980	946	822	771	654	518	489
Local	0	0	0	0	0	0	0	30	35	39	54	65	71	90	118	182	212	219	239	244	263	261	279	278	269	255	250	1122	1117	221	200	176	171	159	140	124	193
Managerial and technical staff	2	2	2	2	2	3	3	4	6	6	9	19	19	25	30	37	48	53	64	73	84	99	100	102	103	105	107	107	107	106	104	95	87	85	71	63	55	50	43	40	37	58
Chinses	2	2	2	2	2	3	3	4	6	6	9	18	18	23	28	32	43	48	56	65	74	89	90	92	93	95	97	97	97	96	94	85	77	75	64	56	48	43	41	38	35	52
Local	0	0	0	0	0	0	0	0	0	0	0	1	1	2	2	5	5	5	8	8	10	10	10	10	10	10	10	10	10	10	10	10	10	10	7	7	7	7	2	2	2	6
EPC support in China	12	12	12	14	14	19	20	21	21	21	21	22	22	22	23	23	23	23	22	22	20	20	20	20	20	20	20	20	20	20	20	15	15	15	15	14	13	13	13	13	13	19
Civil	0	0	0	0	0	0	0	47	62	76	93	108	122	162	245	409	450	480	496	513	533	548	548	548	528	514	493	468	443	407	347	303	260	226	194	163	123	80	43	0	0	271
Chinese	0	0	0	0	0	0	0	17	27	37	46	51	59	81	136	239	251	277	287	300	311	329	329	332	323	329	318	303	283	263	224	204	168	144	122	100	73	51	28	0	0	163
Local	0	0	0	0	0	0	0	30	35	39	47	57	63	81	109	170	199	203	209	213	222	219	219	216	205	185	175	165	160	144	123	99	92	82	72	63	50	29	15	0	0	108
Installation	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	8	19	35	81	113	212	246	308	381	420	519	617	647	673	677	672	672	594	567	477	365	343	316	291	263	253	264
Chinese	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	8	18	31	74	105	200	233	279	350	387	480	573	601	627	631	626	626	546	521	437	332	312	292	275	249	239	245
Local	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	4	7	8	12	13	29	31	33	39	44	46	46	46	46	46	48	46	40	33	31	24	16	14	14	19
local laborers	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	880	880	0	0	0	0	0	0	0	0	0	0	0	0	48
logistics	0	0	0	0	0	0	0	0	0	0	0	7	7	7	7	7	7	7	15	15	19	19	21	21	21	21	21	21	21	21	21	21	21	21	21	21	13	11	11	11	11	13
Chinese	0	0	0	0	0	0	0	0	0	0	5	6	6	6	6	6	6	7	11	11	15	15	16	16	16	16	16	16	16	16	16	16	16	16	16	16	11	11	11	11	9	10
Local	0	0	0	0	0	0	0	0	0	0	7	7	7	7	7	7	7	7	15	15	19	19	21	21	21	21	21	21	21	21	21	21	21	21	21	21	13	11	11	11	11	13



APPENDIX I– STAKEHOLDER CONSULTATION LETTERS

Suite 1, First Floor 41 Chalton Street, London, NW1 1JD, UK
t +44 207 859 4028
f +44 207 691 9406
e info@juruenergy.com

№ UZB-ACWA-CCGT-20/20/32

22.06.2020

АО «Национальные электрические сети Узбекистана»

Компания ACWA Power при помощи ООО «ACWA Power Sirdarya» (Ташкент) заключила 25-летнее соглашение о покупке электроэнергии с АО «Национальные электрические сети Узбекистана» на разработку газовой турбины с комбинированным циклом мощностью 1500 МВт (ПГУ). Общая площадь, выделенная для проекта, составляет 75 гектаров. Проект будет расположен примерно в 0.3 км к северо-востоку от города Ширин, напротив существующей нефтегазовой теплоэлектростанции мощностью 3000 МВт (Сырдарьинская ТЭС).

Исходя из требований, установленных действующим законодательством, ACWA Power должна сдать в Государственный комитет Республики Узбекистан по экологии и охране окружающей среды (регулирующий орган) отчет об оценке воздействии на окружающую среду (ОВОС), и получить экологическую лицензию до начала проекта. Вследствие этого, в рамках ОВОС корпоративные экологические и социальные консультанты ACWA Power «5 Capitals Environmental & Management Consulting» (Дубай, ОАЭ) назначили Juru Energy (Ташкент, Узбекистан) для проведения необходимых экологических и социальных исследований, а также сбор данных, включая представление ОВОС регулирующему органу.

Учитывая вышеизложенное, Juru Energy, просит АО «Национальные электрические сети Узбекистана» оказать содействие в предоставлении информации, которая может быть необходима для включения в процесс ОВОС, а также любые другие комментарии, которые могут быть необходимы на этапах строительства и эксплуатации ACWA Power Syrdarya 1500 MB ПГУ.

Ваши предложения и комментарии могут быть направлены координатору проекта Умиде Розумбетовой через электронную почту u.rozumbeova@juruenergy.com, а также по телефону +99871 202-04-40.

Благодарим Вас за сотрудничество.

Хушнуджон Рахимберганов

LONDON, UK
JURU ENERGY LIMITED
COMPANY No 9672085

Директор

Исполнитель А.Адхамов

Тел.: +99871 202 04 40

Моб.: +99897 3076003

Приложение к письму №
UZB-ACWA-CCGT-20/20/32
22.06.2020

Juru Energy

Juru Energy

Suite 1, First Floor, 41 Chalton Street, London, NW1 1JD, UK
+44 207 859 4028
+44 207 691 9406
info@juruenergy.com

№ UZB-ACWA-CCGT-20/20/31

22.06.2020

АО «Сырдарьинская ТЭС»

Компания ACWA Power при помощи ООО «ACWA Power Sirdarya» (Ташкент) заключила 25-летнее соглашение о покупке электроэнергии с АО «Национальные электрические сети Узбекистана» на разработку газовой турбины с комбинированным циклом мощностью 1500 МВт (ПГУ). Общая площадь, выделенная для проекта, составляет 75 гектаров. Проект будет расположен примерно в 0,3 км к северо-востоку от города Ширин, напротив существующей нефтегазовой теплоэлектростанции мощностью 3000 МВт (Сырдарьинская ТЭС).

Исходя из требований, установленных действующим законодательством, ACWA Power должна сдать в Государственный комитет Республики Узбекистан по экологии и охране окружающей среды (регулирующий орган) отчет об оценке воздействии на окружающую среду (ОВОС), и получить экологическую лицензию до начала проекта. Вследствие этого, в рамках ОВОС корпоративные экологические и социальные консультанты ACWA Power «5 Capitals Environmental & Management Consulting» (Дубай, ОАЭ) назначили Juru Energy (Ташкент, Узбекистан) для проведения необходимых экологических и социальных исследований, а также сбор данных, включая представление ОВОС регулирующему органу.

Учитывая вышеизложенное, Juru Energy, просит АО «Сырдарьинская ТЭС» оказать содействие в предоставлении информации, которая может быть необходима для включения в процесс ОВОС, а также любые другие комментарии, которые могут быть необходимы на этапах строительства и эксплуатации ACWA Power Syrdarya 1500 МВ ПГУ.

Ваши предложения и комментарии могут быть направлены координатору проекта Умиде Розумбетовой через электронную почту u.rozumbeova@juruenergy.com, а также по телефону +99871 202-04-40.

Благодарим Вас за сотрудничество

Хушнуджон Рахимберганов

LONDON, UK
JURU ENERGY LIMITED
COMPANY No 9677085

Директор

Исполнитель А.Адхамов

Тел: +99871 202 04 40

Моб.: +998337 3076003

Приложение к письму №
UZB-ACWA-CCGT-20/20/31
22.06.2020

Juru Energy

Suite 1, First Floor, 41 Chalton Street, London, NW1 1JD, UK
+44 207 859 4026
+44 207 691 9406
info@juruenergy.com

№ UZB-ACWA-CCGT-20/20/30

22.06.2020

АО «Узтрансгаз»

Компания ACWA Power при помощи ООО «ACWA Power Sirdarya» (Ташкент) заключила 25-летнее соглашение о покупке электроэнергии с АО «Национальные электрические сети Узбекистана» на разработку газовой турбины с комбинированным циклом мощностью 1500 МВт (ПГУ). Общая площадь выделенная для проекта, составляет 75 гектаров. Проект будет расположен примерно в 0,3 км к северо-востоку от города Ширин, напротив существующей нефтегазовой теплоэлектростанции мощностью 3000 МВт (Сырдарьинская ТЭС)

Исходя из требований, установленных действующим законодательством, ACWA Power должна сдать в Государственный комитет Республики Узбекистан по экологии и охране окружающей среды (регулирующий орган) отчет об оценке воздействии на окружающую среду (ОВОС), и получить экологическую лицензию до начала проекта Вследствие этого, в рамках ОВОС корпоративные экологические и социальные консультанты ACWA Power «5 Capitals Environmental & Management Consulting» (Дубай, ОАЭ) назначили Juru Energy (Ташкент, Узбекистан) для проведения необходимых экологических и социальных исследований, а также сбор данных, включая представление ОВОС регулирующему органу.

Учитывая вышеизложенное, Juru Energy, просит АО «Узтрансгаз» оказать содействие в предоставлении информации, которая может быть необходима для включения в процесс ОВОС, а также любые другие комментарии, которые могут быть необходимы на этапах строительства и эксплуатации ACWA Power Syrdarya 1500 МВ ПГУ.

Ваши предложения и комментарии могут быть направлены координатору проекта Умиде Розумбетовой через электронную почту u.rozumbeova@juruenergy.com, а также по телефону +99871 202-04-40.

Благодарим Вас за сотрудничество.

Хушнуджон Рахимберганов

LONDON, UK
JURU ENERGY LIMITED
COMPANY No. 9677085

Директор

Исполнитель:А.Адхамов

Тел. +99871 202 04 40

Моб : +99897 3076003

Приложение к письму №
UZB-ACWA-CCGT-20/20/28
22.06.2020

Juru Energy

Juru Energy

Suite 1, First Floor, 41 Chalton Street, London, NW1 1JD, UK
+44 207 859 4028
+44 207 691 9406
info@juruenergy.com

№ UZB-ACWA-CCGT-20/20/33

22.06.2020

Государственный комитет Республики Узбекистан по земельным ресурсам, геодезии, картографии и государственному кадастру

Компания ACWA Power при помощи ООО «ACWA Power Sirdarya» (Ташкент) заключила 25-летнее соглашение о покупке электроэнергии с АО «Национальные электрические сети Узбекистана» на разработку газовой турбины с комбинированным циклом мощностью 1500 МВт (ПГУ). Общая площадь, выделенная для проекта, составляет 75 гектаров. Проект будет расположен примерно в 0,3 км к северо-востоку от города Ширин, напротив существующей нефтегазовой теплоэлектростанции мощностью 3000 МВт (Сырдарьинская ТЭС).

Исходя из требований, установленных действующим законодательством, ACWA Power должна сдать в Государственный комитет Республики Узбекистан по экологии и охране окружающей среды (регулирующий орган) отчет об оценке воздействии на окружающую среду (ОВОС), и получить экологическую лицензию до начала проекта. Вследствие этого в рамках ОВОС корпоративные экологические и социальные консультанты ACWA Power «5 Capitals Environmental & Management Consulting» (Дубай, ОАЭ) назначили Juru Energy (Ташкент, Узбекистан) для проведения необходимых экологических и социальных исследований, а также сбор данных, включая представление ОВОС регулирующему органу

Учитывая вышеизложенное, Juru Energy, просит Государственный комитет Республики Узбекистан по земельным ресурсам, геодезии, картографии и государственному кадастру оказать содействие в предоставлении информации, которая может быть необходима для включения в процесс ОВОС, а также любые другие комментарии, которые могут быть необходимы на этапах строительства и эксплуатации ACWA Power Syrdarya 1500 MB ПГУ.

Ваши предложения и комментарии могут быть направлены координатору проекта Умиде Розумбетовой через электронную почту u.rozumbeova@juruenergy.com, а также по телефону +99871 202-04-40.

Благодарим Вас за сотрудничество.

Хушнуджон Рахимбарганов

LONDON, UK
JURU ENERGY LIMITED
COMPANY No 9677085

Директор

Исполнитель А.Адхамов Тел.: +99871 202 04 40, Моб.: +99897 3076303

Приложение к письму №
UZB-ACWA-CCGT-20/20/33
22.06.2020

Juru Energy

Suite 1, First Floor, 41 Chalton Street, London, NW1 1JD, UK
t +44 207 859 4028
f +44 207 691 9406
e info@juruenergy.com

№ UZB-ACWA-CCGT-20/20/36

22.06.2020

Министерство внутренних дел Республики Узбекистан

Компания ACWA Power при помощи ООО «ACWA Power Sirdarya» (Ташкент) заключила 25-летнее соглашение о покупке электроэнергии с АО «Национальные электрические сети Узбекистана» на разработку газовой турбины с комбинированным циклом мощностью 1500 МВт (ПГУ). Общая площадь, выделенная для проекта, составляет 75 гектаров. Проект будет расположен примерно в 0.3 км к северо-востоку от города Ширин, напротив существующей нефтегазовой теплоэлектростанции мощностью 3000 МВт (Сырдарьинская ТЭС).

Исходя из требований, установленных действующим законодательством, ACWA Power должна сдать в Государственный комитет Республики Узбекистан по экологии и охране окружающей среды (регулирующий орган) отчет об оценке воздействии на окружающую среду (ОВОС), и получить экологическую лицензию до начала проекта. Вследствие этого, в рамках ОВОС корпоративные экологические и социальные консультанты ACWA Power «5 Capitals Environmental & Management Consulting» (Дубай, ОАЭ) назначили Juru Energy (Ташкент, Узбекистан) для проведения необходимых экологических и социальных исследований, а также сбор данных, включая предствление ОВОС регулирующему органу

Учитывая вышеизложенное, Juru Energy, просит Министерство оказать содействие в предоставлении информации, которая может быть необходима для включения в процесс ОВОС, а также любые другие комментарии, которые могут быть необходимы на этапах строительства и эксплуатации ACWA Power Syrdarya 1500 MB ПГУ

Ваши предложения и комментарии могут быть направлены координатору проекта Умиде Розумбетовой через электронную почту u.rozumbeova@juruenergy.com, а также по телефону +99871 202-04-40

Благодарим Вас за сотрудничество.

Хушнуджон Рахимберганов

Директор

LONDON, UK
JURU ENERGY LIMITED
COMPANY No 9677085

Исполнитель А.Адхамов

Тел.: +99871 202 04 40 Моб.: +998997 307 6003

Приложение к письму №
UZB-ACWA-CCGT-20/20/36
22.06.2020

Juru Energy

Juru Energy

Suite 1, First Floor, 41 Chalton Street, London, NW1 1JD, UK
+44 207 859 4028
+44 207 691 9406
info@juruenergy.com

№ UZB-ACWA-CCGT-20/20/39

22.06.2020

Министерство сельского хозяйства Республики Узбекистан

Компания ACWA Power при помощи ООО «ACWA Power Sirdarya» (Ташкент) заключила 25-летнее соглашение о покупке электроэнергии с АО «Национальные электрические сети Узбекистана» на разработку газовой турбины с комбинированным циклом мощностью 1500 МВт (ПГУ). Общая площадь, выделенная для проекта, составляет 75 гектаров. Проект будет расположен примерно в 0.3 км к северо-востоку от города Ширин, напротив существующей нефтегазовой теплоэлектростанции мощностью 3000 МВт (Сырдарьинская ТЭС).

Исходя из требований, установленных действующим законодательством, ACWA Power должна сдать в Государственный комитет Республики Узбекистан по экологии и охране окружающей среды (регулирующий орган) отчет об оценке воздействии на окружающую среду (ОВОС), и получить экологическую лицензию до начала проекта. Вследствие этого, в рамках ОВОС корпоративные экологические и социальные консультанты ACWA Power «5 Capitals Environmental & Management Consulting» (Дубай, ОАЭ) назначили Juru Energy (Ташкент, Узбекистан) для проведения необходимых экологических и социальных исследований, а также сбор данных, включая представление ОВОС регулирующему органу.

Учитывая вышеизложенное Juru Energy, просит Министерство оказать содействие в предоставлении информации, которая может быть необходима для включения в процесс ОВОС, а также любые другие комментарии, которые могут быть необходимы на этапах строительства и эксплуатации ACWA Power Syrdarya 1500 МВ ПГУ.

Ваши предложения и комментарии могут быть направлены координатору проекта Умиде Розумбетовой через электронную почту u.rozumbeova@juruenergy.com, а также по телефону +99871 202-04-40.

Благодарим Вас за сотрудничество

Хушнуджон Рахимбергановв

Директор

LONDON, UK
JURU ENERGY LIMITED
COMPANY No. 09677085

Исполнитель А.Адхамов

Тел.: +99871 202 04 40 Моб: +99897 3076003

Приложение к письму №
UZB-ACWA-CCGT-20/20/39
22.06.2020

Juru Energy

Suite 1, First Floor, 41 Chalton Street, London, NW1 1JD, UK
+44 207 859 4028
+44 207 691 9406
info@juruenergy.com

№ UZB-ACWA-CCGT-20/20/37

22.06.2020

Министерство здравоохранения Республики Узбекистан

Компания ACWA Power при помощи ООО «ACWA Power Sirdarya» (Ташкент) заключила 25-летнее соглашение о покупке электроэнергии с АО «Национальные электрические сети Узбекистана» на разработку газовой турбины с комбинированным циклом мощностью 1500 МВт (ПГУ). Общая площадь, выделенная для проекта, составляет 75 гектаров. Проект будет расположен примерно в 0,3 км к северо-востоку от города Ширин, напротив существующей нефтегазовой теплоэлектростанции мощностью 3000 МВт (Сырдарьинская ТЭС).

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Благодарим Вас за сотрудничество

Хушнуджон Рахимберганов

LONDON, UK
JURU ENERGY LIMITED
COMPANY NO. 9677035

Директор

Исполнитель:А.Адхамов

Тел.: +99871 202 04 40 Моб.: +99897 3078003

Приложение к письму №
UZB-ACWA-CCGT-20/20/37
22.06.2020

Juru Energy

Juru Energy

Suite 1, First Floor, 41 Chaltor Street, London, NW1 1JD, UK
+44 207 859 4028
+44 207 691 9406
info@juruenergy.com

№ UZB-ACWA-CCGT-20/20/40

22.06.2020

Министерство водного хозяйства Республики Узбекистан

Компания ACWA Power при помощи ООО «ACWA Power Sirdarya» (Ташкент) заключила 25-летнее соглашение о покупке электроэнергии с АО «Национальные электрические сети Узбекистана» на разработку газовой турбины с комбинированным циклом мощностью 1500 МВт (ПГУ). Общая площадь, выделенная для проекта, составляет 75 гектаров. Проект будет расположен примерно в 0,3 км к северо-востоку от города Ширин, напротив существующей нефтегазовой теплоэлектростанции мощностью 3000 МВт (Сырдарьинская ТЭС).

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Благодарим Вас за сотрудничество.

Хушнуджон Рахимберганов

LONDON, UK
JURU ENERGY LIMITED
COMPANY No 9677085

Директор

Исполнитель:А Адхамов

Тел.: +99871 202 04 40 Моб.: +99897 3076003

Приложение к письму №
UZB-ACWA-CCGT-20/20/40
22.06.2020

Juru Energy

Juru Energy

Suite 1, First Floor, 41 Chaltor Street, London, NW1 1JD, UK
+44 207 859 4028
+44 207 691 9406
info@juruenergy.com

№ UZB-ACWA-CCGT-20/20/34

22.06.2020

Министерство занятости и трудовых отношений Республики Узбекистан

Компания ACWA Power при помощи ООО «ACWA Power Sirdarya» (Ташкент) заключила 25-летнее соглашение о покупке электроэнергии с АО «Национальные электрические сети Узбекистана» на разработку газовой турбины с комбинированным циклом мощностью 1500 МВт (ПГУ). Общая площадь, выделенная для проекта, составляет 75 гектаров. Проект будет расположен примерно в 0,3 км к северо-востоку от города Ширин, напротив существующей нефтегазовой теплоэлектростанции мощностью 3000 МВт (Сырдарьинская ТЭС).

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Благодарим Вас за сотрудничество.

Хушнуджон Рахимберганов

LONDON, UK
JURU ENERGY LIMITED
COMPANY No 9677085

Директор

Исполнитель:А.Адхамов

Тел.: +99871 202-04-40 Моб.: +99897 3076033

Приложение к письму №
UZB-ACWA-CCGT-20/20/34
22.06.2020

Juru Energy

Suite 1, First Floor, 41 Chalton Street, London, NW1 1JD, UK
☎ +44 207 859 4028
☎ +44 207 691 9406
✉ info@jurueneгgy.com

№ UZB-ACWA-CCGT-20/20/38

22.06.2020

Министерство транспорта
Республики Узбекистан

Компания ACWA Power при помощи ООО «ACWA Power Sirdarya» (Ташкент) заключила 25-летнее соглашение о покупке электроэнергии с АО «Национальные электрические сети Узбекистана» на разработку газовой турбины с комбинированным циклом мощностью 1500 МВт (ПГУ). Общая площадь, выделенная для проекта, составляет 75 гектаров. Проект будет расположен примерно в 0,3 км к северо-востоку от города Ширин напротив существующей нефтегазовой теплоэлектростанции мощностью 3000 МВт (Сырдарьинская ТЭС).

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Благодарим Вас за сотрудничество.

Хушнуджон Рахимберганов

LONDON, UK
JURU ENERGY LIMITED
COMPANY No 96[illegible]085

Директор

Исполнитель А.Адхамов

Тел.: +99871 202 04 40 Моб.: +99897 3073003

Приложение к письму №
UZB-ACWA-CCGT-20/20/38
22.06.2020

Juru Energy

Suite 1, First Floor, 41 Chalton Street, London, NW1 1JD, UK
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+44 207 691 9406
info@juruenergy.com

№ UZB-ACWA-CCGT-20/20/35

22.06.2020

Министерство чрезвычайных ситуаций Республики Узбекистан

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Хушнуджон Рахимберганов

Директор

LONDON, UK
JURU ENERGY LIMITED
COMPANY No 96[illegible]

Исполнитель А.Адхамов

Тел. +99871 202 04 40 Моб.. +99897 3079003

Приложение к письму №
UZB-ACWA-CCGT-20/20/35
22.05.2020

Juru Energy

APPENDIX J– AMBIENT AIR QUALITY MONITORING RESULTS

Служба мониторинга загрязнения природной среды Узгидромета (СМЗ)
Лаборатория мониторинга загрязнения атмосферного воздуха (ЛМЗАВ)
г.Ташкент, ул. Бодомзор йули 1-й проезд, 72, тел 237-15-47, 150-85-02

Утверждаю
Начальник СМЗ
_____ М.А. Пынеев
18 мая 2020 г.

Протокол № 7
лабораторного анализа проб атмосферного воздуха.

Протокол лабораторного анализа проб атмосферного воздуха, отобранных при экологическом мониторинге качества воздуха в Сырдарьинской области

Результаты анализов приведены в таблице.

Дата отбора	Время отбора	NO_2 мг/м^3	SO_2 мг/м^3	CO мг/м^3	Пыль мг/м^3
21.05.20	10:20	0,00	0,001	3,3	0,33
	13:00	0,00	0,001	2,7	
	16:00	0,00	0,000	2,3	
	Ср.с.	***0,00***	***0,001***	***2,8***	
22.05.20	09:20	0,02	0,001	3,9	0,30
	13:00	0,01	0,007	3,7	
	16:00	0,01	0,002	3,5	
	Ср.с.	***0,01***	***0,003***	***3,4***	
23.05.20	09:45	0,00	0,001	3,9	0,35
	13:45	0,01	0,003	4,8	
	15:45	0,00	0,001	3,2	
	Ср.с.	***0,00***	***0,002***	***4,0***	
24.05.20	10:00	0,00	0,003	5,0	0,30
	13:00	0,00	0,008	3,0	
	15:50	0,00	0,004	3,2	
	Ср.с.	***0,00***	***0,005***	***3,7***	
25.05.20	09:40	0,00	0,002	2,3	0,20
	12:40	0,00	0,000	2,3	
	16:10	0,00	0,003	1,3	
	Ср.с.	***0,00***	***0,002***	***2,0***	
26.05.20	10:55	0,00	0,001	4,2	0,23
	13:00	0,00	0,001	3,4	
	15:50	0,00	0,003	3,9	
	Ср.с.	***0,00***	***0,002***	***3,8***	
27.05.20	09:30	0,01	0,003	3,7	0,13
	12:30	0,00	0,002	3,5	
	15:30	0,00	0,005	3,5	
	Ср.с.	***0,00***	***0,003***	***3,6***	
ПДК ср.с., мг/м^3		**0,06**	**0,2**	**4**	**0,35**

P.S.: *Во время отбора проб атмосферного воздуха превышение среднесуточных предельно допустимых значений по определяемым ингредиентам не наблюдалось.*

Начальник ЛМЗАВ Г.Н. Гранкина

Инженер 1 кат. ЛМЗАВ Н.К.Теряева

Uzhydromet Environmental Monitoring Service (EMS)
Laboratory for Monitoring Air Pollution (LMAP)
Tashkent city, Bodomzor street, 72, tel. 237-15-47, 150-85-02

Protocol of sampling atmospheric air №7

Protocol of laboratory analysis of atmospheric air samples taken during environmental monitoring of air quality in the Syrdarya region

The results of the analyzes are shown in the table.

Measurement date	Measurement time	NO_2, mg/m^3	SO, mg/m^3	CO, mg/m^3	Total suspended particles mg/m^3
05/21/20	10:20	0.00	0.001	3.3	0.33
	13:00	0.00	0.001	2.7	
	16:00	0.00	0,000	2,3	
	Daily average	*0.00*	*0.001*	*2,8*	
05/22/20	09:20	0.02	0.001	3.9	0.30
	13:00	0.01	0.007	3,7	
	16:00	0.01	0.002	3,5	
	Daily average	*0.01*	*0.003*	*3.4*	
05/23/20	09:45	0.00	0.001	3.9	0.35
	13:45	0.01	0.003	4.8	
	15:45	0.00	0.001	3.2	
	Daily average	*0.00*	*0.002*	*4.0*	
05/24/20	10 a.m.	0.00	0.003	5,0	0.30
	13:00	0.00	0.008	3.0	
	15:50	0.00	0.004	3.2	
	Daily average.	*0.00*	*0.005*	*3,7*	
05/25/20	09:40	0.00	0.002	2,3	0.20
	12:40	0.00	0,000	2,3	
	16:10	0.00	0.003	1.3	
	Daily average	*0.00*	*0.002*	*2.0*	
05/26/20	10:55	0.00	0.001	4.2	0.23
	13:00	0.00	0.001	3.4	
	15:50	0.00	0.003	3.9	
	Daily average	*0.00*	*0.002*	*3.8*	
05/27/20	09:30	0.01	0.003	3,7	0.13
	12:30	0.00	0.002	3,5	
	15:30	0.00	0.005	3,5	
	Dailyaverage	*0.00*	0.003	*3.6*	
MPC , mg/m^3		**0.06**	**0.2**	**4**	**0.35**

PS: *During sampling of atmospheric air, the excess of daily average maximum allowable values for the determined ingredients was not observed.*

Head of LAMP T.N. Grankina

1st category Engineer LAMP N.K. Teryaeva

Служба мониторинга загрязнения природной среды Узгидромета (СМЗ)
Лаборатория мониторинга загрязнения атмосферного воздуха (ЛМЗАВ)
г.Ташкент, ул. 1-й проезд Бодомзор йули, 72, тел 237-15-47, 150-85-02

Утверждаю
Начальник СМЗ
_____ М.А. Пасич
28 мая 2020 г.

Акт отбора проб атмосферного воздуха № 6

Лабораторные испытания объекта: Сырдарьинская область. Сырдарьинская ТЭС
Полное наименование Заказчика его адрес: Juru Energy Consulting
Цель, задачи испытаний (измерений): Экологический мониторинг
НД на объекты испытаний (измерений): СанПиН 0293-11
Описание и идентификация образцов: Диоксид азота, диоксид серы, оксид углерода, пыль
Дата отбора образцов: 21-27 мая 2020 г.
Использованное оборудование:
1.Аспиратор АПВ-4 (диоксид азота, диоксид серы)
2.Аспиратор АВА-3 (пыль)
3.Барометр-анероид М-67 (атмосферное давление)
4.Психрометр ВМ-4м (температура)
5.Анемометр (скорость ветра)
6.Оксид углерода отбирался в камеры и анализировался в лаборатории на ЭЛАН-СО-50

Проведение испытаний (измерений)

Дата отбора	Время отбора	Тем-ра, ^{0}C	Давление, мм.рт.ст.	Скорость ветра, м/с	Направление ветра
21.05.2020	10:20	+ 22	735	1,4	З
	13:00	+ 28	734	1,1	С
	16:00	+ 29	734	1,4	СВ
22.05.2020	09:20	+ 27	734	0,8	В, ЮВ
	13:00	+ 30	733	0,5	В, ЮВ
	16:00	+ 32	732	3,0	С, СЗ
23.05.2020	09:45	+ 26	730	2,0	В
	13:45	+ 32	731	1,0	С
	15:45	+ 34	730	2,0	З
24.05.2020	10:00	+ 31	730	0,3	В, СВ
	13:00	+ 36	729	0,3	Ю, ЮВ
	15:50	+ 35	729	1,0	Ю
25.05.2020	09:40	+ 33	730	0,5	В
	12:40	+ 36	730	штиль	-
	16:10	+ 36	730	1,5	С, СЗ
26.05.2020	10:55	+ 34	729	2,8	ЮВ
	13:00	+ 37	728	штиль	-
	15:50	+ 36	728	0,3	Ю
27.05.2020	09:30	+ 33	729	1,3	ЮВ
	12:30	+ 37	728	1,7	З, ЮЗ
	15:30	+ 37	728	0,5	ЮВ

Измерения проводил:
Начальник ЛМЗАВ _____ (подпись) Г.Н. Гранкина

Инженер 1 кат. ЛМЗАВ _____ (подпись) Н.К. Теряева

Uzhydromet Environmental Monitoring Service (EMS)
Laboratory for Monitoring Air Pollution (LMAP)
Tashkent city, Bodomzor street, 72, tel. 237-15-47, 150-85-02

Act of sampling atmospheric air №6

Laboratory tests of the object: Syrdarya region.
Purpose, tasks of tests (measurements): AQ monitoring
Regulator documents on the objects of tests (measurements): SanPiN 0293-11
Description and identification of samples: Nitrogen dioxide, sulfur dioxide, carbon monoxide, TSP.
Date of sampling: May 21-27, 2020.
Used equipment:
1. Aspirator APV-4 (nitrogen dioxide, sulfur dioxide)
2. AspiAVA-3 radiator (TSP)
3. Aneroid barometer M-67 (Atmosphere pressure)
4. Psychrometer VM-4m (temperature)
5. Anemometer (wind speed)
6. Carbon monoxide was taken into chambers and analyzed in a laboratory at ELAN-CO-50

Spot monitoring (measureements)

Measurement date	Measurement time	° C	Pressure, mmHg.	Wind speed, m / s	Direction of the wind
05/21/2020	10:20	+	735	.1,4	West
	13:00	+	734	1,1	North
	16:00	+	734	1.4	North-East
	09:20	+	734	0.8	East, South-East
	13:00	+	733	0.5	East, South-East
05/22/2020	16:00	+	732	3.0	North, North-West
05/23/2020	09:45	+	730	2.0	East
	13:45	+	731	1,0	North
	15:45	+	730	2.0	West
05/24/2020	10:00	+	730	0.3	East, North-East
	13:00	+	729	0.3	South, South-East
	15:50	+	729	1,0	South
05/25/2020	09:40	+	730	0.5	East
	12:40	+	730	calm	-
	16:10	+	730	1,5	North, North-West
05/26/2020	10:55	+	729	2,8	South-East
	13:00	+	728	calm	-
	15:50	+	728	0.3	South
05/27/2020	09:30	+	729	1.3	South-East
	12:30	+	728	1.7	West, South-West
	15:30	+	728	0.5	South-East

Measurements were carried out:

Head of LAMP (подпись) G.N. Grankina

1st category Engineer LAMP (подпись) N.K. Teryaeva

(A division of Gradko International Ltd.)
St. Martins House, 77 Wales Street Winchester, Hampshire SO23 0RH
tel.: 01962 860331 fax: 01962 841339 e-mail:diffusion@gradko.co.uk

2187

LABORATORY ANALYSIS REPORT

DETERMINATION OF OZONE IN DIFFUSION TUBES BY ION CHROMATOGRAPHY

REPORT NUMBER O03404R

BOOKING IN REFERENCE No O03404

DESPATCH NOTE No 78688

CUSTOMER Juru Energy Ltd Attn: Oleg Khegay
Suite 1 Lower Ground Floor
1 George Yard
London
EC3V 9DF

DATE SAMPLES RECEIVED 16/06/2020

JOB NUMBER

Location	Sample Number	Date Exposed*	Date Finished*	Exposure Hours*	NO_3^- µg/ml	µg/ml NO_3^- - Blank	O_3 µg/m^3*	O_3 ppb*
DT6	1576600	20/05/2020	11/06/2020	529.00	1.06	1.05	114.76	57.38
DT6	1576601	20/05/2020	11/06/2020	529.00	1.04	1.03	112.64	56.32
DT5	1576602	20/05/2020	11/06/2020	529.00	0.95	0.94	102.78	51.39
DT5	1576603	20/05/2020	11/06/2020	529.00	0.89	0.88	96.23	48.12
DT1	1576604	20/05/2020	11/06/2020	529.00	0.88	0.87	94.86	47.43
DT1	1576605	20/05/2020	11/06/2020	529.00	0.99	0.98	107.17	53.59
DT4	1576607	20/05/2020	11/06/2020	529.00	0.88	0.87	95.39	47.69
DT4	1576608	20/05/2020	11/06/2020	529.00	0.88	0.87	94.99	47.49
DT3	1576609	20/05/2020	11/06/2020	529.50	0.85	0.84	91.29	45.65
DT3	1576610	20/05/2020	11/06/2020	529.50	0.94	0.92	100.97	50.48
DT2	1576611	20/05/2020	11/06/2020	529.50	1.24	1.23	134.49	67.25
DT2	1576612	20/05/2020	11/06/2020	529.50	1.34	1.33	144.72	72.36
Laboratory Blank					0.01			

Comment: Results are blank subtracted

Exposure times were calculated from start and finish times given on the exposure sheet.

Tubes 1576605, 1576609 & 1576612 were dirty when received. Results may be compromised.

Overall M.U. ±12.0% **Reporting Limit** 0.05µg/ml NO_3^-

The reported expanded uncertainty is based on a standard uncertainty multiplied by a factor of *k*=2, providing a level of confidence of approximately 95%. Uncertainty of measurement has not been applied to the reported results.

Analysed on Dionex ICS1100 ICU11

Analyst Name Michael Battram **Report Checked By** Andrew Poole

Date of Analysis 20/06/2020 **Date of Report** 04/07/2020

Analysis has been carried out in accordance with in-house method GLM 2

Samples have been tested within the scope of Gradko International Ltd. Laboratory Quality Procedures. Results within this report relate only to samples as received. Data provided by the client and any subsequent calculations shall be indicated by an asterisk (*), these calculations and results are not within the scope of our UKAS accreditation. Any queries concerning data in this report should be directed to the Laboratory Manager Gradko International Ltd. This report is not to be reproduced, except in full, without the written permission of Gradko International Ltd.

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gradko environmental
(A division of Gradko International Ltd.)
St. Martins House, 77 Wales Street Winchester, Hampshire SO23 0RH
tel.: 01962 860331 fax: 01962 841339 e-mail:diffusion@gradko.co.uk

ilac-MRA UKAS TESTING 2187

LABORATORY ANALYSIS REPORT

DETERMINATION OF SULPHUR DIOXIDE IN DIFFUSION TUBES BY ION CHROMATOGRAPHY

REPORT NUMBER O03406R

BOOKING IN REFERENCE No O03406

DESPATCH NOTE No 78688

CUSTOMER Juru Energy Ltd Attn: Oleg Khegay
Suite 1 Lower Ground Floor
1 George Yard
London
EC3V 9DF

DATE SAMPLES RECEIVED 16/06/2020

JOB NUMBER

Location	Sample Number	Date Exposed*	Date Finished*	Exposure Hours*	SO_4^{2-} µg/ml	µgSO_4^{2-} - Blank	SO_2 µg/m^3*	SO_2 ppb*
DT6	1576587	20/05/2020	11/06/2020	529.00	0.11	0.10	2.33	0.87
DT6	1576588	20/05/2020	11/06/2020	529.00	0.11	0.11	2.45	0.92
DT5	1576589	20/05/2020	11/06/2020	529.00	0.10	0.09	2.10	0.79
DT5	1576590	20/05/2020	11/06/2020	529.00	0.11	0.10	2.29	0.86
DT1	1576591	20/05/2020	11/06/2020	529.00	0.12	0.11	2.50	0.94
DT1	1576592	20/05/2020	11/06/2020	529.00	0.10	0.10	2.21	0.83
DT4	1576594	20/05/2020	11/06/2020	529.50	0.14	0.13	2.92	1.10
DT4	1576595	20/05/2020	11/06/2020	529.00	0.11	0.10	2.40	0.90
DT3	1576596	20/05/2020	11/06/2020	529.50	0.25	0.25	5.65	2.12
DT3	1576597	20/05/2020	11/06/2020	529.50	0.18	0.17	3.85	1.44
DT2	1576598	20/05/2020	11/06/2020	529.50	0.40	0.39	9.02	3.38
DT2	1576599	20/05/2020	11/06/2020	529.50	0.10	0.09	2.11	0.79
Laboratory Blank					0.01			

Comment: Results are blank subtracted

Exposure times were calculated from start and finish times given on the exposure sheet.

Tubes 1576587 & 1576596-1576599 were dirty when received. Results may be compromised.

Overall M.U. ±9.6% **Reporting Limit** 0.09µg SO_4^{2-}

The reported expanded uncertainty is based on a standard uncertainty multiplied by a factor of *k*=2, providing a level of confidence of approximately 95%. Uncertainty of measurement has not been applied to the reported results.

Analysed on Dionex ICS1100 ICU11

Analyst Name Michael Battram **Report Checked By** Andrew Poole

Date of Analysis 25/06/2020 **Date of Report** 04/07/2020

Analysis has been carried out in accordance with in-house method GLM1

Samples have been tested within the scope of Gradko International Ltd. Laboratory Quality Procedures. Results within this report relate only to samples as received. Data provided by the client and any subsequent calculations shall be indicated by an asterisk (*), these calculations and results are not within the scope of our UKAS accreditation. Any queries concerning data in this report should be directed to the Laboratory Manager Gradko International Ltd. This report is not to be reproduced, except in full, without the written permission of Gradko International Ltd.

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(A division of Gradko International Ltd.)
St. Martins House, 77 Wales Street Winchester, Hampshire SO23 0RH
tel.: 01962 860331 fax: 01962 841339 e-mail:diffusion@gradko.co.uk

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LABORATORY ANALYSIS REPORT

NITROGEN DIOXIDE IN DIFFUSION TUBES BY U.V.SPECTROPHOTOMETRY

REPORT NUMBER Amendment to O03432R

BOOKING IN REFERENCE O03432
DESPATCH NOTE 78688
CUSTOMER Juru Energy Ltd Attn: Oleg Khegay
Suite 1 Lower Ground Floor
1 George Yard
London
EC3V 9DF

DATE SAMPLES RECEIVED 16/06/2020

Location	Sample Number	Exposure Data Date On*	Date Off*	Time* (hr.)	µg/m^3 *	ppb *	µg NO_2 on tube
DT6	1576574	20/05/2020	11/06/2020	529.00	5.77	3.01	0.22
DT6	1576575	20/05/2020	11/06/2020	530.00	5.53	2.89	0.21
DT5	1576576	20/05/2020	11/06/2020	529.00	7.07	3.69	0.27
DT5	1576577	20/05/2020	11/06/2020	529.00	6.89	3.60	0.27
DT1	1576578	20/05/2020	11/06/2020	529.00	3.56	1.86	0.14
DT1	1576579	20/05/2020	11/06/2020	529.00	8.04	4.19	0.31
DT4	1576581	20/05/2020	11/06/2020	528.50	6.82	3.56	0.26
DT4	1576582	20/05/2020	11/06/2020	529.00	6.76	3.53	0.26
DT3	1576583	20/05/2020	11/06/2020	529.50	9.02	4.71	0.35
DT3	1576584	20/05/2020	11/06/2020	529.50	9.51	4.96	0.37
DT2	1576585	20/05/2020	11/06/2020	529.50	8.13	4.24	0.31
DT2	1576586	20/05/2020	11/06/2020	529.50	7.61	3.97	0.29
Laboratory Blank				530.00	0.03	0.01	0.001

Comment: Results are not blank subtracted
Report amended to remove incorrect comment.
Results have been corrected to a temperature of 293 K (20°)

Overall M.U. ±9.7% **Limit of Detection** 0.031µgNO_2
The reported expanded uncertainty is based on a standard uncertainty multiplied by a factor of *k*=2, providing a level of confidence of approximately 95%. Uncertainty of measurement has not been applied to the reported results.

Tube Preparation : 20% TEA / Water Analysed on UV CARY2

Analyst Name Molly Bevan **Report Checked By** Pedro Gomes

Date of Analysis 29/06/2020 **Date of Report** 07/07/2020

Analysis carried out in accordance with documented in-house Laboratory Method GLM7

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(A division of Gradko International Ltd.)
St. Martins House, 77 Wales Street Winchester, Hampshire SO23 0RH
tel.: 01962 860331 fax: 01962 841339 e-mail:diffusion@gradko.co.uk

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LABORATORY ANALYSIS REPORT

Report Number	**O03467R**
Customer	**Juru Energy Ltd**
	Suite 1 Lower Ground Floor
	1 George Yard
	London
	EC3V 9DF
Booking In Reference	**S0599**
Despatch Note Number	**78688**
Date Samples Received	**16/06/2020**
Diffusion Tube Type	**Tenax**

Quantitative Analysis of BTEX
Identification and estimation of ng on tube in accordance with ISO16000-6

Tube Number	**004183**
Gradko Lab Reference	**08O0798**
Exposure Time (mins)*	**30360**
Sample ID	**DT5 (DT5)**

BTEX	ng on tube	ppb in air*	µgm^{-3}*
Benzene	9.6	0.4	1.4
Toluene	13.3	0.4	1.6
Ethylbenzene	<5	<0.1	<0.5
m/p-Xylene	5.7	0.1	0.5
o-Xylene	<5	<0.1	<0.5

Top 5 VOC	NIST Library Quality Match	**Estimated ng on tube**	**ppb in air***	**µgm^{-3}***
Hexanedioic acid, bis(2-ethylhexyl) ester	98	690	11.4	168
Benzoic acid	97	420	6.9	34
Several compounds. Identity not confirmed		268	4.4	
Nonanal**	91	54	0.9	5.1
Phenylmaleic anhydride	96	54	0.9	6.2

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LABORATORY ANALYSIS REPORT

Tube Number	**GRA11231**
Gradko Lab Reference	**08O0799**
Exposure Time (mins)*	**30360**
Sample ID	**DT5 (DT5(1))**

BTEX	**ng on tube**	**ppb in air***	**µgm^{-3}***
Benzene	11.5	0.5	1.7
Toluene	8.7	0.3	1.0
Ethylbenzene	<5	<0.1	<0.5
m/p-Xylene	5.6	0.1	0.5
o-Xylene	<5	<0.1	<0.5

Top 5 VOC	NIST Library Quality Match	**Estimated ng on tube**	**ppb in air***	**µgm^{-3}***
Hexanedioic acid, bis(2-ethylhexyl) ester	98	386	6.4	94
Benzoic acid	96	351	5.8	28
Several compounds. Identity not confirmed		261	4.3	
Nonanal**	90	84	1.4	7.8
Benzaldehyde**	97	48	0.8	3.3

Tube Number	**GRA09518**
Gradko Lab Reference	**08O0800**
Exposure Time (mins)*	**30360**
Sample ID	**DT6 (DT6)**

BTEX	**ng on tube**	**ppb in air***	**µgm^{-3}***
Benzene	6.6	0.3	1.0
Toluene	8.8	0.3	1.0
Ethylbenzene	<5	<0.1	<0.5
m/p-Xylene	<5	<0.1	<0.5
o-Xylene	<5	<0.1	<0.5

Top 5 VOC	NIST Library Quality Match	**Estimated ng on tube**	**ppb in air***	**µgm^{-3}***
Benzoic acid	96	321	5.3	26
Several compounds. Identity not confirmed		219	3.6	
Benzaldehyde**	97	50	0.8	3.5
Phenylmaleic anhydride	96	42	0.7	4.8
Acetophenone**	94	39	0.6	3.1

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tel.: 01962 860331 fax: 01962 841339 e-mail:diffusion@gradko.co.uk

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LABORATORY ANALYSIS REPORT

Tube Number	**GRA10026**
Gradko Lab Reference	**08O0801**
Exposure Time (mins)*	**30360**
Sample ID	**DT6 (DT6(1))**

BTEX	**ng on tube**	**ppb in air***	**µgm^{-3}***
Benzene	7.6	0.4	1.1
Toluene	6.8	0.2	0.8
Ethylbenzene	<5	<0.1	<0.5
m/p-Xylene	<5	<0.1	<0.5
o-Xylene	<5	<0.1	<0.5

Top 5 VOC	NIST Library Quality Match	**Estimated ng on tube**	**ppb in air***	**µgm^{-3}***
Benzoic acid	95	291	4.8	23
Several compounds. Identity not confirmed		229	3.8	
Phenylmaleic anhydride	93	46	0.8	5.3
Benzaldehyde**	97	43	0.7	3.0
Acetophenone**	91	42	0.7	3.4

Tube Number	**GRA06977**
Gradko Lab Reference	**08O0802**
Exposure Time (mins)*	**30360**
Sample ID	**DT4 (DT4)**

BTEX	**ng on tube**	**ppb in air***	**µgm^{-3}***
Benzene	9.2	0.4	1.4
Toluene	6.6	0.2	0.8
Ethylbenzene	<5	<0.1	<0.5
m/p-Xylene	<5	<0.1	<0.5
o-Xylene	7.3	0.2	0.7

Top 5 VOC	NIST Library Quality Match	**Estimated ng on tube**	**ppb in air***	**µgm^{-3}***
Benzoic acid	95	518	8.5	42
Several compounds. Identity not confirmed		349	5.7	
Hexanedioic acid, bis(2-ethylhexyl) ester	93	299	4.9	73
Phenylmaleic anhydride	96	61	1.0	7.0
Benzaldehyde**	97	52	0.9	3.6

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tel.: 01962 860331 fax: 01962 841339 e-mail:diffusion@gradko.co.uk

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LABORATORY ANALYSIS REPORT

Tube Number	**GRA09872**
Gradko Lab Reference	**08O0809**
Exposure Time (mins)*	**30360**
Sample ID	**DT4 (DT4(1))**

BTEX	**ng on tube**	**ppb in air***	**µgm^{-3}***
Benzene	5.6	0.3	0.8
Toluene	6.8	0.2	0.8
Ethylbenzene	<5	<0.1	<0.5
m/p-Xylene	<5	<0.1	<0.5
o-Xylene	7.8	0.2	0.7

Top 5 VOC	NIST Library Quality Match	**Estimated ng on tube**	**ppb in air***	**µgm^{-3}***
Several compounds. Identity not confirmed		322	5.3	
Benzoic acid	96	141	2.3	11
Cyclohexadecane	98	69	1.1	10.2
Benzaldehyde**	97	35	0.6	2.4
Acetophenone**	94	30	0.5	2.4

Tube Number	**GRA09919**
Gradko Lab Reference	**08O0803**
Exposure Time (mins)*	**30360**
Sample ID	**DT1 (DT1)**

BTEX	**ng on tube**	**ppb in air***	**µgm^{-3}***
Benzene	7.9	0.4	1.2
Toluene	9.0	0.3	1.1
Ethylbenzene	<5	<0.1	<0.5
m/p-Xylene	7.0	0.2	0.7
o-Xylene	<5	<0.1	<0.5

Top 5 VOC	NIST Library Quality Match	**Estimated ng on tube**	**ppb in air***	**µgm^{-3}***
Several compounds. Identity not confirmed		348	5.7	
Benzoic acid	96	277	4.6	22
Hexanedioic acid, bis(2-ethylhexyl) ester	93	126	2.1	31
Benzaldehyde**	91	42	0.7	2.9
Nonanal**	87	39	0.6	3.7

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LABORATORY ANALYSIS REPORT

Tube Number	**GRA10816**
Gradko Lab Reference	**08O0804**
Exposure Time (mins)*	**30360**
Sample ID	**DT1 (DT(1))**

BTEX	**ng on tube**	**ppb in air***	**µgm^{-3}***
Benzene	10.7	0.5	1.6
Toluene	10.7	0.3	1.3
Ethylbenzene	<5	<0.1	<0.5
m/p-Xylene	7.1	0.2	0.7
o-Xylene	<5	<0.1	<0.5

Top 5 VOC	NIST Library Quality Match	**Estimated ng on tube**	**ppb in air***	**µgm^{-3}***
Several compounds. Identity not confirmed		392	6.5	
Benzoic acid	95	292	4.8	23
Hexanedioic acid, bis(2-ethylhexyl) ester	95	69	1.1	17
Benzaldehyde**	97	42	0.7	2.9
Phenylmaleic anhydride	95	36	0.6	4.1

Tube Number	**003100**
Gradko Lab Reference	**08O0805**
Exposure Time (mins)*	**30390**
Sample ID	**DT3 (DT3)**

BTEX	**ng on tube**	**ppb in air***	**µgm^{-3}***
Benzene	8.5	0.4	1.2
Toluene	8.6	0.3	1.0
Ethylbenzene	<5	<0.1	<0.5
m/p-Xylene	<5	<0.1	<0.5
o-Xylene	<5	<0.1	<0.5

Top 5 VOC	NIST Library Quality Match	**Estimated ng on tube**	**ppb in air***	**µgm^{-3}***
Several compounds. Identity not confirmed		433	7.1	
Benzoic acid	96	358	5.9	29
Hexanedioic acid, bis(2-ethylhexyl) ester	93	210	3.5	51
Phenylmaleic anhydride	95	49	0.8	5.6
Benzaldehyde**	97	44	0.7	3.1

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LABORATORY ANALYSIS REPORT

Tube Number	**003292**
Gradko Lab Reference	**08O0806**
Exposure Time (mins)*	**30390**
Sample ID	**DT3 (DT3(1))**

BTEX	**ng on tube**	**ppb in air***	**µgm^{-3}***
Benzene	8.0	0.4	1.2
Toluene	7.7	0.2	0.9
Ethylbenzene	<5	<0.1	<0.5
m/p-Xylene	<5	<0.1	<0.5
o-Xylene	<5	<0.1	<0.5

Top 5 VOC	NIST Library Quality Match	**Estimated ng on tube**	**ppb in air***	**µgm^{-3}***
Several compounds. Identity not confirmed		538	8.9	
Benzoic acid	96	371	6.1	30
Hexanedioic acid, bis(2-ethylhexyl) ester	89	63	1.0	15
Benzaldehyde**	97	54	0.9	3.7
Phenylmaleic anhydride	96	44	0.7	5.0

Tube Number	**GRA10027**
Gradko Lab Reference	**08O0807**
Exposure Time (mins)*	**30390**
Sample ID	**DT2 (DT2)**

BTEX	**ng on tube**	**ppb in air***	**µgm^{-3}***
Benzene	8.9	0.4	1.3
Toluene	12.5	0.4	1.5
Ethylbenzene	<5	<0.1	<0.5
m/p-Xylene	7.9	0.2	0.8
o-Xylene	<5	<0.1	<0.5

Top 5 VOC	NIST Library Quality Match	**Estimated ng on tube**	**ppb in air***	**µgm^{-3}***
Benzoic acid	95	199	3.3	16
Several compounds. Identity not confirmed		192	3.2	
Hexanedioic acid, bis(2-ethylhexyl) ester	91	148	2.4	36
Nonanal**	90	74	1.2	6.9
Benzaldehyde**	95	40	0.7	2.8

Samples have been tested within the scope of Gradko International Ltd. Laboratory Quality Procedures. Results within this report relate only to samples as received. Data provided by the client and any subsequent calculations shall be indicated by an asterisk (*), these calculations and results are not within the scope of our UKAS accreditation. Any queries concerning data in this report should be directed to the Laboratory Manager Gradko International Ltd. This report is not to be reproduced, except in full, without the written permission of Gradko International Ltd.

REPORT OFFICIALLY CHECKED

Gradko International Ltd
This signature confirms the authenticity of these results
Signed.....
L. Gates, Laboratory Manager

(A division of Gradko International Ltd.)
St. Martins House, 77 Wales Street Winchester, Hampshire SO23 0RH
tel.: 01962 860331 fax: 01962 841339 e-mail:diffusion@gradko.co.uk

2187

LABORATORY ANALYSIS REPORT

Tube Number	**003290**
Gradko Lab Reference	**08O0808**
Exposure Time (mins)*	**30390**
Sample ID	**DT2 (DT2(1))**

BTEX	**ng on tube**	**ppb in air***	**µgm^{-3}***
Benzene	10.0	0.5	1.5
Toluene	15.8	0.5	1.9
Ethylbenzene	13.5	0.3	1.3
m/p-Xylene	16.9	0.4	1.6
o-Xylene	7.2	0.2	0.7

Top 5 VOC	NIST Library Quality Match	**Estimated ng on tube**	**ppb in air***	**µgm^{-3}***
Benzoic acid	96	535	8.8	43
Several compounds. Identity not confirmed		502	8.3	
Phenylmaleic anhydride	96	72	1.2	8.3
Benzaldehyde**	97	67	1.1	4.6
Acetophenone**	94	55	0.9	4.4

Tube Number	**GRA08972**
Gradko Lab Reference	**200623_TXTABLANK_6**
Sample ID	**Laboratory Blank**

BTEX	**ng on tube**
Benzene	<5
Toluene	<5
Ethylbenzene	<5
m/p-Xylene	<5
o-Xylene	<5

Top 5 VOC	NIST Library Quality Match	**Estimated ng on tube**
		<5

Uptake rates

Benzene 0.70 ng.ppm^{-1}.min^{-1}.
Toluene 1.03 ng.ppm^{-1}.min^{-1}.
Ethylbenzene 1.46 ng.ppm^{-1}.min^{-1}.
m/p Xylene 1.46 ng.ppm^{-1}.min^{-1}.
o-Xylene 1.46 ng.ppm^{-1}.min^{-1}.
All other compounds: 2.00 ng.ppm^{-1}.min^{-1}.

Samples have been tested within the scope of Gradko International Ltd. Laboratory Quality Procedures. Results within this report relate only to samples as received. Data provided by the client and any subsequent calculations shall be indicated by an asterisk (*), these calculations and results are not within the scope of our UKAS accreditation. Any queries concerning data in this report should be directed to the Laboratory Manager Gradko International Ltd. This report is not to be reproduced, except in full, without the written permission of Gradko International Ltd.

REPORT OFFICIALLY CHECKED

Gradko International Ltd
This signature confirms the authenticity of these results
Signed.....
L. Gates, Laboratory Manager

(A division of Gradko International Ltd.)
St. Martins House, 77 Wales Street Winchester, Hampshire SO23 0RH
tel.: 01962 860331 fax: 01962 841339 e-mail:diffusion@gradko.co.uk

2187

LABORATORY ANALYSIS REPORT

Results are not Blank corrected.

A peak was present that contained several compounds which could not be identified.

Tubes from locations "DT1 (DT1)" and "DT2 (DT2(1))" were received with a loose cap. Results may be compromised.

**Compounds may be an artifact due to reaction of ozone with the Tenax sorbent.

Reporting Limit 5ng on tube
Results reported as <5ng on tube are below the reporting limit.
Estimated results reported as <5ng on tube are below the reporting limit for the non-specific standard toluene.

Measurement Uncertainty BTEX compounds ±16.3%

The reported expanded uncertainty is based on a standard uncertainty multiplied by a factor of *k*=2, providing a level of confidence of approximately 95%. Uncertainty of measurement has not been applied to the reported results.

Estimated results as ng on tube are calculated by reference to toluene in accordance with ISO 16000-6

Identification of compounds is carried out by comparison of the mass spectra to the NIST 17 mass spectral library. Compounds with a quality match below 85% are noted as a tentative identity and shown in italics. These compounds are outside of the scope of our UKAS accreditation.

Analysts Name	Katya Paldamova	**Date of Analysis**	23/06/2020
Report Checked By	Gavin Aikman	**Date of Report**	03/07/2020

Analysis has been carried out in accordance with in-house method GLM 13

Samples have been tested within the scope of Gradko International Ltd. Laboratory Quality Procedures. Results within this report relate only to samples as received. Data provided by the client and any subsequent calculations shall be indicated by an asterisk (*), these calculations and results are not within the scope of our UKAS accreditation. Any queries concerning data in this report should be directed to the Laboratory Manager Gradko International Ltd. This report is not to be reproduced, except in full, without the written permission of Gradko International Ltd.

REPORT OFFICIALLY CHECKED

Gradko International Ltd
This signature confirms the authenticity of these results
Signed.....
L. Gates, Laboratory Manager

APPENDIX J-1– AMBIENT AIR QUALITY LABORATORY CERTIFICATES

ГОСУДАРСТВЕННЫЙ КОМИТЕТ
РЕСПУБЛИКИ УЗБЕКИСТАН
ПО ЭКОЛОГИИ И ОХРАНЕ
ОКРУЖАЮЩЕЙ СРЕДЫ

СВИДЕТЕЛЬСТВО

об аттестации экоаналитической лаборатории

№ 84 – 28

Настоящее Свидетельство выдано Лаборатория мониторинга загрязнения атмосферного воздуха города Ташкент Узгидромета на основании результатов аттестации (Акт № 28 от 27 декабря 2019 г.) о удостоверяет наличие необходимых условий для выполнения достоверного аналитического контроля атмосферного воздуха на территории города Ташкента

Свидетельство действительно до декабря 2022 года.

Область аттестации приведена в приложении, являющемся неотъемлемой частью свидетельства.

Первый заместитель председателя М.П. Н. Каримов

Document of accreditation of Uzhydromet (AQ) laboratory

Translation:

Ecoanalytical Laboratory Approval Certificate

This Certificate was issued to the Laboratory for Monitoring Ambient Air Pollution in the city of Tashkent Uzhydromet based on the results of certification (Act No. 28 of December 27, 2019) and certifies the presence of the necessary conditions for performing reliable analytical control of atmospheric air in the city of Tashkent

The certificate is valid until December 2022.

СИСТЕМА ОБЕСПЕЧЕНИЯ ЕДИНСТВА ИЗМЕРЕНИЙ
РЕСПУБЛИКИ УЗБЕКИСТАН
Узбекское агентство стандартизации, метрологии и сертификации
(агентство "Узстандарт")
«Узбекский национальный институт метрологии»

СЕРТИФИКАТ ПОВЕРКИ
СРЕДСТВА ИЗМЕРЕНИЙ
№ 0901504

Действителен до "20" 02 2021 г.

Настоящий сертификат удостоверяет, что средство измерений
Газоанализатор ЭЛАН – СО- 50 сер № 36
Диапазон измерения
с метрологическими характеристиками
CO от 0 до 50 mg/m³ Δ= ± (0,5+0,1Cx)
изготовленное (импортированное) НПО «Химавтоматика»
Узбекистан
принадлежащее «Узгидромет»
поверенное «УзНИМ»
в соответствии с ГОСТ 8.618-2013
использованием ПГС
соответствует требованиям ГОСТ 13320-81
и допущено к применению в сфере распространения государственного метрологического контроля и надзора.

Дата поверки "20" 02 2020 г.

Поверитель Г.С.Гулямова

А 0441309

Certificate for ELAN gas analyzer (CO measurement)

Translation:

Verification Certificate
№ 0901504

valid until:
20.02.2021

This certificate justifies that

Gas Analyzer ELAN – 50 series №35 with measurement range CO from 0 to 50 mg/m^3

$\Delta = \pm (0.5 + 0,1\ C_x)$

manufactured by NPO “Himavtomatika”, Uzbekistan belonging to Uzhydromet and

verified by «UZSTANDARD» agency Standartization, metrology and certification

agency of Uzbekistan

In accordance with GOST 8.618-2013.

with use of PGS

in accordance with GOST 13320-81

approved for use in the field of dissemination of state metrological control and

supervision

date of verification 20 February 2020

Executor *sign* Gulyamova. G.S

СИСТЕМА ОБЕСПЕЧЕНИЯ ЕДИНСТВА ИЗМЕРЕНИЙ
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(агентство "Узстандарт")
«Узбекский национальный институт метрологии»

СЕРТИФИКАТ ПОВЕРКИ
СРЕДСТВА ИЗМЕРЕНИЙ

№ 0901504

Действителен до "20" 02 2021 г.

Настоящий сертификат удостоверяет, что средство измерений
Газоанализатор ЕАН – СО- 50 сер № 36
с метрологическими характеристиками Диапазон измерения
СО от 0 до 50 mg/m³ Δ= ±(0,5+0,1С)
изготовленное (импортированное) НПО «Химавтоматика»
Узбекистан
принадлежащее «Узнефтегазпромсервис»
поверенное «УзНИМ»
в соответствии с ГОСТ 8.618-2013
использовавшихся ПГС
соответствует требованиям ГОСТ 13320-81
и допущено к применению в сфере распространения государственного метрологического контроля и надзора.

Дата поверки "20" 02 2020 г.

Поверитель Г.С.Гулямова

А 0441309

Certificate for Photometer KFK -3 (for NO_2, SO_2 measurement)

Translation:

Verification Certificate
№ 0901494
Valid until:

20.02.2021

This certificate justifies that Photometer KFK 3 № 0036

with measurement range from 5% to 100% СКО = 0.3 %)

manufactured by JSC “ZOMZ”, Russia

verified by “Uzbekistan Metrological Institute”

in accordance with GOST 8.298-2013

with use of КС 100

approved for use in the field of dissemination of state metrological control and supervision

Date of verification 20.02.2020

Executor *sign* Gulyamova. G.S

СИСТЕМА ОБЕСПЕЧЕНИЯ ЕДИНСТВА ИЗМЕРЕНИЙ
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«Узбекский национальный институт метрологии»

СЕРТИФИКАТ ПОВЕРКИ
СРЕДСТВА ИЗМЕРЕНИЙ

№ 0901494

Действителен до "20" 02 2021 г.

Настоящий сертификат удостоверяет, что средства измерений
Фотометр КФК – 3 № 0036
с метрологическими характеристиками Диапазон измерения
от 5% до 100%; СКО = 0,3%
изготовленное (импортированное) ЮМЗ
Россия
принадлежащие «Узгидромет»
«УзНИМ»
поверенные ГОСТ 8.298-2013
в соответствии с КС 100
использованием
соответствует требованиям Тех. док. фирмы-изготовителя
и допущено к применению в сфере распространения государственного
метрологического контроля и надзора.

Дата поверки "20" 02 2020

Поверитель Г.С.Гулямова

А 0441299

Photometer KFK – 3 (measurement of SO_2, NO_2)

UNIT OF MEASUREMENTS SYSTEM
REPUBLIC OF UZBEKISTAN
Uzbek Agency for Standardization, Metrology and Certification
(agency "Uzdavlatstandart")
SE « UZBEK NATIONAL INSTITUTE OF METROLOGY »

Verification Certificate
№ 8765

Valid until:

24 September 2020

This Certificate Certifies That

Photometer KFK – 3 №0036

with measurement range of 5 % – 100%; SKO = 0.3 %

manufactured by ZOMZ, in Russia

belongs to Uzhydromet

verified by Uzbek National Institute Of Metrology

in accordance with GOST 8.298-2013

with use of KS 100

the equipment corresponds to technical documentation of the manufacture

approved for use in the field of dissemination of state metrological control and supervision

date of verification 20 February 2020
Executor *sign* Gulyamova. G.S.

СИСТЕМА ОБЕСПЕЧЕНИЯ ЕДИНСТВА ИЗМЕРЕНИЙ
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(агентство "Узстандарт")

ГП «Узбекский национальный институт метрологии»

СЕРТИФИКАТ ПОВЕРКИ
СРЕДСТВА ИЗМЕРЕНИЙ

№ 3276/08

Действителен до
«10» сентября 2020 г.

Настоящий сертификат удостоверяет, что средство измерений
Электроаспиратор прибор «АВА-34» №186
с метрологическими характеристиками
с пределами измерений от 0 до 6 Па
изготовленное (импортированное)
Россия
принадлежащее O'ZB RES FAVQULODDA VAZIYATLAR VAZ HUKMI
поверенное ГП «УзГИМС» Агентство «Узстандарт»
в соответствии с МИ 09-171-2015
с использованием Газовый счетчик барабанный ..... и секундомера
соответствует требованиям
Техническая документация завода изготовителя
и допущено к применению в сфере распространения государственного метрологического контроля и надзора.

Дата поверки «10» сентября 2019 г.

Поверитель А.Б. Ботиров

А 0052710

Aspirator AVA – 34 (measurement of TSP/dust)

UNIT OF MEASUREMENTS SYSTEM
REPUBLIC OF UZBEKISTAN
Uzbek Agency for Standardization, Metrology and Certification
(agency "Uzdavlatstandart")
SE « UZBEK NATIONAL INSTITUTE OF METROLOGY »

Verification Certificate
№ 3276/08

Valid until:
10 September 2020

This Certificate Certifies That

Aspirator AVA – 34 №186

with measurement range of 0 – 6 Pa;

manufactured in Russia

belongs to Ministry of Emergency Situations RUz

verified by SE “UzStandard”

in accordance with MI 09-171:2015

with use of gas drum counter

the equipment corresponds to technical documentation of the manufacture

approved for use in the field of dissemination of state metrological control and supervision

date of verification 10 September 2019

Executor *sign* Botirov. A.B.

СИСТЕМА ОБЕСПЕЧЕНИЯ ЕДИНСТВА ИЗМЕРЕНИЙ
РЕСПУБЛИКИ УЗБЕКИСТАН

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ГП «Узбекский национальный институт метрологии»

СЕРТИФИКАТ ПОВЕРКИ
СРЕДСТВА ИЗМЕРЕНИЙ

№ 3275/08

Действителен до
«10» сентября 2020 г.

Настоящий сертификат удостоверяет, что средство измерений

Аспиратор электронный модели «АПВ-4» №297

с метрологическими характеристиками

от 0,2 до 1 l/min; от 1 до 20 l/min; погрешность ± 5%; 7%

изготовленное (импортированное) ОАО «НИКИ МЕТ»

Россия

принадлежащее O'ZB RES. FAVQULODDA VAZIYATLAR VAZ. HUQ.X.M

поверено ГП «УзНИИМ» Агентства «Узстандарт»

в соответствии с МИ 09-171:2015

с использованием Газовый счетчик барабанный ЛГБ-1 с поверителем

соответствует требованиям

Техническая документация завода-изготовителя

и допущено к применению в сфере распространения государственного метрологического контроля и надзора.

Дата поверки «10» сентября 2019 г.

Поверитель А.Б. Ботиров

А 0052709

Aspirator APV - 4 (measurement for SO2, NO2)

UNIT OF MEASUREMENTS SYSTEM
REPUBLIC OF UZBEKISTAN
Uzbek Agency for Standardization, Metrology and Certification
(agency "Uzdavlatstandart")
SE « UZBEK NATIONAL INSTITUTE OF METROLOGY »

Verification Certificate
№ 3275/08

Valid until:
10 September 2020

This Certificate Certifies That

Aspirator APV – 4 №297

with measurement range of 0.2 – 1 l/min; 1 - 20 l/min, Δ ± 5%; 7%

manufactured by JSC “NIKI MLT” in Russia

belongs to Hydrometeorological Service center under Ministry of Emergency Situations

RUz

verified by SE “UzStandard”

in accordance with MI 09-171:2015

with use of gas drum counter

the equipment corresponds to technical documentation of the manufacture

approved for use in the field of dissemination of state metrological control and supervision

date of verification 10 September 2019

Executor *sign* Botirov. A.B.

СИСТЕМА ОБЕСПЕЧЕНИЯ ЕДИНСТВА ИЗМЕРЕНИЙ
РЕСПУБЛИКИ УЗБЕКИСТАН
Узбекское агентство стандартизации, метрологии и сертификации
(агентство "Узстандарт")
ГП «УЗБЕКСКИЙ НАЦИОНАЛЬНЫЙ ИНСТИТУТ МЕТРОЛОГИИ»

СЕРТИФИКАТ ПОВЕРКИ
СРЕДСТВА ИЗМЕРЕНИЙ
№ 8765

Действителен до
«24» сентября 2020 г.

Настоящий сертификат удостоверяет, что средство измерений
Электронные весы тип AB204-S зав.№ 1122360582
с метрологическими характеристиками Специальный класс
с пред. изм. от 10 mg до 220 g e= 1 mg
изготовлено (маркировано) Mettler Toledo
Швейцария
принадлежит O'zR FVV huzuridagi Gidrometeorologiya XM
поверено ГП «УзНИИМ» Агентства «Узстандарт»
в соответствии с ГОСТ 8.520-2005
с использованием
соответствует требованиям ГОСТ 24104-2001 п.п. 4.1-4.6
и признано к применению в сфере распространения государственного метрологического контроля и надзора.

Дата поверки 24 сентября 2019 г.
Поверитель Хакимова Н.Х.
UZB 09 OT

O'T 1334639

Digital balance AB204-S (measurement of TSP/dust)

UNIT OF MEASUREMENTS SYSTEM
REPUBLIC OF UZBEKISTAN
Uzbek Agency for Standardization, Metrology and Certification
(agency "Uzdavlatstandart")
SE « UZBEK NATIONAL INSTITUTE OF METROLOGY »

Verification Certificate
№ 8765

Valid until:
10 September 2020

This Certificate Certifies That

Digital balance AB 204-S № 1122360582

with measurement range of 10 mg – 220 g; accuracy class 1

manufactured by Mettler Toledo, Switzerland

belongs to Hydrometeorological Service center under Ministry of Emergency Situations

RUz

verified by SE “UzStandard”

in accordance with GOST 8.520-2005

the equipment corresponds to GOST 24104-2001, clause 4.1-4.6

approved for use in the field of dissemination of state metrological control and supervision

date of verification 24 September 2019

Executor *sign* Hakimova. N.H.

APPENDIX K– AIR QUALITY MODELLING STUDY

ACWA Power Sydarya 1,500MW CCGT IPP

Air Quality Modelling Study

ACWA Power Sydarya 1,500MW CCGT IPP

Air Quality Modelling Study

Revision	Date	Notes	Author	Checked	Approved
1.0	05/08/2020	E2799	AB	ND	Dr N Davey
1.1	06/08/2020	E2799	AB	ND	Dr N Davey
2.0	01/10/2020	E2799	AB	ND	Dr N Davey
2.1	12/10/2020	E2799	AB	ND	Dr N Davey

Entran Limited
12 Greenway Farm
Bath Road
Wick
Bristol
BS30 5RL

T: 0117 937 4077
www.entranltd.co.uk

-

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1 INTRODUCTION

1.1 Entran Ltd has been commissioned by 5 Capitals Environmental & Management Consulting (5 Capitals) to undertake an assessment of the predicted local air quality impacts arising from the operation of the proposed ACWA Power Sydarya 1,500MW Combined Cycle Gas Turbine (CCGT) at Shirin, Uzbekistan (hereafter known as the 'Project'). The Project is located on a plot of land that has been allocated for the development of two (2) CCGT Power Plant projects. The eastern plot, which is the subject of this assessment, has been granted to ACWA Power. The western plot has yet to be allocated but is understood to be under a tendering process with the IFC, it is anticipated that a similar sized plant will be operated in the future on this land (hereafter known as the 'IFC Project').

1.2 The Project Site is located 0.3km to the northeast of the city of Shirin in Uzbekistan which is located at the border with Tajikistan. The Site is located in close proximity to the Sirdarya Thermal Power Plant (TPP) which currently operates 10 units of 300MW. It is understood there will be a partial decommissioning of the Sirdarya TPP with the operation of the CCGT power plants on the Site (eastern plot) and the adjacent western plot. Figure 1.1 below shows the location of the Site.

Figure 1.1: Location of the Site

1.3 The Project would comprise two combined cycle gas turbine (CCGT) generators and one Heat Recovery Steam Generator (HRSG). The CCGT plant will be fired by natural gas and there is no provision for back up supplies of other fuels.

1.4 The plant will operate in combined cycle for normal operations. In case of maintenance on the water/steam cycle there will be the option for the plant to operate in open / simple cycle mode. The plant will have two main stacks for combined cycle emissions and two bypass stacks for open / simple cycle operations.

1.5 The Project will also include a 500/220kV switchgear station to the JSC National Electric Networks of Uzbekistan which will be a common facility between the Project and the IFC Project on the western site.

1.6 A detailed air quality dispersion modelling assessment has been undertaken to determine impacts associated with the proposed Project. Dispersion modelling has been carried out using the United States (US) Environmental Protection Agency (EPA) Breeze AERMOD 7 (version 7.12 and US EPA version 16216) dispersion model, three years of meteorological data from Samarkand (2017 to 2019) and terrain data for the local area.

1.7 The key pollutants considered in this assessment are: oxides of nitrogen (NO_2 and NO) and carbon monoxide (CO) as these are the key pollutants emitted from combustion of natural gas that may potentially lead to exceedances of any relevant standards. In addition, emission of ammonia (NH_3) are also considered due to the emissions arising from the proposed SCR for the Project. Predicted concentrations are compared with relevant standards and guidelines incorporated into Uzbekistan law and also the European Union (EU) standards, the International Finance Corporation (IFC) guidelines and the World Health Organisation (WHO) Guidelines.

1.8 The proposed plant will be located adjacent to the existing Sirdarya Thermal Power Plant which includes a number of stacks emitting to air.

1.9 A glossary of common air quality terminology is provided in **Appendix A.**

2 LEGISLATION, POLICY AND ASSESSMENT CRITERIA

Uzbekistan Air Quality Standards

2.1 The Uzbekistan air quality standards are Maximum Permissible Concentrations (MPC) set within the SanPiN No. 0293-11 *'Hygienic regulations. List of maximum permissible concentrations (MPC) of contaminants in the atmospheric air of inhabitant areas in the territory of the Republic of Uzbekistan'.* The relevant standards applicable to this project are set out in Table 2.1 below.

Table 2.1: Uzbekistan Ambient Air Quality Standards

Pollutant	Averaging Period	MPC (μg/m^3)
NO_2	1 time	85
	24-hour	60
	Monthly	50
	Annual	40
NO	1 time	600
	24-hour	250
	Monthly	120
	Annual	60
CO	1 time	5000
	24-hour	4000
	Monthly	3500
	Annual	3000
NH_3	1-time	200
	24-hour	120
	Monthly	60
	Annual	40

European Bank for Reconstruction and Development (EBRD)

2.2 Performance Requirement PR3 recognises that increased economic activity and urbanisation can generate increased levels of pollution to air, water and land. It acknowledges the importance of using best available techniques (BAT) and good international practice (GIP) to efficiently prevent pollution and control the release of pollutants into the environment.

2.3 PR3 requires projects involving new facilities to meet relevant EU environmental standards. The relevant EU air quality standards are presented in Table 2.2 below.

Table 2.2: EU Ambient Air Quality Standards

Pollutant	Averaging Period	EU Limit Value ($\mu g/m^3$)	Comments
Nitrogen dioxide (NO_2)	1-hour	200	Not to be exceeded more than 18 times in a calendar year
	Annual	40	
Carbon monoxide (CO)	Maximum daily 8 hour mean	10,000	

2.4 PR3 also requires that projects will be required to meet EU Best Available Techniques (BAT) associated emission levels as set out in Table 2.3 below.

Table 2.3: BAT – Associated Emission Levels (AELs)

Pollutant	BAT – AELs (mg/Nm^3)	
	Yearly Average	Daily Average
NOx	10 - 30	15 -40
Carbon monoxide (CO)	5 - 30	
*For plants with a net electrical efficiency (EE) greater than 55%, a correction factor may be applied to the higher end of the BAT-AEL range corresponding to [higher end] x EE/55, where EE is the net electrical efficiency of the plant determined at ISO baseload conditions. ** dry, 15%O_2		

International Finance Corporation World Bank Group

2.5 The IFC Guidelines[1] recommend the use of national legislated standards, or in their absence, the current World Health Organisation (WHO) Air Quality Guidelines. A summary of the IFC guideline values relevant to this project is provided in Table 2.4.

[1] International Finance Corporation World Bank Group, General EHS Guidelines: Environmental. Air Emissions and Ambient Air Quality, April 2007.

Table 2.4: IFC and WHO Guideline Values

Pollutant	Averaging Period	Guideline Value ($\mu g/m^3$)
Nitrogen Dioxide	1-year	40
	1-hour	200
Carbon Monoxide	1-hour	30,000
	8-hour	10,000

The Equator Principles

2.6 The Equator Principles provides a set of standards for financial investors to assess the social and environmental risk of a project. In air quality terms, a proposed facility satisfies the Equator Principles if compliance with the IFC air quality guideline values is demonstrated.

Degraded Airsheds

2.7 The term 'Airshed' refers to the local area around a facility or complex of facilities that is directly affected by emissions from the facility or complex. There are a number of factors that can potentially affect the size of a relevant airshed, including plant characteristics, stack height, meteorological conditions and topography.

2.8 For new power plants in degraded airsheds, the IFC[2] states that new facilities should minimise incremental impacts by achieving the emission values set out in Table 2.5.

2.9 In addition, the IFC guidance states *that 'emissions from a single project should not contribute more than 25% of the applicable ambient air quality standards to allow additional, future sustainable development in the same airshed'.*

[2] International Finance Corporation World Bank Group (December 2008), Environmental, Health and Safety Guidelines for Thermal Power Plants.

Table 2.5: World Bank Emission Guidelines for Combustion Turbines (mg/Nm^3)

Note:
- Guidelines are applicable for new facilities
- EA may justify more stringent or less stringent limits due to ambient environment, technical and economic considerations provided there is compliance with applicable ambient air quality standards and incremental impacts are minimised.
- For projects to rehabilitate existing facilities, case-by-case emission requirements should be established by the EA considering (i) the existing emission levels and impacts on the environment and community health, and (ii) cost and technical feasibility of bringing the existing emission levels to meet these new facilities limits.
- EA should demonstrate that emissions do not contribute a significant portion to the attainment of relevant ambient air quality guidelines or standards, and more stringent limits may be required.

Combustion Technology/ Fuel	Particulate Matter (PM)		Sulphur dioxide (SO_2)		Nitrogen oxides (NOx)		Dry Gas, Excess O_2 Content (%)
Boiler	NDA	DA	NDA	DA	NDA	DA	
Natural Gas (all turbine types of Unit >50MWth)	N/A	N/A	N/A	N/A	51	51	15%
Other Fuels (Unit > 50MWth)	50	30	Use of 1% or less S fuel	Use of 0.5% or less S fuel	152 (a)	152 (a)	15%

General Notes:

- MWth = Megawatt thermal input on HHV basis; N/A/ = Not applicable; NDA = Non-degraded airshed; DA = Degraded airshed (poor air quality); Airshed should be considered as being degraded if nationally legislated air quality standards are exceeded or, in their absence, if WHO Air Quality Guidelines are exceeded significantly; S = sulphur content (expressed a percent by mass); Nm^3 is at one atmosphere pressure, 0 degrees Celsius, MWth category is to apply to the entire facility consisting of multiple units that are reasonably considered to be emitted from a common stack. Guideline limits to apply to facilities operating more than 500 hrs per year. Emission levels should be evaluated on a one hour average basis and be achieved 95% of annual operating hours.
- If supplemental firing is used in a combined cycle gas turbine mode, the relevant guideline limits for combustion turbines should be achieved including emissions from those supplemental firing units (e.g., duct burners).
- (a) Technological differences (for example the use of Aeroderivatives) may require different emissions values which should be evaluated on a cases-by-case basis through the EA process but which should not exceed 200 mg/Nm3.

Comparison of the Guideline limits with standards of selected countries / region (as of August 2008):

- Natural Gas-fired Combustion Turbine – NOx
  - o Guideline limits: 51 (25 ppm)
  - o EU: 50 (24 ppm), 75 (37 ppm) (if combined cycle efficiency > 55%), 50*η / 35 (where η = simple cycle efficiency)
  - o US: 25 ppm (> 50 MMBtu/h (≈ 14.6 MWth) and ≤ 850 MMBtu/h (≈ 249MWth)), 15 ppm (> 850 MMBtu/h (≈ 249 MWth))
  - o (Note: further reduced NOx ppm in the range of 2 to 9 ppm is typically required through air permit)
- Liquid Fuel-fired Combustion Turbine – NOx
  - o Guideline limits: 152 (74 ppm) – Heavy Duty Frame Turbines & LFO/HFO, 300 (146 ppm) – Aeroderivatives & HFO, 200 (97 ppm) – Aeroderivatives & LFO
  - o EU: 120 (58 ppm), US: 74 ppm (> 50 MMBtu/h (≈ 14.6 MWth) and ≤ 850 MMBtu/h (≈ 249MWth)), 42 ppm (> 850 MMBtu/h (≈ 249 MWth))
- Liquid Fuel-fired Combustion Turbine – SOx
  - o Guideline limits: Use of 1% or less S fuel
  - o EU: S content of light fuel oil used in gas turbines below 0.1% / US: S content of about 0.05% (continental area) and 0.4% (non-continental area)

Source: EU (LCP Directive 2001/80/EC October 23 2001), EU (Liquid Fuel Quality Directive 1999/32/EC, 2005/33/EC), US (NSPS for Stationary Combustion Turbines, Final Rule – July 6, 2006)

Adopted Air Quality Standards for the Assessment

2.10 The assessment has used the Uzbekistan MPC, the IFC / WHO guidelines and the EU standards for assessing the impact of the development on local air quality. A summary of the air quality standards adopted for the assessment is provided in Table 2.6.

Table 2.6: Ambient Air Quality Standards and Guidelines Adopted for the Assessment

Pollutant	Averaging Period	Uzbekistan MPC (µg/m^3)	IFC/WHO Guidelines (µg/m^3)	EU Standards (µg/m^3)
Nitrogen dioxide (NO_2)	1-time[2]	85	200	200[1]
	24-hour	60	-	-
	Monthly	50	-	-
	Annual	40	40	40
Nitrogen oxide (NO)	1-time[2]	600	-	-
	24-hour	250	-	-
	Monthly	120	-	-
	Annual	60	-	-
Carbon monoxide (CO)	1-hour	5000	30,000	-
	8-hour	-	10,000	10,000
	24-hour	4000	-	-
	Monthly	3500	-	-
	Annual	3000	-	-
Ammonia (NH_3)	1-time[2]	200	-	-
	24-hour	120	-	-
	Monthly	60	-	-
	Annual	40	-	-

[1]includes 18 allowable exceedance of the standard of 200µg/m^3 per year.

[2]compared against 1 hour average concentrations

3 ASSESSMENT METHODOLOGY

Scope of Assessment

3.1 The assessment comprises a review of local ambient air quality monitoring data and dispersion modelling of emissions from the proposed plant to predict ground-level concentrations of pollutants at sensitive receptor locations.

3.2 The assessment also included modelling the emissions arising from the existing Sirdarya TPP plant and the TPP plant following the proposed modernisation works.

3.3 Predicted ground level concentrations are compared with relevant air quality standards.

Dispersion Modelling Parameters

3.4 The potential impact of the facility arising from the proposed plant on local air quality has been assessed using Breeze AERMOD 7, a new generation dispersion model that incorporates the latest understanding of the atmospheric boundary layer.

3.5 The primary emission sources at the Site are as follows:

- In Combined Cycle Mode – two main stacks associated with the HRSG; or
- In Simple Cycle Mode – two bypass stacks

3.6 The key pollutants arising from natural gas combustion and emitted via the main stack / bypass stack will be oxides of nitrogen (NO and NO_2) and CO. Ammonia (NH_3) will also be emitted from the proposed SCR and therefore is also considered.

3.7 A summary of the emission parameters used in the dispersion modelling are presented in **Appendix B**. These data have been provided by the equipment manufacturer in line with the proposed fuel specifications.

3.8 The results presented in this report are determined assuming the main stacks are at a height of 60m and the bypass stacks are at a height of 45m.

3.9 For the purposes of the assessment it has been assumed that the facility will operate at full load continuously all year. The operational scenarios assessed are detailed in Table 3.1 below.

Table 3.1: Summary of Scenarios Assessed for the Air Quality Assessment of the Project

Operational Scenario	Fuel	Pollutants	Operational Mode	Emissions Via
Scenario 1	Natural gas	NO_x, CO, NH_3	Combined	Main Stack
Scenario 2	Natural gas	NO_x, CO, NH_3	Simple	Bypass Stacks

3.10 For each scenario the results are presented as:

- the baseline concentration (including a contribution from the existing plant at the neighbouring Sirdarya TPP and the background concentration in the area;
- the process contribution (PC) from the proposed plant; and
- the overall predicted environmental concentration (PEC) (PC + contribution from upgraded plant at the neighbouring Sirdarya TPP and the background concentration in the area.

3.11 Monitoring of ambient concentrations of ammonia (NH_3) is not undertaken, NH_3 is also not emitted by the Sirdarya TPP. Therefore, for the assessment of NH_3 only the PC arising from the proposed plant is provided.

3.12 It is understood that the existing Sirdarya TPP, will be partially decommissioned with the operation of the CCGT. The baseline scenario assumes that all 10 of the existing units are operational. Following the opening of the Project, it is assumed that 4 units will cease to operate (units 1, 2, 7 & 8) and the remaining 6 units will be modernised. Further details of the emissions from the Sirdarya TPP are provided in **Appendix B.**

3.13 As discussed previously the Project forms part of a wider CCGT development with additional IFC Project proposed for the adjacent land (western plot). Further modelling has been completed to determine the cumulative impact of this plant in addition to the proposed plant. To ensure a worst case assessment, emissions from the proposed IFC Project do not assume NOx abatement.

3.14 The following modelling will be completed:

Table 3.2: Summary of Modelled Scenarios

Scenario	Conditions	Description
Baseline	Existing	• TPP operating with 10 units
Scenario 1	Opening of Project	• TPP operating with 6 remaining modernised units • Project operating in Combined Cycle Mode
Scenario 2	Opening of Project	• TPP operating with 6 remaining modernised units • Project operating in Simple Cycle Mode
Scenario 3	Opening of Adjacent IFC Project	• TPP operating with 6 remaining modernised units • Project operating in Combined Cycle Mode • IFC Project operating in Combined Cycle Mode

3.15 It is understood that the proposed Project will only operate on Simple Cycle Mode during maintenance of the HRSG plant. It is therefore considered unlikely that both the Project and the IFC Project will both operate on Simple Cycle Mode at the same time, therefore this scenario has not been modelled.

Local Meteorological Data

3.16 The modelling has been carried out using three years (2017-2019) of hourly sequential meteorological data in order to take account of inter-annual variability and reduce the effect of any atypical conditions. Data from meteorological station at Samarkand has been used for the assessment.

3.17 Wind roses for each of these years are presented in Figures 3.1 to 3.3; these show that the predominant wind direction is from the southeast.

Figure 3.1: Wind rose for Samarkand (2017)

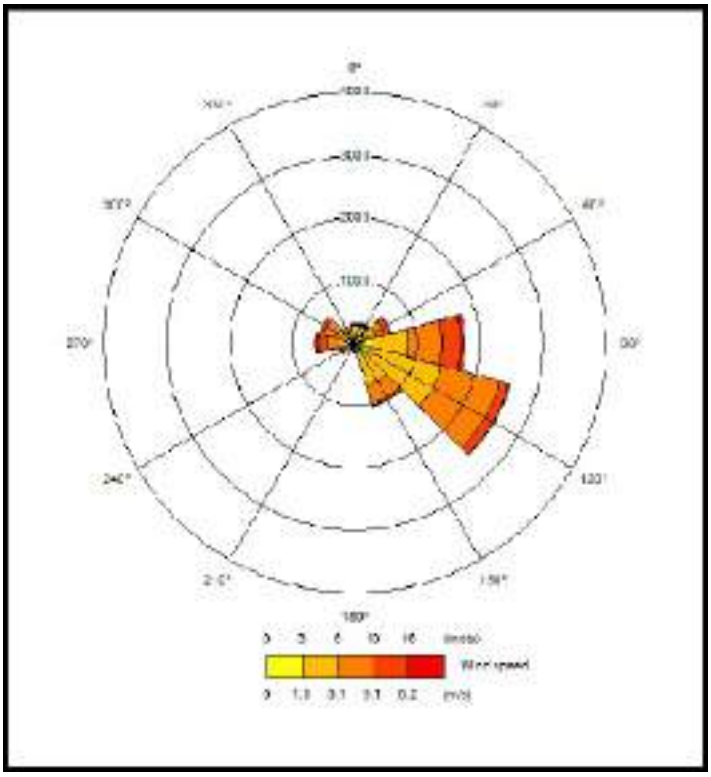


Figure 3.2: Wind rose for Samarkand (2018)

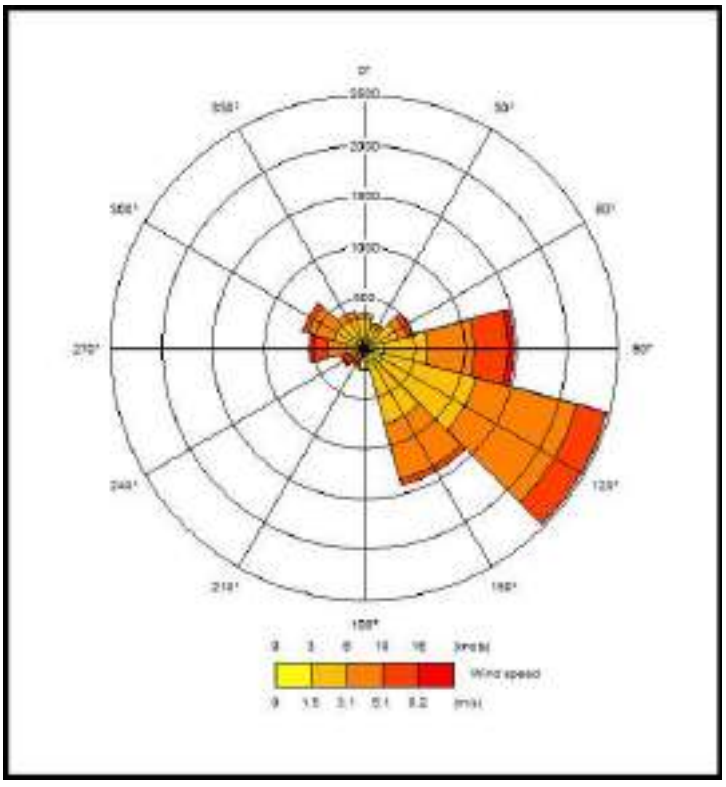
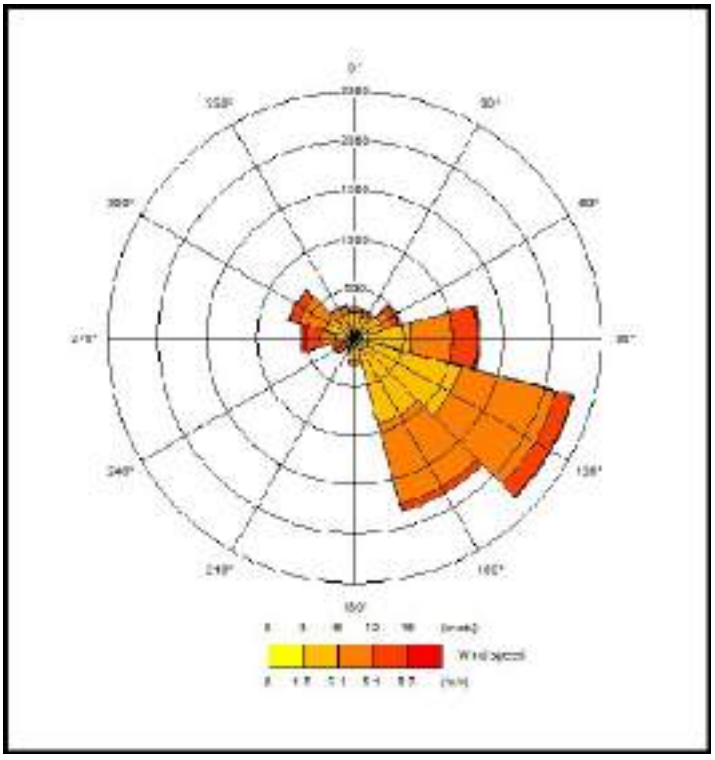


Figure 3.3: Wind rose for Samarkand (2019)



3.18 The raw meteorological data was sourced from the National Centres for Environmental Information (NCEI), the data capture rates for the raw data for the key parameters are as follows:

Table 3.3: Data Capture Rates

Year	% Data Capture Rate for raw meteorological data			
	Temperature	Wind Speed	Wind Direction	Relative Humidity
2017	99.8	94.7	94.7	99.8
2018	97.2	93.3	93.3	97.2
2019	99.5	94.2	94.2	99.5

3.19 No bias in the collection of data availability was identified.

Building Downwash / Entrainment

3.20 The presence of buildings close to emission sources can significantly affect the dispersion of pollutants by leading to a phenomenon called building downwash. This occurs when a building distorts the wind flow, creating zones of increased turbulence. Increased turbulence causes the plume to come to ground earlier than otherwise would be the case and results in higher ground level concentrations closer to the stack.

3.21 Downwash effects are only significant where building heights are greater than 30 to 40% of the emission release height. The downwash structures also need to be sufficiently close for their influence to be significant.

3.22 A summary of the proposed buildings and structures that have been included in the model are presented in Table 3.4 below, further details are provided in **Appendix B**.

Table 3.4: Downwash Structures

Description	Height (m)
Gas Turbine Buildings	25
Steam Turbine Building	25
Heat Recovery Steam Generator Buildings	40
Control Building	25

Topography

3.23 The presence of elevated terrain can significantly affect the dispersion of pollutants by increasing turbulence and reducing the distance between the plume centre line and the ground level. Terrain data has been included in the model.

Nitric Oxide to NO_2 Conversion

3.24 Oxides of nitrogen (NO_x) emitted to atmosphere as a result of combustion will consist largely (around 90%) of nitric oxide (NO), a relatively innocuous substance. Once released into the atmosphere, NO is oxidised to NO_2. The proportion of NO converted to NO_2 depends on a number of factors including wind speed, distance from the source, solar irradiation and the availability of oxidants, such as ozone (O_3). At locations close to the source where highest concentrations are predicted, the rate of oxidation will be relatively small.

3.25 Typical NO:NO_2 conversion ratios of 70% for long term predictions and 35% for short term predictions have been assumed for comparison with the air quality standards for NO_2. For NO, a worst-case approach has been adopted assuming no conversion to NO_2.

Sensitive Receptors

3.26 The Project Site is located on farming land, residential areas are located to the northeast, northwest, east and west. A military barracks is located to the southeast and the Sirdarya TPP is located to the southwest. Due to lack of relevant exposure, only the short-term air quality standards are applicable within the non-residential areas such as the Site itself, the Sirdarya TPP and parts of the barracks.

3.27 Grids have been modelled across the nearest sensitive areas (Residential Areas A to E and Military Barracks) to ensure the worst affected locations within these areas are assessed. In the wider area, specific receptors have been selected to represent areas where people are likely to be regularly exposed for prolonged periods of time (e.g. residential areas). The locations of the residential grids and discrete sensitive receptors in the vicinity of the Site are presented in Table 3.5 and Figures 3.4 and 3.5. Five receptors have also been included within the Site itself representing the areas likely to have relevant exposure for assessment of short-term effects.

Table 3.5: Location of Sensitive Receptors

ID (Plan 3.5 below)	Receptor Type	Ground-Level Elevation (m)
H3	Residential Grid Area A (to northwest of Site)	324.2 – 342.9
H1	Residential Grid Area B (to west of Site including Farmers Homes)	323.0 – 332.9
H5	Residential Grid Area C (to east of Site including Kindergarten and Sports Centre)	286.1 – 373.8
H5	Residential Grid Area D (new homes to east of Site)	286.9 – 291.7
H7	Residential Grid Area E (accommodation blocks to southeast of Site)	285.2 – 292.1
H8	Military Barracks (short-term)	285.1 – 292.2
H2	Sirdarya TPP	332.3 / 295.2
H4	Residential	325.8
H6	Residential	293.4
H7	Residential	290.4
H9	Residential	359.9
H10	Residential	369.2
H11	Residential	301.8
H12	Residential	307.6

H13	Residential	367.8
H14	Residential	338.5
H15	Residential	339.8
H16	Residential	360.4
H17	Residential	363.6
H18	Residential	477.8
H19	Residential	479.6
H20	Residential	395.0
H21	Residential	410.4
H22	Residential	317.4
H23	Residential	286.9
H24	Residential	283.3
H25	Residential	282.7
H26	Residential	279.3
H27	Residential	325.2
H28	Residential	323.1
H29	Residential	307.0
H30	Residential	281.8
H31	Residential	282.1
H32	Residential	280.7
H33	Residential	279.7
H34	Residential	307.1
H35	Residential	291.7
H36	Residential	311.5
H37	Residential	304.2
H38	Residential	313.5
H39	Residential	302.3
H40	Residential	284.1
D1	Proposed On-site receptor (Central Control Building) (short-term exposure)	317.2
D2	Proposed On-site receptor (Workshop Area) (short-term exposure)	292.8
D3	Proposed On-site receptor (Admin Building) (short-term exposure)	292.3
D4	Proposed On-site receptor (Social Building) (short-term exposure)	294.9
D5	Proposed On-site receptor (Gatehouse) (short-term exposure)	292.0

Figure 3.4: Sensitive Receptor Locations within 2km radius of Site

Figure 3.5: Sensitive Receptor Locations within 10km radius of Site

3.28 Ground-level pollutant concentrations have been predicted at both the receptor locations above and over a coarse grid of size 10km by 10km Cartesian grid of 250m resolution and a fine grid 2km by 2km of 50m resolution both centred on the Site.

Significance Criteria

3.29 There are no local planning policies that provide criteria for acceptable impacts from proposed facilities in Uzbekistan. The UK Environment Agency has developed criteria for assessing the significance of an impact compared with relevant air quality standards and background air quality. A process contribution (PC) is considered significant if:

- The long-term PC > 1% of the long-term air quality standard;
- The short-term PC > 10% of the short-term air quality standard.

3.30 At 1% of the long-term air quality standard, the impact of a development is unlikely to be significant compared with background air quality. Both the short-and long-term criteria are also designed to ensure that there is a substantial safety margin to protect public health and the environment.

3.31 If the screening criteria are not met, the process contribution should be considered in combination with relevant ambient background pollutant concentrations. The impact is considered to be insignificant if:

- The long-term PC + background concentration < 70% of the air quality standard;
- The short-term PC < 20% (air quality standard – short-term background concentration), where the short-term background concentration is assumed to be twice the long-term background concentration.

4 BASELINE CONDITIONS

4.1 Ambient air quality data at two monitoring locations (Bekobad and Gulistan) has been reviewed to establish the baseline conditions in the vicinity of the Site.

Bekobad

4.2 The monitoring station at Bekobad is location approximately 12km to the east of the Site. The monitoring site at Bekobad is a more industrial setting than the Site with the main industries being cement and steel industries, therefore the ambient concentrations measured at this location are likely to be an overestimation of the background concentrations at the Project Site.

4.3 Five years of monthly monitoring data for concentrations of nitrogen dioxide (NO_2), nitrogen oxide (NO) and carbon monoxide (CO) have been reviewed, and are summarised in Table 4.1.

Table 4.1: Results of Monitoring at Bekobad (μg/m³)

Year	Concentration (μg/m³)		
	NO_2	NO	CO
2015	35.8	26.7	1000.0
2016	41.7	30.0	1000.0
2017	47.5	30.8	1000.0
2018	47.5	33.3	1000.0
2019	47.5	-	1000.0

4.4 Daily spot measurements at 07:00, 13:00 and 19:00 at the Bekobad monitoring station were reviewed for the year 2019. A summary of this data is provided in Tables 4.2 to 4.4 below.

Table 4.2: Results of NO_2 Monitoring at Bekobad in 2019 (µg/m³)

Month	Concentration (µg/m³)			
	NO_2			
	07:00	13:00	19:00	Average
January	43.2	44.8	41.6	43.2
February	42.8	46.3	52.1	46.9
March	41.7	47.8	43.5	44.3
April	59.6	50.8	53.5	54.6
May	51.2	55.8	60.8	55.9
June	55.0	50.8	55.4	53.8
July	42.2	46.3	48.1	45.6
August	49.3	52.6	53.0	51.6
September	37.1	37.5	41.7	38.8
October	52.3	50.4	52.7	51.8
November	45.8	38.1	36.5	40.1
December	43.2	43.6	44.4	43.7
Average	**47.0**	**47.1**	**48.6**	**47.5**

Table 4.3: Results of NO Monitoring at Bekobad in 2019 (µg/m³)

Month	Concentration (µg/m³)			
	NO			
	07:00	13:00	19:00	Average
January	22.7	22.7	23.6	23.0
February	22.3	23.2	25.9	23.8
March	24.3	25.7	27.4	25.8
April	26.2	30.0	28.8	28.3
May	28.1	33.1	30.0	30.4
June	29.6	26.7	29.1	28.4
July	26.5	27.0	24.8	26.1
August	25.6	31.1	28.1	28.3
September	26.5	25.7	23.8	25.3
October	33.5	38.5	36.2	36.0
November	28.5	22.0	27.2	25.9

Month	Concentration (μg/m³)			
	NO			
	07:00	13:00	19:00	Average
December	30.8	31.2	37.2	33.1
Average	**27.0**	**28.1**	**28.5**	**27.9**

Table 4.4: Results of CO Monitoring at Bekobad in 2019 (μg/m³)

Month	Concentration (μg/m³)			
	CO			
	07:00	13:00	19:00	Average
January	1181.8	818.2	909.1	969.7
February	1363.6	1000.0	909.1	1090.9
March	1739.1	739.1	869.6	1115.9
April	1307.7	1230.8	1384.6	1307.7
May	1230.8	1038.5	1076.9	1115.4
June	1041.7	625.0	791.7	819.4
July	1259.3	703.7	1037.0	1000.0
August	1444.1	1777.8	851.9	1358.0
September	913.0	1000.0	1000.0	971.0
October	1076.9	1269.2	1192.3	1179.5
November	730.8	1153.8	1153.8	1012.8
December	1120.0	880.0	1000.0	1000.0
Average	**1200.7**	**1019.7**	**1014.7**	**1078.4**

Gulistan

4.5 The monitoring station at Gulistan is located approximately 41km to the northeast of the Site. The monitoring site at Gulistan is a rural/agricultural area with similar land use and wind patterns to the proposed Project site. The ambient concentrations measured at this location are likely therefore likely to be similar to the background concentrations at the Project in the absence of the influence of the Sirdarya TPP.

4.6 Five years of monthly monitoring data for concentrations of nitrogen dioxide (NO_2) and carbon monoxide (CO) have been reviewed, and are summarised in Table 4.5.

Table 4.5: Results of Monitoring at Gulistan (μg/m³)

Year	Concentration (μg/m³)	
	NO_2	CO
2015	16.7	1250.0
2016	19.2	1916.7
2017	19.2	1916.7
2018	20.0	2000.0
2019	20.0	2000.0

4.7 Daily spot measurements at 07:00, 13:00 and 19:00 at the Gulistan monitoring station were reviewed for the year 2019. A summary of this data is provided below.

Table 4.6: Results of NO_2 Monitoring at Gulistan in 2019 (μg/m³)

Month	Concentration (μg/m³)			
	NO_2			
	07:00	13:00	19:00	Average
January	18.3	20.8	23.5	20.9
February	19.1	21.3	22.4	20.9
March	19.1	22.0	23.0	21.4
April	18.1	21.7	26.5	22.1
May	18.2	22.2	26.0	22.1
June	18.7	20.0	24.6	21.1
July	17.2	21.3	24.6	21.0
August	18.9	22.6	22.0	21.2
September	18.9	22.6	22.0	21.2
October	17.3	19.8	24.0	20.4
November	16.0	21.4	27.2	21.5
December	16.4	20.8	24.8	20.7
Average	**18.0**	**21.4**	**24.2**	**21.2**

Table 4.7: Results of NO Monitoring at Gulistan in 2019 (μg/m³)

Month	Concentration (μg/m³)			
	NO			
	07:00	13:00	19:00	Average
January	13.8	17.1	16.3	15.7
February	13.3	13.8	18.3	15.1
March	12.3	18.2	21.8	17.4
April	13.8	16.9	21.2	17.3
May	12.8	14.8	18.8	15.5
June	12.2	16.1	18.7	15.7
July	12.6	17.4	20.7	16.9
August	17.0	22.6	24.8	21.5
September	17.0	22.6	24.8	21.5
October	13.8	16.5	18.5	16.3
November	14.0	16.0	19.6	16.5
December	12.8	17.6	21.2	17.2
Average	**13.8**	**17.5**	**20.4**	**17.2**

Table 4.8: Results of CO Monitoring at Gulistan in 2019 (μg/m³)

Month	Concentration (μg/m³)			
	CO			
	07:00	13:00	19:00	Average
January	2208.3	2166.7	2500.0	2291.7
February	2000.0	2000.0	2291.7	2097.2
March	1891.3	2239.1	2260.9	2130.4
April	2038.5	2307.7	2346.2	2230.8
May	2200.0	2060.0	2440.0	2233.3
June	2043.5	2065.2	2478.3	2195.7
July	2000.0	2314.8	2166.7	2160.5
August	2333.3	2314.8	2240.7	2296.3
September	2333.3	2314.8	2240.7	2296.3
October	2057.7	2096.2	2192.3	2115.4
November	2080.0	2000.0	2120.0	2066.7
December	2160.0	1920.0	2160.0	2080.0
Average	**2112.2**	**2149.9**	**2286.5**	**2182.9**

Local Monitoring

4.8 Monitoring was undertaken at a central location within the Project site itself, three measurements were taken per day for a period of 7 consecutive days between the 21st to 27th May 2020. Concentrations of NO_2, SO_2, CO and Total suspended particles were measured. Of relevance to this assessment are concentrations of NO_2 and CO. The monitoring data provided is presented in Table 4.9 below.

Table 4.9: Results of Monitoring at the Site (μg/m³)

Date	Concentration (μg/m³)							
	NO_2				CO			
	1	2	3	Average	1	2	3	Average
21/05/20	0	0	0	0	3300	2700	2300	2767
22/05/20	20	10	10	13	3900	3700	3500	3700
23/05/20	0	10	0	3	3900	4800	3200	3967
24/05/20	0	0	0	0	5000	3000	3200	3733
25/05/20	0	0	0	0	2300	2300	1300	1937
26/05/20	0	0	0	0	4200	3400	3900	3833
27/05/20	10	0	0	3	3700	3500	3500	3567

4.9 Monitoring of ambient pollutant concentrations of NO_2, ozone (O_3), volatile organic compounds (VOCs) and sulphur dioxide (SO_2) using diffusion tubes has also been undertaken at 6 locations within the vicinity of the Site. Of relevance to this assessment are concentrations of NO_2. The monitoring locations are illustrated in Figure 4.1 below.

Figure 4.1: Diffusion Tube Survey Monitoring Locations

4.10 Monitoring data had been provided for the period from the 20th May to 11th June 2020. The results at each monitoring location are presented in Table 4.10 below.

Table 4.10: Results of Ambient NO_2 Diffusion Tube Survey ($\mu g/m^3$)

Monitoring Locations	Concentration ($\mu g/m^3$)
DT1	5.8
DT2	7.9
DT3	9.3
DT4	6.8
DT5	7.0
DT6	5.7

4.11 In order to establish a representative background concentration, continuous measurements over a period of at least 3 months are required. The results from the onsite spot readings and diffusion tube survey were taken over a short time period and were not continuous measurements. They are therefore not considered suitable for use in establishing the background concentration.

4.12 For the purposes of this assessment the background concentrations are assumed to be similar to the concentrations measured at the Guilstan monitoring site. The background concentrations used for this assessment are 21$\mu g/m^3$ for NO_2, 17$\mu g/m^3$ for NO and 2200$\mu g/m^3$ for CO.

4.13 As monitoring data measured at some distance from the Project site has been used to establish a background concentration, further modelling was completed to determine the effects of the emissions arising from the Sirdarya TPP that is located adjacent to the Project site.

4.14 The background concentrations used in this assessment are likely to be higher than those likely to be experienced in the vicinity of the Site, therefore the assessment can be considered to be worst case. As there is some uncertainty regarding the background concentrations, the background concentrations and PECs presented in this report should be considered to be indicative only.

5 ASSESSMENT OF IMPACTS

Introduction

5.1 The maximum predicted concentrations of NO_2, NO and CO as a result of the proposals have been predicted by dispersion modelling using three years of meteorological data.

5.2 The impact of the proposals i.e. process contribution (PC) is considered as a proportion of the relevant air quality standards to determine the significance of the impact. Where more than one standard exists for the same pollutant and averaging period, the most stringent standard has been used in this assessment.

5.3 In order to predict the long-term predicted environmental concentration (PEC) the background concentrations as summarised in Section 4 have been combined with the long-term PC. To predict the short-term PECs, the predicted short-term PC is added to the short-term background concentrations, usual practice is to assume to be twice that of the long-term background concentration as recommended by the UK EA. Hourly, 8-hour, 24-hour and monthly concentrations are all considered as short-term concentrations.

Scenario One (Combined Cycle)

Nitrogen Dioxide (NO_2)

5.4 The maximum predicted ground-level annual NO_2 concentrations at the nearest identified sensitive receptor locations are presented in Table 5.1. For ease of reading only the concentrations at the closest receptor locations and those that are showing elevated concentrations are presented in the table, full results are presented in **Appendix C**. The results are presented for the baseline scenario which includes the existing emissions arising from the neighbouring Sirdarya TPP and the likely local background concentration; the process contribution (PC) for emissions from the proposed plant and as a percentage of the relevant standard and the predicted environmental concentration (PEC) which includes the emissions from the retained plant at the neighbouring Sirdarya TPP following the upgrading and closure of some of the current units.

Table 5.1: Maximum Predicted Long Term (Annual) NO_2 Concentrations – Combined Cycle ($\mu g/m^3$)

Receptor	Baseline (including existing TPP)	PC	PC as % of Standard	PEC (including modernised TPP)	Overall Impact (PEC – Baseline)
Residential Area A (H3)	21.2	0.5	1.3	21.6	0.4
Residential Area B (H1)	21.2	0.7	1.7	21.8	0.6
Residential Area C (H5)	21.5	0.5	1.2	21.7	0.2
Residential Area D (new homes)	21.8	0.2	0.5	21.6	-0.2
Residential Area E (accommodation blocks (H8)	21.8	0.4	0.9	21.7	-0.1
H4	21.2	0.3	0.7	21.4	0.2
H6	21.9	0.3	0.8	21.7	-0.1
H7	21.8	0.4	0.9	21.7	-0.1
H9	21.3	0.0	0.1	21.2	-0.1
H10	21.4	0.1	0.1	21.3	-0.1
H11	21.5	0.1	0.2	21.3	-0.1
H12	21.6	0.2	0.4	21.5	-0.1
H18	22.0	0.3	0.8	21.8	-0.2
H19	22.1	0.3	0.9	21.9	-0.2
H27	21.4	0.6	1.4	21.7	0.3
H34	22.2	0.2	0.4	21.8	-0.4
H35	21.8	0.1	0.3	21.5	-0.2
H36	22.1	0.1	0.4	21.7	-0.4
Standard	40				

5.5 The results indicate that there will be no exceedances of the relevant annual mean NO_2 standard (which is the Uzbekistan MPC, the EU standard and WHO guideline concentration of 40$\mu g/m^3$) within the nearby residential areas.

5.6 The greatest impact in annual mean NO_2 concentrations as a result of the proposed plant when operating in combined cycle mode is predicted to be a PC of 0.7$\mu g/m^3$ predicted at Residential Area B which is located close to the west boundary of the Site. At this and three other nearby sensitive receptors (Residential Areas A, C and H27) the impact is greater than 1% of the standard. However, at all the selected locations within the study area, the predicted PEC is less than 70% of

the relevant standard, therefore the impact is considered to be insignificant in accordance with the significance criteria.

5.7 The greatest change in the overall annual mean NO_2 concentrations as a result of the changes (proposed plant plus changes to emissions from neighbouring Sirdarya TPP) is an increase of 0.6μg/m^3 also predicted at Residential Area B. The results also indicate that at a number of other nearby sensitive receptors, the predicted concentrations will be reduced from the current levels. The impact at these locations is considered to be beneficial.

5.8 A contour plot showing the annual mean NO_2 PC across the study area is shown in Figure 5.1 below.

Figure 5.1: Predicted Maximum Annual Mean NO_2 PC Concentrations (μg m^{-3})

5.9 The maximum predicted ground-level short-term NO_2 concentrations at the identified sensitive receptor locations are presented in Table 5.2.

Table 5.2: Maximum Predicted Short-Term (1 Hour, 24 Hour and Monthly) NO_2 Concentrations – Combined Cycle ($\mu g/m^3$)

Receptor	Baseline (including existing TPP)	PC	PC as % of Standard	PEC (including retained TPP)	Overall Impact (PEC – Baseline)
1-Hour					
Residential Area A (H3)	82.8	14.1	16.6	67.9	-14.8
Residential Area B (H1)	83.1	14.6	17.1	73.2	-9.9
Residential Area C (H5)	84.2	24.0	28.3	69.1	-15.1
Residential Area D (new homes)	91.0	6.6	7.8	72.8	-18.3
Residential Area E (accommodation blocks (H8)	87.6	7.0	8.3	70.5	-17.1
Military Barracks	95.0	11.3	13.3	75.9	-19.2
Sirdarya TPP (H2)	42.7	7.1	8.3	49.1	6.3
H4	80.5	5.3	6.3	65.7	-14.8
H6	85.5	5.9	7.0	67.1	-18.4
H7	81.1	5.6	6.6	65.3	-15.8
H9	79.3	5.5	6.5	68.9	-10.4
H10	76.0	5.5	6.4	66.8	-9.2
H11	73.1	6.5	7.7	63.9	-9.2
H12	80.8	6.9	8.1	68.1	-12.7
H18	74.3	33.7	39.7	75.7	1.4
H19	73.4	33.5	39.4	75.5	2.2
H27	92.3	8.3	9.7	77.4	-14.9
H34	87.8	4.5	5.2	72.8	-14.9
H35	84.8	6.7	7.9	67.1	-17.7
H36	84.9	5.7	6.8	70.0	-14.9
24-Hour					
Residential Area A (H3)	44.6	2.0	3.4	44.2	-0.4
Residential Area B (H1)	43.8	4.5	7.4	46.5	2.7
Residential Area C (H5)	46.4	4.8	8.1	46.8	0.4
Residential Area D (new homes)	48.6	1.2	2.0	45.4	-3.2
Residential Area E (accommodation blocks	48.6	1.9	3.2	45.6	-3.0

Receptor	Baseline (including existing TPP)	PC	PC as % of Standard	PEC (including retained TPP)	Overall Impact (PEC – Baseline)
(H8)					
Military Barracks	46.3	1.2	1.9	44.2	-2.1
Sirdarya TPP (H2)	42.1	2.4	4.0	44.4	2.3
H4	44.5	1.1	1.8	44.1	-0.5
H6	48.0	1.3	2.2	45.7	-2.3
H7	48.0	1.6	2.7	45.5	-2.5
H9	46.0	0.5	0.8	44.6	-1.4
H10	45.4	0.7	1.1	44.4	-1.0
H11	46.5	0.9	1.5	45.1	-1.4
H12	47.3	1.5	2.5	45.8	-1.5
H18	47.6	3.3	5.6	46.3	-1.3
H19	47.8	4.6	7.7	47.6	-0.2
H27	45.0	2.1	3.5	44.1	-0.9
H34	48.1	0.5	0.8	45.6	-2.4
H35	46.4	0.6	1.0	44.6	-1.8
H36	46.5	0.6	1.0	44.9	-1.6
Monthly					
Residential Area A (H3)	42.3	0.5	1.0	42.5	0.2
Residential Area B (H1)	42.2	1.3	2.5	43.3	1.1
Residential Area C (H5)	42.7	0.6	1.2	43.0	0.3
Residential Area D (new homes)	43.5	0.2	0.5	43.0	-0.5
Residential Area E (accommodation blocks (H8)	43.4	0.4	0.8	43.0	-0.4
Military Barracks	42.7	0.3	0.7	42.5	-0.1
Sirdarya TPP (H2)	42.0	0.6	1.1	42.6	0.6
H4	42.3	0.3	0.5	42.4	0.1
H6	43.3	0.3	0.5	43.0	-0.4
H7	43.2	0.3	0.7	43.0	-0.2
H9	42.5	0.1	0.1	42.3	-0.2
H10	42.6	0.1	0.2	42.4	-0.2
H11	42.5	0.1	0.2	42.4	-0.2
H12	42.7	0.2	0.4	42.6	-0.2
H18	42.9	0.4	0.8	42.7	-0.3

Receptor	Baseline (including existing TPP)	PC	PC as % of Standard	PEC (including retained TPP)	Overall Impact (PEC – Baseline)
H19	43.0	0.5	0.9	42.8	-0.2
H27	42.5	0.7	1.5	42.8	0.4
H34	44.1	0.2	0.3	43.2	-0.8
H35	43.1	0.1	0.3	42.7	-0.4
H36	43.0	0.2	0.3	42.6	-0.4
1-Hour Standard	85				
24-Hour Standard	60				
Monthly Standard	50				

5.10 The results indicate that there will be no exceedances of the most stringent hourly, 24-hour or monthly mean NO_2 standards which are the Uzbekistan MPC standards of 85, 60 and 50$\mu g/m^3$ respectively within the nearby sensitive areas when the proposed plant is operational.

5.11 The greatest impacts on hourly mean NO_2 concentrations are 33.7 and 33.5$\mu g/m^3$ predicted at receptors H18 and H19 which are located in Bekobad over 8km to the east of the Site. The terrain at these locations is approximately 130m higher than at the location of the Site. The elevated terrain may account for the higher concentrations. At the remaining receptors the greatest impact is predicted to be 24.0$\mu g/m^3$ at Residential Area C which is located to the east of the Site. At six of the nearby sensitive receptors (Residential Areas A, B and C, the Military Barracks and receptors H18 and H19) the impact on hourly mean NO_2 concentrations is greater than 10% of the relevant standard and therefore cannot be considered to be an insignificant impact. It should be noted however that the results indicate that at all of the nearby sensitive residential receptors and at the Military Barracks, the overall predicted PECs will be reduced compared to current levels and therefore the overall impact will be beneficial.

5.12 Further modelling has been undertaken to investigate the number of instances in a year that the predicted hourly PCs will exceed the significance criteria of 10% of the relevant standard. At the receptors with the highest PCs (Residential Area C, H18 and H19) the PCs are predicted to exceed 10% of the relevant standard for 23, 31 and 40 hours respectively in the worst-case year which equates to 0.3, 0.4 and 0.5% of the year.

5.13 The greatest impact of 24-hour mean NO_2 concentrations as a result of the proposed plant when operating in combined cycle mode are predicted at Residential Area C which is located to the east of the Site. The impact at all of the sensitive receptors is less than 10% of the relevant standard

and therefore considered to be insignificant in accordance with the significance criteria. At the majority of sensitive receptors, the overall predicted PECs will be reduced compared to current levels and therefore the overall impact will be beneficial.

5.14 The greatest impact on monthly mean NO_2 concentrations is predicted at Residential Area B which is located to the west of the Site. At this and all the other sensitive receptors close to the Site, the impact is less than 10% of the relevant standard and therefore is considered to be insignificant in accordance with the significance criteria.

5.15 With regards to the future exposure within the Site itself, the greatest predicted hourly, 24 hour and monthly mean NO_2 PEC concentrations are 78.1, 43.9 and 42.5 $\mu g/m^3$ respectively which are all below the relevant standards.

5.16 Within the Sirdarya TPP site, the predicted concentrations as a result of the emissions from the TPP are low. This is likely to be due to the height of the stacks. The stacks within the TPP are 180 and 320m tall, the emissions arising from theses stacks will therefore be dispersed some distance from the TPP site.

5.1 The predicted short-term NO_2 PC concentrations are also presented as contour plots in Figures 5.2, 5.3 and 5.4.

Figure 5.2: Predicted Maximum 1-Hour Mean NO_2 PC Concentrations ($\mu g\ m^{-3}$)

Figure 5.3: Predicted Maximum 24-Hour Mean NO_2 PC Concentrations ($\mu g\ m^{-3}$)

Figure 5.4: Predicted Maximum Monthly Mean NO_2 PC Concentrations ($\mu g\ m^{-3}$)

Nitrogen Oxide (NO)

5.2 The maximum predicted ground-level annual NO concentrations at the nearest identified sensitive receptor locations are presented in Table 5.3, full results are presented in **Appendix C**.

Table 5.3: Maximum Predicted Long Term (Annual) NO Concentrations – Combined Cycle (μg/m³)

Receptor	Baseline (including existing TPP)	PC	PC as % of Standard	PEC (including retained TPP)	Overall Impact (PEC – Baseline)
Residential Area A (H3)	17.2	0.5	1.2	17.6	0.4
Residential Area B (H1)	17.2	0.6	1.6	17.7	0.5
Residential Area C (H5)	17.5	0.4	1.1	17.6	0.2
Residential Area D (new homes)	17.8	0.2	0.5	17.6	-0.2
Residential Area E (accommodation blocks (H8)	17.8	0.3	0.9	17.7	-0.1
H4	17.2	0.2	0.6	17.5	0.1
H6	17.8	0.3	0.7	17.3	-0.1
H7	17.7	0.3	0.8	17.7	-0.1
H9	17.3	0.0	0.1	17.7	-0.1
H10	17.4	0.1	0.1	17.2	-0.1
H11	17.4	0.1	0.2	17.2	-0.1
H12	17.5	0.1	0.4	17.3	-0.1
H18	17.9	0.3	0.8	17.8	-0.2
H19	18.0	0.3	0.8	17.8	-0.2
H27	17.4	0.5	1.3	17.6	0.3
H34	18.1	0.2	0.4	17.7	-0.4
H35	17.7	0.1	0.3	17.5	-0.2
H36	18.0	0.1	0.3	17.7	-0.3
Standard	60				

5.3 The results indicate that there will be no exceedances of the relevant annual mean NO standard which is the Uzbekistan MPC of 60μg/m³ within the nearby residential areas.

5.4 The greatest impact in annual mean NO concentrations as a result of the proposed plant when operating in combined cycle mode will be a PC of 0.6μg/m³ predicted at Residential Area B which is located close to the west boundary of the Site. At this and three other nearby sensitive receptors (Residential Areas A, C and H27) the impact is greater than 1% of the standard. However, at all the selected locations within the study area, the predicted PEC is less than 70% of the relevant standard, therefore the impact is considered to be insignificant in accordance with the significance

criteria. It should also be noted that a worst-case assessment has been undertaken with regards to NO assuming no conversion to NO_2.

5.5 A contour plot showing the annual mean NO PC across the study area is shown in Figure 5.5 below.

Figure 5.5: Predicted Maximum Annual Mean NO PC Concentrations ($\mu g\ m^{-3}$)

5.6 The maximum predicted ground-level short-term NO concentrations at the identified sensitive receptor locations are presented in Table 5.4.

Table 5.4: Maximum Predicted Short-Term (1 Hour, 24 Hour and Monthly) NO Concentrations – Combined Cycle (μg/m³)

Receptor	Baseline (including existing TPP)	PC	PC as % of Standard	PEC (including retained TPP)	Overall Impact (PEC – Baseline)
1-Hour					
Residential Area A (H3)	110.0	26.3	4.4	82.3	-27.7
Residential Area B (H1)	110.6	27.2	4.5	92.2	-18.4
Residential Area C (H5)	112.7	44.8	7.5	84.6	-28.1
Residential Area D (new homes)	125.4	12.4	2.1	91.4	-34.0
Residential Area E (accommodation blocks (H8)	119.0	13.1	2.2	87.1	-31.9
Military Barracks	132.8	21.0	3.5	97.1	-35.7
Sirdarya TPP (H2)	35.4	13.2	2.2	47.2	11.8
H4	105.7	9.9	1.7	78.1	-27.6
H6	115.0	11.1	1.8	80.8	-34.2
H7	106.9	10.5	1.7	77.5	-29.5
H9	103.4	10.2	1.7	84.1	-19.3
H10	97.4	10.2	1.7	80.2	-17.2
H11	91.9	12.2	2.0	74.8	-17.1
H12	106.3	12.8	2.1	82.7	-23.6
H18	94.1	62.8	10.5	96.8	2.7
H19	92.5	62.5	10.4	96.5	4.0
H27	127.8	15.4	2.6	100.0	-27.8
H34	119.3	8.3	1.4	91.5	-27.8
H35	113.8	12.5	2.1	80.7	-33.1
H36	114.0	10.7	1.8	86.2	-27.8
24-Hour					
Residential Area A (H3)	38.8	3.8	1.5	38.2	-0.7
Residential Area B (H1)	37.4	8.3	3.3	42.3	4.9
Residential Area C (H5)	42.2	9.0	3.6	43.0	0.8
Residential Area D (new homes)	46.3	2.2	0.9	40.3	-6.0
Residential Area E (accommodation blocks (H8)	46.3	3.6	1.4	40.6	-5.7
Military Barracks	42.0	2.1	0.9	38.1	-3.9
Sirdarya TPP (H2)	34.3	4.5	1.8	38.5	4.2

Receptor	Baseline (including existing TPP)	PC	PC as % of Standard	PEC (including retained TPP)	Overall Impact (PEC – Baseline)
H4	38.7	2.0	0.8	37.9	-0.9
H6	45.1	2.5	1.0	40.9	-4.3
H7	45.1	3.0	1.2	40.5	-4.6
H9	41.5	0.9	0.4	38.9	-2.5
H10	40.3	1.2	0.5	38.5	-1.8
H11	42.4	1.6	0.7	39.8	-2.7
H12	43.8	2.8	1.1	41.0	-2.8
H18	44.4	6.2	2.5	42.0	-2.4
H19	44.8	8.6	3.4	44.4	-0.4
H27	39.6	3.9	1.6	37.9	-1.7
H34	45.3	0.9	0.4	40.7	-4.5
H35	42.2	1.1	0.4	38.8	-3.4
H36	42.4	1.1	0.4	39.5	-3.0
Monthly					
Residential Area A (H3)	34.6	0.9	0.8	35.0	0.4
Residential Area B (H1)	34.3	2.4	2.0	36.4	2.1
Residential Area C (H5)	35.3	1.1	1.0	35.8	0.6
Residential Area D (new homes)	36.8	0.4	0.4	35.9	-0.9
Residential Area E (accommodation blocks (H8)	36.6	0.7	0.6	35.9	-0.7
Military Barracks	35.3	0.6	0.5	35.0	-0.3
Sirdarya TPP (H2)	34.0	1.0	0.9	35.0	1.0
H4	34.6	0.5	0.4	34.7	0.1
H6	36.5	0.5	0.4	35.8	-0.7
H7	36.3	0.6	0.5	35.8	-0.5
H9	34.9	0.1	0.1	34.6	-0.3
H10	35.1	0.2	0.1	34.7	-0.3
H11	35.0	0.2	0.1	34.7	-0.3
H12	35.4	0.3	0.3	35.1	-0.3
H18	35.7	0.7	0.6	35.3	-0.5
H19	35.8	0.8	0.7	35.4	-0.4
H27	34.8	1.4	1.1	35.5	0.7
H34	37.9	0.3	0.2	36.3	-1.6

Receptor	Baseline (including existing TPP)	PC	PC as % of Standard	PEC (including retained TPP)	Overall Impact (PEC – Baseline)
H35	36.0	0.3	0.2	35.3	-0.7
H36	35.8	0.3	0.3	35.2	-0.7
1-Hour Standard	600				
24-Hour Standard	250				
Monthly Standard	120				

5.7 The results indicate that there will be no exceedances of the relevant hourly, 24-hour or monthly mean NO standards which are the Uzbekistan MPC standards of 600, 250 and 120μg/m^3 respectively at the nearby sensitive areas.

5.8 The greatest impacts on hourly mean NO concentrations are 62.8 and 62.5μg/m^3 predicted at receptors H18 and H19 which are located in Bekobad over 8km to the east of the Site. As discussed above for hourly mean NO_2, this may to be due to the elevated terrain at these locations. At the remaining receptors the greatest impact is predicted to be 44.8μg/m^3 at Residential Area C which is located to the east of the Site. The impacts at all of the sensitive receptors with the exception of H18 and H19 is less than 10% of the relevant standard and therefore are considered to be insignificant. The impacts at receptors H18 and H19 are only marginally greater than 10% of the relevant standard. It should be noted that in order to assess the NO, no conversion of NO to NO_2 is assumed, which provides an overestimation with regards to NO concentrations. It should also be noted that the results indicate that at all of the nearby sensitive residential receptors (except H18 and H19) and at the Military Barracks, the overall predicted PECs will be reduced compared to current levels and therefore the overall impact will be beneficial.

5.9 The greatest impact on 24-hour mean NO concentrations as a result of the proposed plant when operating in combined cycle mode is predicted at Residential Area C which is located to the east of the Site. The impact on 24 hourly mean NO concentrations at all of the sensitive receptors is less than 10% of the relevant standard and therefore considered to be insignificant in accordance with the significance criteria. At the majority of all of the nearby sensitive residential receptors and within the Military Barracks the overall predicted PECs will be reduced compared to current levels and therefore the overall impact will be beneficial.

5.10 The greatest impact on monthly mean NO concentrations is predicted at Residential Area B which is located to the west of the Site. At this and all the other sensitive receptors close to the Site, the impact is less than 10% of the relevant standard and therefore is considered to be

insignificant in accordance with the significance criteria. At the majority of sensitive receptors, the overall impact when also considering the impact of the upgraded plant at the Sirdarya TPP will be beneficial.

5.11 With regards to the future exposure within the Site itself, the greatest predicted hourly, 24 hour and monthly mean NO PEC concentrations are 101.3, 37.6 and 34.9 $\mu g/m^3$ respectively which are all below the relevant standards.

5.12 The predicted short-term NO PC concentrations are also presented as contour plots in Figures 5.6, 5.7 and 5.8.

Figure 5.6: Predicted Maximum 1-Hour Mean NO PC Concentrations ($\mu g\ m^{-3}$)

Figure 5.7: Predicted Maximum 24-Hour Mean NO PC Concentrations (μg m^{-3})

Figure 5.8: Predicted Maximum Monthly Mean NO PC Concentrations (μg m^{-3})

Carbon Monoxide (CO)

5.13 The maximum predicted ground-level annual CO concentrations at the nearest identified sensitive receptor locations are presented in Table 5.5, full results are presented in **Appendix C**.

Table 5.5: Maximum Predicted Long Term (Annual) CO Concentrations – Combined Cycle (μg/m³)

Receptor	Baseline (including existing TPP)	PC	PC as % of Standard	PEC (including retained TPP)	Overall Impact (PEC – Baseline)
Residential Area A (H3)	2200.01	0.7	0.02	2200.75	0.7
Residential Area B (H1)	2200.01	1.0	0.03	2200.99	1.0
Residential Area C (H5)	2200.02	0.7	0.02	2200.69	0.7
Residential Area D (new homes)	2200.03	0.3	0.01	2200.33	0.3
Residential Area E (accommodation blocks (H8)	2200.03	0.5	0.02	2200.54	0.5
H4	2200.01	0.4	0.01	2200.38	0.4
H6	2200.03	0.4	0.01	2200.45	0.4
H7	2200.03	0.5	0.01	2200.51	0.5
H9	2200.01	0.1	0.02	2200.07	0.1
H10	2200.01	0.1	0.00	2200.09	0.1
H11	2200.02	0.1	0.00	2200.14	0.1
H12	2200.02	0.2	0.00	2200.23	0.2
H18	2200.03	0.5	0.02	2200.48	0.4
H19	2200.04	0.5	0.02	2200.51	0.5
H27	2200.01	0.8	0.03	2200.79	0.8
H34	2200.04	0.2	0.01	2200.25	0.2
H35	2200.03	0.2	0.01	2200.19	0.2
H36	2200.04	0.2	0.01	2200.22	0.2
Standard	3000				

5.14 The results indicate that there will be no exceedances of the relevant annual mean CO standard (which the Uzbekistan MPC of 3000μg/m³) within the nearby residential areas.

5.15 The greatest impact in annual mean CO concentrations as a result of the proposed plant when operating in combined cycle mode will be a PC of 1.0μg/m³ predicted at Residential Area B which is located close to the west boundary of the Site. This is less than 1% of the standard. Therefore, the impact is considered to be insignificant in accordance with the significance criteria.

5.16 A contour plot showing the annual mean CO PC across the study area is shown in Figure 5.9 below.

Figure 5.9: Predicted Maximum Annual Mean CO PC Concentrations (μg m^{-3})

5.17 The maximum predicted ground-level short term CO concentrations at the identified sensitive receptor locations are presented in Table 5.6.

Table 5.6: Maximum Predicted Short-Term (Hourly, 8 Hour, 24 Hour and Monthly) CO Concentrations – Combined Cycle (μg/m^3)

Receptor	Baseline (including existing TPP)	PC	PC as % of Standard	PEC (including retained TPP)	Overall Impact (PEC – Baseline)
1-Hour					

Receptor	Baseline (including existing TPP)	PC	PC as % of Standard	PEC (including retained TPP)	Overall Impact (PEC – Baseline)
Residential Area A (H3)	4402.7	40.4	0.1	4440.4	37.6
Residential Area B (H1)	4402.3	41.6	0.1	4441.7	39.4
Residential Area C (H5)	4402.6	68.6	0.2	4468.6	66.0
Residential Area D (new homes)	4402.8	19.0	0.1	4419.0	16.1
Residential Area E (accommodation blocks (H8)	4402.7	20.1	0.1	4419.6	16.9
Military Barracks	4402.8	32.2	0.1	4432.2	29.4
Sirdarya TPP (H2)	4400.1	20.2	0.1	4420.2	20.1
H4	4402.4	15.2	0.1	4415.2	12.8
H6	4403.0	16.9	0.1	4417.0	14.0
H7	4402.7	16.1	0.1	4416.1	13.4
H9	4402.6	15.7	0.1	4416.1	13.5
H10	4402.4	15.6	0.1	4416.0	13.6
H11	4401.9	18.7	0.1	4418.7	16.8
H12	4402.7	19.6	0.1	4419.7	17.0
H18	4402.2	96.3	0.3	4496.3	94.1
H19	4402.2	95.8	0.3	4495.8	93.6
H27	4402.7	23.6	0.1	4423.6	21.0
H34	4403.2	12.7	0.0	4412.8	9.6
H35	4403.0	19.1	0.1	4419.4	16.4
H36	4403.0	16.4	0.1	4416.4	13.4
8-Hour					
Residential Area A (H3)	4400.5	13.8	0.1	4413.9	13.4
Residential Area B (H1)	4400.4	18.7	0.2	4418.7	18.2
Residential Area C (H5)	4400.7	26.7	0.3	4426.7	26.0
Residential Area D (new homes)	4400.7	8.6	0.1	4408.6	7.9
Residential Area E (accommodation blocks (H8)	4400.9	9.5	0.1	4409.6	8.7
Military Barracks	4400.5	7.7	0.1	4407.7	7.2
Sirdarya TPP (H2)	4400.0	11.8	0.1	4411.8	11.8
H4	4400.4	7.0	0.1	4407.0	6.5
H6	4400.8	6.3	0.1	4406.4	5.6

Receptor	Baseline (including existing TPP)	PC	PC as % of Standard	PEC (including retained TPP)	Overall Impact (PEC – Baseline)
H7	4400.8	7.8	0.1	4407.8	7.0
H9	4400.6	2.5	0.0	4402.8	2.2
H10	4400.6	4.0	0.0	4404.3	3.7
H11	4400.7	5.2	0.1	4405.6	4.8
H12	4400.6	6.5	0.1	4406.6	6.0
H18	4400.7	16.4	0.2	4416.4	15.6
H19	4400.8	24.0	0.2	4424.0	23.2
H27	4400.6	13.0	0.1	4413.0	12.4
H34	4401.1	3.5	0.0	4403.6	2.9
H35	4401.2	3.9	0.0	4403.9	3.3
H36	4400.8	4.2	0.0	4404.2	3.5
24-Hour					
Residential Area A (H3)	4400.2	5.8	0.1	4404.6	4.4
Residential Area B (H1)	4400.1	12.7	0.3	4412.7	12.6
Residential Area C (H5)	4400.3	13.8	0.3	4413.8	13.5
Residential Area D (new homes)	4400.4	3.4	0.1	4403.4	3.0
Residential Area E (accommodation blocks (H8)	4400.5	5.5	0.1	4405.5	5.0
Military Barracks	4400.3	3.3	0.1	4403.3	3.0
Sirdarya TPP (H2)	4400.0	6.9	0.2	4406.9	6.9
H4	4400.2	3.1	0.1	4403.1	2.9
H6	4400.4	3.8	0.1	4403.8	3.4
H7	4400.4	4.6	0.1	4404.6	4.2
H9	4400.3	1.4	0.0	4401.6	1.3
H10	4400.2	1.9	0.0	4402.0	1.8
H11	4400.3	2.5	0.1	4402.6	2.3
H12	4400.4	4.3	0.1	4404.4	4.1
H18	4400.4	9.6	0.2	4409.6	9.2
H19	4400.4	13.1	0.3	4413.2	12.8
H27	4400.2	6.0	0.1	4406.0	5.7
H34	4400.4	1.3	0.0	4401.5	1.0
H35	4400.3	1.7	0.0	4401.7	1.4
H36	4400.3	1.7	0.0	4401.8	1.5

Receptor	Baseline (including existing TPP)	PC	PC as % of Standard	PEC (including retained TPP)	Overall Impact (PEC – Baseline)
Monthly					
Residential Area A (H3)	4400.02	1.4	0.04	4401.44	1.4
Residential Area B (H1)	4400.01	3.6	0.10	4403.63	3.6
Residential Area C (H5)	4400.05	1.7	0.05	4401.77	1.7
Residential Area D (new homes)	4400.10	0.7	0.02	4400.73	0.6
Residential Area E (accommodation blocks (H8)	4400.10	1.1	0.03	4401.15	1.1
Military Barracks	4400.05	1.0	0.03	4400.99	0.9
Sirdarya TPP (H2)	4400.00	1.6	0.05	4401.58	1.6
H4	4400.02	0.7	0.02	4400.74	0.7
H6	4400.09	0.8	0.02	4400.82	0.7
H7	4400.09	0.9	0.03	4400.99	0.9
H9	4400.04	0.2	0.01	4400.20	0.2
H10	4400.04	0.3	0.01	4400.27	0.2
H11	4400.04	0.3	0.01	4400.28	0.2
H12	4400.05	0.5	0.02	4400.55	0.5
H18	4400.06	1.1	0.03	4401.12	1.1
H19	4400.07	1.3	0.04	4401.32	1.3
H27	4400.03	2.1	0.06	4402.08	2.1
H34	4400.14	0.4	0.01	4400.49	0.3
H35	4400.07	0.4	0.01	4400.46	0.4
H36	4400.07	0.5	0.01	4400.49	0.4
1-Hour Standard	5000				
8-Hour Standard	10000				
24-Hour Standard	4000				
Monthly Standard	3500				

5.18 The most stringent standard for hourly mean CO is the Uzbekistan MPC of 5000μg/m^3. The results indicate that there will be no exceedances of this standard within the nearby sensitive areas. The impact of the emissions arising from the proposed plant when operating in combined cycle mode will be less than 10% of the relevant standard, therefore the impact on hourly mean CO concentrations is considered to be insignificant.

5.19 The 8 hour mean CO standard is the EU standard and WHO guideline of 10,000μg/m^3. The results indicate that there will be no exceedances of this standard and the impact will be less than 10% of the standard, therefore the impact on 8-hour mean CO concentrations is considered to be insignificant.

5.20 The 24-hour mean and monthly mean CO standards are the Uzbekistan MPCs of 4000μg/m^3 and 3500μg/m^3 respectively. The results indicate that these standards are likely to be breached across the study area, however this is due to the high background concentration assumed for the area. The impact of the emissions from the proposed plant when operating in combined cycle mode will be less than 10% of the respective standards, therefore the impact on 24-hour mean and monthly mean CO concentrations is considered to be insignificant.

5.21 With regards to the future exposure within the Site itself, the greatest predicted hourly and 8 hour mean CO PEC concentrations are 4424.2 and 4407.2 μg/m^3 respectively which are below the relevant standards. The greatest predicted 24 hour and monthly mean CO PEC concentrations within the Site itself are predicted to be 4403.2 and 4400.9 μg/m^3 respectively which are above the relevant standards. However, it should be noted that a worst-case assessment has been undertaken with regards to the background concentrations used in the assessment. The contribution from the proposed plant is very small in comparison to the background concentration.

5.22 The predicted CO PC concentrations are also presented as contour plots in Figures 5.10, 5.11 5.12 and 5.13.

Figure 5.10: Predicted Maximum 1-Hour Mean CO PC Concentrations (μg m^{-3})

Figure 5.11: Predicted Maximum 8-Hour Mean CO PC Concentrations (μg m^{-3})

Figure 5.12: Predicted Maximum 24-Hour Mean CO PC Concentrations (μg m^{-3})

Figure 5.13: Predicted Maximum Monthly Mean CO PC Concentrations (μg m^{-3})

Ammonia (NH_3)

5.23 The maximum predicted annual NH_3 PC concentrations arising from the proposed plant at the nearest identified sensitive receptor locations are presented in Table 5.7, full results are presented in **Appendix C**.

Table 5.7: Maximum Predicted Long Term (Annual) NH_3 PC Concentrations – Combined Cycle ($\mu g/m^3$)

Receptor	PC	PC as % of Standard
Residential Area A (H3)	0.03	0.09
Residential Area B (H1)	0.05	0.12
Residential Area C (H5)	0.03	0.08
Residential Area D (new homes)	0.01	0.04
Residential Area E (accommodation blocks (H8)	0.02	0.06
H4	0.02	0.04
H6	0.02	0.05
H7	0.02	0.06
H9	0.00	0.01
H10	0.00	0.01
H11	0.01	0.02
H12	0.01	0.03
H18	0.02	0.05
H19	0.02	0.06
H27	0.04	0.09
H34	0.01	0.03
H35	0.01	0.02
H36	0.01	0.02
Standard	40	

5.24 The annual mean NH_3 standard is the Uzbekistan MPC of 40$\mu g/m^3$. The predicted PC concentrations arising from the proposed plant are well below this standard. Although no NH_3 ambient monitoring data was available in order to establish a likely background concentration it is considered unlikely that there would be any breaches of this standard in the vicinity of the Site.

5.25 The greatest impact in annual mean NH_3 concentrations as a result of the proposed plant when operating in combined cycle mode will be a PC of 0.05$\mu g/m^3$ predicted at Residential Area B which is located close to the west boundary of the Site. The impact is less than 1% of the standard, therefore the impact is considered to be insignificant in accordance with the significance criteria.

5.26 A contour plot showing the annual mean NH_3 PC across the study area is shown in Figure 5.14 below.

Figure 5.14: Predicted Maximum Annual Mean NH_3 PC Concentrations ($\mu g\ m^{-3}$)

5.27 The maximum predicted short-term NH_3 PC concentrations at the identified sensitive receptor locations are presented in Table 5.8.

Table 5.8: Maximum Predicted Short-Term (1 Hour, 24 Hour and Monthly) NH_3 Concentrations – Combined Cycle ($\mu g/m^3$)

Receptor	PC	PC as % of Standard
1-Hour		
Residential Area A (H3)	1.9	0.9
Residential Area B (H1)	1.9	1.0
Residential Area C (H5)	3.2	1.6
Residential Area D (new homes)	0.9	0.4
Residential Area E (accommodation blocks (H8)	0.9	0.5

Receptor	PC	PC as % of Standard
Military Barracks	1.5	0.8
Sirdarya TPP (H2)	0.9	0.5
H4	0.7	0.4
H6	0.8	0.4
H7	0.7	0.4
H9	0.7	0.4
H10	0.7	0.4
H11	0.9	0.4
H12	0.9	0.5
H18	4.5	2.2
H19	4.5	2.2
H27	1.1	0.6
H34	0.6	0.3
H35	0.9	0.4
H36	0.8	0.4
24-Hour		
Residential Area A (H3)	0.3	0.2
Residential Area B (H1)	0.6	0.5
Residential Area C (H5)	0.6	0.5
Residential Area D (new homes)	0.2	0.1
Residential Area E (accommodation blocks (H8)	0.3	0.2
Military Barracks	0.2	0.1
Sirdarya TPP (H2)	0.3	0.3
H4	0.1	0.1
H6	0.2	0.1
H7	0.2	0.2
H9	0.1	0.1
H10	0.1	0.1
H11	0.1	0.1
H12	0.2	0.2
H18	0.4	0.4
H19	0.6	0.5
H27	0.3	0.2
H34	0.1	0.1
H35	0.1	0.1
H36	0.1	0.1

Receptor	PC	PC as % of Standard
Monthly		
Residential Area A (H3)	0.07	0.11
Residential Area B (H1)	0.17	0.28
Residential Area C (H5)	0.08	0.14
Residential Area D (new homes)	0.03	0.05
Residential Area E (accommodation blocks (H8)	0.05	0.09
Military Barracks	0.05	0.08
Sirdarya TPP (H2)	0.07	0.12
H4	0.03	0.06
H6	0.04	0.06
H7	0.04	0.07
H9	0.01	0.01
H10	0.01	0.02
H11	0.01	0.02
H12	0.02	0.04
H18	0.05	0.09
H19	0.06	0.10
H27	0.10	0.16
H34	0.02	0.03
H35	0.02	0.03
H36	0.02	0.04
1-Hour Standard	200	
24-Hour Standard	120	
Monthly Standard	60	

5.28 The hourly, 24-hour and monthly mean NH_3 standards are the Uzbekistan MPC standards of 200, 120 and 60$\mu g/m^3$. The predicted hourly, 24-hour and monthly mean PC concentrations arising from the proposed plant are well below these standards. Although no NH_3 ambient monitoring data was available in order to establish a likely background concentration it is considered unlikely that there would be any breaches of these standards in the vicinity of the Site.

5.29 The greatest impact on hourly mean NH_3 concentrations was 4.5$\mu g/m^3$ predicted at receptors H18 and H19 which are located in Bekobad over 8km to the east of the Site. As discussed above for hourly mean concentrations of the other pollutants considered, this may be due to the elevated terrain at these locations. At the remaining receptors the greatest impact is predicted to be 3.2$\mu g/m^3$ at Residential Area C which is located to the east of the Site. The impacts at all of the sensitive

receptors are less than 10% of the relevant standard and therefore are considered to be insignificant in accordance with the significance criteria.

5.30 The greatest impact on 24-hour mean NH_3 concentrations as a result of the proposed plant when operating in combined cycle mode is predicted at Residential Area C which is located to the east of the Site. The impacts on 24 hourly mean NH_3 concentrations at all of the sensitive residential receptors are less than 10% of the relevant standard and therefore considered to be insignificant in accordance with the significance criteria.

5.31 The greatest impact on monthly mean NH_3 concentrations is predicted at Residential Area B which is located to the west of the Site. At this and all the other sensitive receptors close to the Site, the impacts are less than 10% of the relevant standard and therefore considered to be insignificant in accordance with the significance criteria.

5.32 The future exposure within the Site itself cannot be determined as there is no available ambient monitoring to establish the background concentration, however the greatest predicted hourly, 24 hour and monthly mean NH_3 PC concentrations with the Site as a result of the Project operating in combined cycle mode are 1.1, 0.2 and 0.04 $\mu g/m^3$ respectively which are all below the relevant standards.

5.33 The predicted short-term NH_3 PC concentrations are also presented as contour plots in Figures 5.15, 5.16 and 5.17.

Figure 5.15: Predicted Maximum 1-Hour Mean NH_3 PC Concentrations ($\mu g\ m^{-3}$)

Figure 5.16: Predicted Maximum 24-Hour Mean NH_3 PC Concentrations ($\mu g\ m^{-3}$)

Figure 5.17: Predicted Maximum Monthly Mean NH_3 PC Concentrations ($\mu g\ m^{-3}$)

Scenario Two (Simple Cycle)

Nitrogen Dioxide (NO_2)

5.34 The maximum predicted ground-level NO_2 concentrations at the identified sensitive receptor locations during periods of time when the Heat Recovery Steam Generators (HRSG) are not operational and the proposed plant is operating in Simple Cycle mode are presented in Table 5.9. It is envisaged that the simple cycle mode would be used for short periods of time only, therefore only the hourly and 24-hour results are presented.

Table 5.9: Maximum Predicted Short-Term (1 Hour and 24 Hour) NO_2 Concentrations – Simple Cycle (μg/m³)

Receptor	Baseline (including existing TPP)	PC	PC as % of Standard	PEC (including retained TPP)	Overall Impact (PEC – Baseline)
1-Hour					
Residential Area A (H3)	82.8	1.8	2.1	69.0	-13.8
Residential Area B (H1)	83.1	3.1	3.6	68.8	-14.4
Residential Area C (H5)	84.2	1.4	1.7	64.5	-19.7
Residential Area D (new homes)	91.0	1.6	1.9	69.4	-21.7
Residential Area E (accommodation blocks (H8)	87.6	1.6	1.9	66.7	-20.9
Military Barracks	95.0	1.6	1.9	73.9	-21.2
Sirdarya TPP (H2)	42.7	1.7	2.0	43.7	1.0
H4	80.5	1.6	1.9	64.0	-16.4
H6	85.5	1.4	1.6	66.4	-19.1
H7	81.1	1.5	1.8	64.2	-16.9
H9	79.3	1.6	1.9	66.8	-12.4
H10	76.0	1.6	1.9	64.7	-11.4
H11	73.1	1.3	1.5	61.3	-11.8
H12	80.8	1.5	1.8	65.8	-15.0
H18	74.3	3.2	3.8	60.3	-13.9
H19	73.4	3.3	3.8	60.1	-13.3
H27	92.3	1.7	2.0	75.8	-16.6
H34	87.8	1.6	1.8	71.4	-16.4
H35	84.8	1.5	1.7	66.2	-18.6
H36	84.9	1.7	2.0	69.3	-15.6
24-Hour					
Residential Area A (H3)	44.6	0.3	0.5	43.6	-1.0
Residential Area B (H1)	43.8	0.7	1.1	43.2	-0.6
Residential Area C (H5)	46.4	0.4	0.7	44.1	-2.3
Residential Area D (new homes)	48.6	0.0	0.0	45.5	-3.1
Residential Area E (accommodation blocks (H8)	48.6	0.3	0.5	45.3	-3.2
Military Barracks	46.3	0.1	0.2	43.6	-2.7
Sirdarya TPP (H2)	42.0	0.4	0.6	42.4	0.3

Receptor	Baseline (including existing TPP)	PC	PC as % of Standard	PEC (including retained TPP)	Overall Impact (PEC – Baseline)
H4	44.5	0.2	0.3	43.5	-1.0
H6	48.0	0.2	0.4	45.2	-2.8
H7	48.0	0.3	0.4	45.2	-2.8
H9	46.0	0.2	0.3	44.3	-1.7
H10	45.4	0.2	0.3	43.9	-1.4
H11	46.5	0.2	0.3	44.5	-2.0
H12	47.3	0.3	0.4	44.9	-2.3
H18	47.6	0.4	0.6	45.2	-2.4
H19	47.8	0.5	0.8	45.3	-2.5
H27	45.0	0.4	0.6	43.7	-1.3
H34	48.1	0.2	0.3	45.4	-2.6
H35	46.4	0.2	0.3	44.5	-1.9
H36	46.5	0.2	0.3	44.7	-1.9
1-Hour Standard	85				
24-Hour Standard	60				

5.35 The results indicate that there will be no exceedances of the most stringent hourly and 24-hour mean NO_2 standards which are the Uzbekistan MPC standards of 85 and 60 $\mu g/m^3$ respectively within the nearby sensitive areas when the proposed plant is operating in simple cycle mode.

5.36 The predicted hourly and 24-hour NO_2 PCs arising from the proposed plant when operating in simple cycle mode will be less than 10% of the relevant standards at the nearest the sensitive receptors. The impacts are therefore considered to be insignificant in accordance with the significance criteria.

5.37 With regards to the future exposure within the Site itself, the greatest predicted hourly and 24 hour mean NO_2 PEC concentrations are 74.5 and 43.7 $\mu g/m^3$ respectively which are below the relevant standards.

Nitrogen Oxide (NO)

5.38 The maximum predicted ground-level NO concentrations at the identified sensitive receptor locations during periods of time the proposed plant is operating in Simple Cycle mode are presented in Table 5.10.

Table 5.10: Maximum Predicted Short-Term (1 Hour and 24 Hour) NO Concentrations – Simple Cycle (μg/m³)

Receptor	Baseline (including existing TPP)	PC	PC as % of Standard	PEC (including retained TPP)	Overall Impact (PEC – Baseline)
1-Hour					
Residential Area A (H3)	110.0	3.3	0.6	84.3	-25.6
Residential Area B (H1)	110.6	5.7	1.0	83.9	-26.8
Residential Area C (H5)	112.7	2.6	0.4	75.9	-36.8
Residential Area D (new homes)	125.4	3.0	0.5	85.0	-40.4
Residential Area E (accommodation blocks (H8)	119.0	3.0	0.5	79.9	-39.0
Military Barracks	132.8	3.1	0.5	93.4	-39.4
Sirdarya TPP (H2)	35.4	3.1	0.5	37.2	1.8
H4	105.7	3.0	0.5	75.1	-30.6
H6	115.0	2.6	0.4	79.4	-35.6
H7	106.9	2.9	0.5	75.4	-31.5
H9	103.4	3.0	0.5	80.3	-23.2
H10	97.4	3.0	0.5	76.2	-21.2
H11	91.9	2.3	0.4	69.9	-22.0
H12	106.3	2.8	0.5	78.4	-27.9
H18	94.1	6.0	1.0	68.2	-25.9
H19	92.5	6.1	1.0	67.8	-24.7
H27	127.8	3.2	0.5	96.9	-30.9
H34	119.3	2.9	0.5	88.8	-30.5
H35	113.8	2.7	0.5	79.2	-34.6
H36	114.0	3.2	0.5	84.9	-29.1
24-Hour					
Residential Area A (H3)	38.8	0.6	0.2	37.0	-1.9
Residential Area B (H1)	37.4	1.2	0.5	36.3	-1.1
Residential Area C (H5)	42.2	0.8	0.3	38.0	-4.2

Receptor	Baseline (including existing TPP)	PC	PC as % of Standard	PEC (including retained TPP)	Overall Impact (PEC – Baseline)
Residential Area D (new homes)	46.3	0.0	0.0	40.5	-5.8
Residential Area E (accommodation blocks (H8)	46.3	0.5	0.2	40.2	-6.0
Military Barracks	42.0	0.3	0.1	37.0	-5.0
Sirdarya TPP (H2)	34.1	0.7	0.3	34.7	0.6
H4	38.7	0.3	0.1	36.8	-1.9
H6	45.1	0.4	0.2	39.9	-5.2
H7	45.1	0.5	0.2	39.9	-5.2
H9	41.5	0.3	0.1	38.3	-3.2
H10	40.3	0.3	0.1	37.6	-2.7
H11	42.4	0.4	0.1	38.6	-3.8
H12	43.8	0.5	0.2	39.5	-4.3
H18	44.4	0.7	0.3	39.9	-4.4
H19	44.8	0.9	0.4	40.1	-4.7
H27	39.6	0.7	0.3	37.1	-2.5
H34	45.3	0.3	0.1	40.4	-4.8
H35	42.2	0.3	0.1	38.6	-3.6
H36	42.4	0.3	0.1	39.0	-3.5
1-Hour Standard	600				
24-Hour Standard	250				

5.39 The results indicate that there will be no exceedances of the most stringent hourly and 24-hour mean NO standards which are the Uzbekistan MPC standards of 600 and 250 $\mu g/m^3$ respectively within the nearby sensitive areas when the proposed plant is operating in simple cycle mode.

5.40 The predicted hourly and 24-hour mean NO PCs arising from the proposed plant when operating in simple cycle mode will be less than 10% of the relevant standards at the nearest sensitive receptors. The impacts are therefore considered to be insignificant in accordance with the significance criteria.

5.41 With regards to the future exposure within the Site itself, the greatest predicted hourly and 24-hour mean NO_2 PEC concentrations are 94.5 and 37.1 $\mu g/m^3$ respectively which are below the relevant standards.

Carbon Monoxide (CO)

5.42 The maximum predicted ground-level CO concentrations at the identified sensitive receptor locations when the proposed plant is operating in Simple Cycle mode are presented in Table 5.11.

Table 5.11: Maximum Predicted Short-Term (Hourly, 8 Hour and 24 Hour) CO Concentrations – Simple Cycle ($\mu g/m^3$)

Receptor	Baseline (including existing TPP)	PC	PC as % of Standard	PEC (including retained TPP)	Overall Impact (PEC – Baseline)
1-Hour					
Residential Area A (H3)	4402.7	5.1	0.1	4406.5	3.8
Residential Area B (H1)	4402.3	8.8	0.2	4408.8	6.5
Residential Area C (H5)	4402.6	4.0	0.1	4409.0	6.4
Residential Area D (new homes)	4402.8	4.7	0.1	4406.5	3.7
Residential Area E (accommodation blocks (H8)	4402.7	4.7	0.1	4406.3	3.6
Military Barracks	4402.8	4.7	0.1	4406.8	4.0
Sirdarya TPP (H2)	4400.1	4.8	0.1	4404.8	4.7
H4	4402.4	4.5	0.1	4406.0	3.6
H6	4403.0	4.0	0.1	4405.2	2.2
H7	4402.7	4.4	0.1	4405.7	3.0
H9	4402.6	4.6	0.1	4406.2	3.6
H10	4402.4	4.5	0.1	4406.0	3.6
H11	4401.9	3.6	0.1	4404.7	2.8
H12	4402.7	4.3	0.1	4405.6	2.9
H18	4402.2	9.2	0.2	4409.2	7.0
H19	4402.2	9.3	0.2	4409.3	7.1
H27	4402.7	4.9	0.1	4406.8	4.1
H34	4403.2	4.5	0.1	4406.4	3.2
H35	4403.0	4.1	0.1	4405.3	2.3
H36	4403.0	4.9	0.1	4405.6	2.6
8-Hour					

Receptor	Baseline (including existing TPP)	PC	PC as % of Standard	PEC (including retained TPP)	Overall Impact (PEC – Baseline)
Residential Area A (H3)	4400.5	2.3	0.02	4402.3	1.8
Residential Area B (H1)	4400.4	3.1	0.03	4403.1	2.7
Residential Area C (H5)	4400.7	2.8	0.03	4402.8	2.1
Residential Area D (new homes)	4400.7	0.8	0.01	4401.1	0.3
Residential Area E (accommodation blocks (H8)	4400.9	1.7	0.02	4401.8	0.9
Military Barracks	4400.5	1.2	0.01	4401.2	0.7
Sirdarya TPP (H2)	4400.0	2.1	0.02	4402.1	2.1
H4	4400.4	1.4	0.01	4401.5	1.1
H6	4400.8	1.3	0.01	4401.5	0.7
H7	4400.8	1.5	0.01	4401.6	0.8
H9	4400.6	0.8	0.01	4401.1	0.5
H10	4400.6	1.1	0.01	4401.4	0.8
H11	4400.7	1.3	0.01	4401.7	1.0
H12	4400.6	1.6	0.02	4401.7	1.1
H18	4400.7	2.1	0.02	4402.3	1.5
H19	4400.8	2.5	0.03	4402.5	1.7
H27	4400.6	2.1	0.02	4402.1	1.5
H34	4400.7	1.0	0.01	4401.3	0.5
H35	4400.6	0.9	0.01	4401.2	0.6
H36	4400.7	1.4	0.01	4401.7	1.0
24-Hour					
Residential Area A (H3)	4400.2	0.9	0.02	4400.9	0.7
Residential Area B (H1)	4400.1	1.9	0.05	4401.9	1.8
Residential Area C (H5)	4400.3	1.2	0.03	4401.2	0.9
Residential Area D (new homes)	4400.4	0.0	0.00	4400.4	-0.1
Residential Area E (accommodation blocks (H8)	4400.5	0.8	0.02	4400.9	0.4
Military Barracks	4400.3	0.4	0.01	4400.4	0.1
Sirdarya TPP (H2)	4400.0	1.0	0.03	4401.0	1.0
H4	4400.2	0.5	0.01	4400.5	0.4
H6	4400.4	0.6	0.02	4400.7	0.3

Receptor	Baseline (including existing TPP)	PC	PC as % of Standard	PEC (including retained TPP)	Overall Impact (PEC – Baseline)
H7	4400.4	0.7	0.02	4400.8	0.4
H9	4400.3	0.5	0.01	4400.6	0.3
H10	4400.2	0.5	0.01	4400.7	0.4
H11	4400.3	0.6	0.01	4400.7	0.4
H12	4400.4	0.7	0.02	4400.8	0.5
H18	4400.4	1.1	0.03	4401.2	0.8
H19	4400.4	1.4	0.04	4401.5	1.1
H27	4400.2	1.0	0.03	4401.0	0.8
H34	4400.4	0.5	0.01	4400.7	0.3
H35	4400.3	0.4	0.01	4400.5	0.2
H36	4400.3	0.5	0.01	4400.6	0.3
1-Hour Standard	5000				
8-Hour Standard	10000				
24-Hour Standard	4000				

5.43 The most stringent standard for hourly mean CO is the Uzbekistan MPC of 5000μg/m^3. The results indicate that there will be no exceedances of this standard within the nearby sensitive areas. The impact of the emissions arising from the proposed plant when operating in simple cycle mode will be less than 10% of this standard, therefore the impact on hourly mean CO concentrations is considered to be insignificant in accordance with the significance criteria.

5.44 The results also indicate that there will be no exceedances of the 8-hour mean standard which is the EU standard and WHO guideline of 10,000μg/m^3 within the nearby sensitive areas. The impact of the emissions arising from the proposed plant when operating in simple cycle mode will be less than 10% of the standard, therefore the impact on 8-hour mean CO concentrations is considered to be insignificant in accordance with the significance criteria.

5.45 The short-term background concentration used for the modelling is in excess of the Uzbekistan MPC standard for 24-hour mean concentrations of 4000μg/m^3 in the vicinity of the Site. The predicted 24-hour concentrations at nearby sensitive receptors are therefore in exceedance of this standard. The impact of the emissions arising from the proposed plant when operating in simple cycle mode will be less than 10% of the standard, therefore the impact on 24 hour mean CO concentrations is also considered to be insignificant.

5.46 With regards to the future exposure within the Site itself, the greatest predicted hourly, 8 hour and 24-hour mean CO PEC concentrations are 4403.7, 4401.3 and 4400.6 μg/m^3 respectively. The predicted hourly and 8 hour mean concentrations within the Site are below the relevant standards. The predicted 24 hour mean CO PEC within the Site are above the relevant standard, however it should be noted that a worst-case assessment has been undertaken with regards to the local background concentrations.

Ammonia (NH_3)

5.47 The maximum predicted NH_3 PC concentrations arising from the proposed plant at the identified sensitive receptor locations during periods of time the proposed plant is operating in Simple Cycle mode are presented in Table 5.12.

Table 5.12: Maximum Predicted Short-Term (1 Hour and 24 Hour) NH_3 Concentrations – Simple Cycle (μg/m^3)

Receptor	PC	PC as % of Standard
1-Hour		
Residential Area A (H3)	0.24	0.12
Residential Area B (H1)	0.41	0.20
Residential Area C (H5)	0.19	0.09
Residential Area D (new homes)	0.22	0.11
Residential Area E (accommodation blocks (H8)	0.22	0.11
Military Barracks	0.22	0.11
Sirdarya TPP (H2)	0.22	0.11
H4	0.21	0.11
H6	0.19	0.09
H7	0.21	0.10
H9	0.21	0.11
H10	0.21	0.11
H11	0.17	0.08
H12	0.20	0.10

Receptor	PC	PC as % of Standard
H18	0.43	0.21
H19	0.43	0.22
H27	0.23	0.11
H34	0.21	0.10
H35	0.19	0.10
H36	0.23	0.11
24-Hour		
Residential Area A (H3)	0.04	0.03
Residential Area B (H1)	0.09	0.07
Residential Area C (H5)	0.05	0.05
Residential Area D (new homes)	0.00	0.00
Residential Area E (accommodation blocks (H8)	0.04	0.03
Military Barracks	0.02	0.02
Sirdarya TPP (H2)	0.05	0.04
H4	0.02	0.02
H6	0.03	0.03
H7	0.03	0.03
H9	0.02	0.02
H10	0.02	0.02
H11	0.03	0.02
H12	0.03	0.03
H18	0.05	0.04
H19	0.07	0.06
H27	0.05	0.04
H34	0.02	0.02
H35	0.02	0.02
H36	0.02	0.02
1-Hour Standard	200	
24-Hour Standard	120	

5.48 The hourly and 24-hour mean NH_3 standards which are the Uzbekistan MPC standards of 200 and 120 $\mu g/m^3$ respectively. The predicted hourly and 24-hour mean PC concentrations arising from the proposed plant are well below these standards. Although no NH_3 ambient monitoring data was available in order to establish a likely background concentration, it is considered unlikely that there would be any breaches of these standards in the vicinity of the Site.

5.49 The predicted hourly and 24-hour mean NH_3 PCs arising from the proposed plant when operating in simple cycle mode will be less than 10% of the relevant standards at the nearest sensitive receptors. The impacts are therefore considered to be insignificant in accordance with the significance criteria.

5.50 The future exposure within the Site itself cannot be determined as there is no available ambient monitoring to establish the background concentration, however the greatest predicted hourly and 24 hour mean NH_3 PC concentrations with the Site as a result of the proposed plant are 0.16, 0.03 $\mu g/m^3$ respectively which are all below the relevant standards.

Scenario Three – Additional IFC Plant (Combined Cycle)

Nitrogen Dioxide (NO_2)

5.51 The maximum predicted ground-level annual NO_2 concentrations at the nearest identified sensitive receptor locations and those that are showing elevated concentrations are presented in Table 5.13 full results are presented in **Appendix C**. The results are presented for the baseline scenario which includes the existing emissions arising from the neighbouring Sirdarya TPP and the likely local background concentration; the process contribution (PC) for the combined emissions from the proposed plant and the additional IFC plant and as a percentage of the relevant standard and the predicted environmental concentration (PEC) which includes the emissions from the retained plant at the neighbouring Sirdarya TPP following the upgrading and closure of some of the current plant.

Table 5.13: Maximum Predicted Long Term (Annual) NO_2 Concentrations – Combined Cycle ($\mu g/m^3$)

Receptor	Baseline (including existing TPP)	PC	PC as % of Standard	PEC (including retained TPP)	Overall Impact (PEC – Baseline)
Residential Area A (H3)	21.2	1.4	3.5	22.5	1.3
Residential Area B (H1)	21.2	1.7	4.2	22.8	1.6
Residential Area C (H5)	21.5	1.2	2.9	22.4	0.9
Residential Area D (new homes)	21.8	0.6	1.4	22.0	0.1
Residential Area E (accommodation blocks (H8)	21.8	0.9	2.2	22.2	0.4
H4	21.2	0.7	1.6	21.8	0.6
H6	21.9	0.7	1.9	22.2	0.3
H7	21.8	0.8	2.1	22.2	0.4
H9	21.3	0.1	0.3	21.3	0.0
H10	21.4	0.1	0.4	21.3	0.0
H11	21.5	0.2	0.6	21.5	0.0
H12	21.6	0.4	1.0	21.7	0.1
H18	22.0	0.8	2.0	22.3	0.3
H19	22.1	0.9	2.2	22.3	0.3
H27	21.4	1.3	3.3	22.5	1.1
H34	22.2	0.4	1.0	22.0	-0.1
H35	21.8	0.3	0.8	21.7	-0.1
H36	22.1	0.4	0.9	21.9	-0.2
Standard	40				

5.52 The results indicate that there will be no exceedances of the relevant annual mean NO_2 standard (which is the Uzbekistan MPC standard, the EU standard and the WHO guideline concentration of 40$\mu g/m^3$) within the nearby residential areas.

5.53 The greatest combined impact as a result of the proposed plant and IFC plant when operating in combined cycle mode will be a PC of 1.7$\mu g/m^3$ predicted at Residential Area B which is located close to the west boundary of the Site. At this and 12 other nearby sensitive receptors (Residential Areas A, C, D, E, H4, H6, H7, H12, H18, H19, H27 and H34) the impact is greater than 1% of the standard. However, at all the selected locations within the study area, the predicted PEC is less

than 70% of the relevant standard, therefore the impact is considered to be insignificant in accordance with the significance criteria.

5.54 The greatest change in annual mean NO_2 concentrations as a result of the changes (proposed and IFC plant plus changes to emissions from neighbouring Sirdarya TPP is an increase of 1.6μg/m^3 also predicted at Residential Area B.

5.55 The maximum predicted ground-level short-term NO_2 concentrations at the identified sensitive receptor locations are presented in Table 5.14. The results are presented for the process contribution (PC) for the combined emissions from the proposed and IFC plant and as a percentage of the relevant standard and as the predicted environmental concentration (PEC).

Table 5.14: Maximum Predicted Short-Term (1 Hour, 24 Hour and Monthly) NO_2 Concentrations – Combined Cycle (μg/m^3)

Receptor	Baseline (including existing TPP)	PC	PC as % of Standard	PEC (including retained TPP)	Overall Impact (PEC – Baseline)
1-Hour					
Residential Area A (H3)	82.8	20.6	24.3	75.3	-7.4
Residential Area B (H1)	83.1	27.1	31.9	80.4	-2.7
Residential Area C (H5)	84.2	28.4	33.4	76.2	-8.0
Residential Area D (new homes)	91.0	15.2	17.9	78.3	-12.7
Residential Area E (accommodation blocks (H8)	87.6	15.3	18.1	76.0	-11.6
Military Barracks	95.0	15.2	17.9	81.5	-13.5
Sirdarya TPP (H2)	42.7	17.7	20.8	59.7	17.0
H4	80.5	13.7	16.2	71.5	-9.0
H6	85.5	15.4	18.1	69.0	-16.5
H7	81.1	15.0	17.7	68.3	-12.8
H9	79.3	13.7	16.1	74.7	-4.6
H10	76.0	13.4	15.7	72.2	-3.8
H11	73.1	14.7	17.2	69.6	-3.4
H12	80.8	15.0	17.6	73.0	-7.8
H18	74.3	82.0	96.5	124.0	49.8
H19	73.4	83.2	97.9	125.2	51.8
H27	92.3	17.1	20.2	82.9	-9.5
H34	87.8	11.7	13.7	77.4	-10.4

Receptor	Baseline (including existing TPP)	PC	PC as % of Standard	PEC (including retained TPP)	Overall Impact (PEC – Baseline)
H35	84.8	15.9	18.7	70.4	-14.4
H36	84.9	13.9	16.4	72.3	-12.7
24-Hour					
Residential Area A (H3)	44.6	4.3	7.2	46.4	1.8
Residential Area B (H1)	43.8	9.5	15.9	51.5	7.7
Residential Area C (H5)	46.4	6.2	10.4	48.2	1.8
Residential Area D (new homes)	48.6	2.6	4.3	45.4	-3.2
Residential Area E (accommodation blocks (H8)	48.6	4.4	7.3	46.9	-1.7
Military Barracks	46.3	2.5	4.1	44.6	-1.6
Sirdarya TPP (H2)	42.0	5.2	8.7	47.2	5.2
H4	44.5	2.5	4.2	45.2	0.6
H6	48.0	3.3	5.4	46.9	-1.1
H7	48.0	3.9	6.5	46.9	-1.1
H9	46.0	1.5	2.4	45.6	-0.4
H10	45.4	1.6	2.6	45.3	0.0
H11	46.5	2.0	3.3	46.1	-0.5
H12	47.3	3.5	5.9	47.1	-0.2
H18	47.6	9.1	15.1	52.0	4.4
H19	47.8	11.5	19.1	54.5	6.7
H27	45.0	5.3	8.8	47.3	2.3
H34	48.1	1.2	2.0	46.1	-2.0
H35	46.4	1.5	2.4	45.1	-1.3
H36	46.5	1.5	2.5	45.5	-1.0
Monthly					
Residential Area A (H3)	42.3	1.4	2.8	43.4	1.1
Residential Area B (H1)	42.2	2.7	5.4	44.7	2.6
Residential Area C (H5)	42.7	1.4	2.9	43.8	1.1
Residential Area D (new homes)	43.5	0.6	1.1	43.3	-0.2
Residential Area E (accommodation blocks (H8)	43.4	0.9	1.8	43.4	0.0
Military Barracks	42.7	0.8	1.6	42.8	0.2

Receptor	Baseline (including existing TPP)	PC	PC as % of Standard	PEC (including retained TPP)	Overall Impact (PEC – Baseline)
Sirdarya TPP (H2)	42.0	1.1	2.3	43.1	1.1
H4	42.3	0.7	1.3	42.8	0.5
H6	43.3	0.6	1.3	43.3	0.0
H7	43.2	0.8	1.6	43.4	0.2
H9	42.5	0.2	0.4	42.5	0.0
H10	42.6	0.2	0.5	42.5	0.0
H11	42.5	0.2	0.5	42.5	0.0
H12	42.7	0.5	1.0	42.9	0.1
H18	42.9	1.0	2.0	43.3	0.4
H19	43.0	1.1	2.3	43.4	0.5
H27	42.5	2.1	4.2	44.2	1.7
H34	44.1	0.4	0.8	43.5	-0.6
H35	43.1	0.4	0.7	42.9	-0.1
H36	43.0	0.4	0.8	42.8	-0.1
1-Hour Standard	85				
24-Hour Standard	60				
Monthly Standard	50				

5.56 The results indicate that there will be no exceedances of the most stringent 24-hour or monthly mean NO_2 standards (which are the Uzbekistan MPC standards of 60 and 50$\mu g/m^3$ respectively) within the nearby residential areas with the proposed plant and IFC plant are operational.

5.57 Exceedances of the hourly mean NO_2 standard of 85$\mu g/m^3$ are predicted at receptors H18 and H19. The results of the modelling predicted that at receptors H18 and H19 the standard will be exceeded for 12 and 14 hours respectively in the worst-case year which equate to 0.13 and 0.15% of the time. As this is only a small number of hours predicted at the worst meteorological conditions over a three year period and as worst case assumptions are included in the modelling with regards to the emission rates, especially with regards to the emissions from the future IFC plant which assumes no NO_x mitigation, it is considered unlikely that exceedances of the standard will occur.

5.58 The greatest impact on hourly mean NO_2 concentrations as a result of the proposed and IFC plant when operating in combined cycle mode are predicted at receptors H18 and H19 which are

located in Bekobad over 8km to the east of the Site. As discussed previously, the terrain at these locations is approximately 130m higher than at the location of the Site. The elevated terrain may account for the higher concentrations. At the remaining receptors the greatest impact is predicted to be 28.4μg/m^3 at Residential Area C which is located to the east of the Site. At all of the nearby sensitive receptors, the impact on hourly mean NO_2 concentrations is greater than 10% of the relevant standard and therefore cannot be considered to be an insignificant impact. It should be noted however that the results indicate that at the majority of the nearby sensitive receptors the overall predicted PECs when considering the proposed upgrades to the Sirdarya TPP plant will be reduced compared to current levels and therefore the overall impact will be beneficial.

5.59 Further modelling has been undertaken to investigate the number of instances in a year that the predicted hourly PCs will exceed the significance criteria of 10% of the relevant standard. At the receptors with the highest PCs (Residential Area B, Residential Area C, H18 and H19) the PCs are predicted to exceed 10% of the relevant standard for 199, 134, 73 and 77 hours respectively in the worst-case year which equates to 2.3, 1.5, 0.8 and 0.9% of the year.

5.60 With regards to 24-hour NO_2 concentrations, the greatest impacts as a result of the proposed and IFC plant when operating in combined cycle mode are predicted at Residential Area B and receptors H18 and H19. The predicted PCs are less than 10% of the relevant standard at all but four of the nearest sensitive receptors. At these locations the impact is considered to be insignificant in accordance with the significance criteria. At the worst-case location within residential areas B and C and at receptors H18 and H19, the impact with regards to 24-hour mean NO_2 concentrations is higher than 10% and therefore cannot be considered to be insignificant. However, the overall PEC is below the relevant standard.

5.61 The greatest impact on monthly mean NO_2 concentrations is predicted at Residential Area B which is located to the west of the Site. At this and all the other sensitive receptors close to the Site, the predicted PC is less than 10% of the relevant standard and therefore the impact is considered to be insignificant in accordance with the significance criteria.

5.62 With regards to the future exposure within the Site itself, the greatest predicted hourly, 24 hour and monthly mean NO_2 PEC concentrations are 85.3, 44.9 and 42.9 μg/m^3 respectively. The predicted 24-hour and monthly NO_2 PEC concentrations are therefore below the relevant standards. The maximum predicted hourly mean NO_2 PEC of 85.3μg/m^3 within the Site itself is marginally above the relevant standard of 85μg/m^3. It should be noted however that this has been predicted using the worst-case meteorological data measured over a three-year period and worst-case background concentrations. The actual concentrations likely to be experienced at the Site are therefore likely to be lower than those presented.

Nitrogen Oxide (NO)

5.63 The maximum predicted ground-level annual NO concentrations at the nearest identified sensitive receptor locations are presented in Table 5.15, full results are presented in **Appendix C**.

Table 5.15: Maximum Predicted Long Term (Annual) NO Concentrations – Combined Cycle (μg/m³)

Receptor	Baseline (including existing TPP)	PC	PC as % of Standard	PEC (including retained TPP)	Overall Impact (PEC – Baseline)
Residential Area A (H3)	17.2	1.3	2.2	18.4	1.2
Residential Area B (H1)	17.2	1.6	2.6	18.6	1.5
Residential Area C (H5)	17.5	1.1	1.8	18.3	0.8
Residential Area D (new homes)	17.8	0.5	0.9	17.9	0.1
Residential Area E (accommodation blocks (H8)	17.8	0.8	1.4	18.2	0.4
H4	17.2	0.6	1.0	17.7	0.5
H6	17.8	0.7	1.2	18.1	0.3
H7	17.7	0.8	1.3	18.1	0.4
H9	17.3	0.1	0.2	17.3	0.0
H10	17.4	0.1	0.2	17.3	0.0
H11	17.4	0.2	0.4	17.4	0.0
H12	17.5	0.4	0.6	17.6	0.1
H18	17.9	0.8	1.3	18.2	0.3
H19	18.0	0.8	1.3	18.2	0.3
H27	17.4	1.2	2.1	18.4	1.0
H34	18.1	0.4	0.6	17.9	-0.1
H35	17.7	0.3	0.5	17.7	-0.1
H36	18.0	0.3	0.6	17.9	-0.2
Standard	60				

5.64 The results indicate that there will be no exceedances of the relevant annual mean NO standard which is the Uzbekistan MPC of 60μg/m³ within the nearby residential areas.

5.65 The greatest impact on annual mean NO concentrations as a result of the proposed and IFC plant when operating in combined cycle mode will be a PC of 1.6μg/m³ predicted at Residential

Area B which is located close to the west boundary of the Site. At this and nine other nearby sensitive receptors (Residential Areas A, C, E, H4, H6, H7, H18, H19 and H27) the impact is greater than 1% of the standard. However, at all the selected locations within the study area, the predicted PEC is less than 70% of the relevant standard, therefore the impact is considered to be insignificant in accordance with the significance criteria.

5.66 The maximum predicted ground-level short-term NO concentrations at the identified sensitive receptor locations are presented in Table 5.16. The results are presented for the process contribution (PC) for the combined emissions from the proposed plant and IFC plant and as a percentage of the relevant standard and as the predicted environmental concentration (PEC).

Table 5.16: Maximum Predicted Short-Term (1 Hour, 24 Hour and Monthly) NO Concentrations – Combined Cycle (μg/m^3)

Receptor	Baseline (including existing TPP)	PC	PC as % of Standard	PEC (including retained TPP)	Overall Impact (PEC – Baseline)
1-Hour					
Residential Area A (H3)	110.0	38.5	6.4	96.1	-13.8
Residential Area B (H1)	110.6	50.5	8.4	105.6	-5.0
Residential Area C (H5)	112.7	52.8	8.8	97.7	-15.0
Residential Area D (new homes)	125.4	28.3	4.7	101.7	-23.7
Residential Area E (accommodation blocks (H8)	119.0	28.6	4.8	97.4	-21.6
Military Barracks	132.8	28.4	4.7	107.6	-25.2
Sirdarya TPP (H2)	35.4	32.9	5.5	67.0	31.6
H4	105.7	25.6	4.3	89.0	-16.7
H6	115.0	28.6	4.8	84.3	-30.7
H7	106.9	28.0	4.7	83.1	-23.9
H9	103.4	25.5	4.2	94.9	-8.5
H10	97.4	24.9	4.1	90.2	-7.2
H11	91.9	27.3	4.6	85.5	-6.4
H12	106.3	27.9	4.7	91.7	-14.6
H18	94.1	152.8	25.5	186.8	92.7
H19	92.5	155.0	25.8	189.0	96.6
H27	127.8	31.9	5.3	110.2	-17.6
H34	119.3	21.8	3.6	99.9	-19.4
H35	113.8	29.6	4.9	86.9	-26.9

Receptor	Baseline (including existing TPP)	PC	PC as % of Standard	PEC (including retained TPP)	Overall Impact (PEC – Baseline)
H36	114.0	26.0	4.3	90.4	-23.6
24-Hour					
Residential Area A (H3)	38.8	8.1	3.2	42.1	3.3
Residential Area B (H1)	37.4	17.8	7.1	51.8	14.4
Residential Area C (H5)	42.2	11.6	4.6	45.6	3.4
Residential Area D (new homes)	46.3	4.8	1.9	40.3	-6.0
Residential Area E (accommodation blocks (H8)	46.3	8.1	3.3	43.2	-3.1
Military Barracks	42.0	4.6	1.8	38.9	-3.0
Sirdarya TPP (H2)	34.1	9.7	3.9	43.7	9.7
H4	38.7	4.7	1.9	39.9	1.2
H6	45.1	6.1	2.4	43.1	-2.1
H7	45.1	7.3	2.9	43.0	-2.1
H9	41.5	2.7	1.1	40.7	-0.8
H10	40.3	3.0	1.2	40.2	-0.1
H11	42.4	3.7	1.5	41.6	-0.9
H12	43.8	6.6	2.6	43.5	-0.3
H18	44.4	16.9	6.8	52.7	8.3
H19	44.8	21.4	8.6	57.2	12.4
H27	39.6	9.9	4.0	43.9	4.3
H34	45.3	2.3	0.9	41.6	-3.7
H35	42.2	2.7	1.1	39.8	-2.4
H36	42.4	2.7	1.1	40.5	-1.9
Monthly					
Residential Area A (H3)	34.6	2.6	2.1	36.6	2.0
Residential Area B (H1)	34.3	5.0	4.2	39.1	4.8
Residential Area C (H5)	35.3	2.7	2.2	37.3	2.1
Residential Area D (new homes)	36.8	1.1	0.9	36.5	-0.3
Residential Area E (accommodation blocks (H8)	36.6	1.7	1.4	36.6	0.1
Military Barracks	35.3	1.5	1.2	35.6	0.3
Sirdarya TPP	34.0	2.1	1.8	36.1	2.1

Receptor	Baseline (including existing TPP)	PC	PC as % of Standard	PEC (including retained TPP)	Overall Impact (PEC – Baseline)
H4	34.6	1.2	1.0	35.5	0.9
H6	36.5	1.2	1.0	36.5	0.0
H7	36.3	1.4	1.2	36.6	0.3
H9	34.9	0.3	0.3	34.8	-0.1
H10	35.1	0.4	0.4	35.0	-0.1
H11	35.0	0.4	0.4	34.9	0.0
H12	35.4	0.9	0.7	35.6	0.3
H18	35.7	1.9	1.6	36.4	0.7
H19	35.8	2.1	1.8	36.7	0.9
H27	34.8	3.9	3.2	38.0	3.2
H34	37.9	0.7	0.6	36.7	-1.1
H35	36.0	0.7	0.6	35.7	-0.3
H36	35.8	0.8	0.6	35.5	-0.3
1-Hour Standard	600				
24-Hour Standard	250				
Monthly Standard	120				

5.67 The results indicate that there will be no exceedances of the relevant hourly, 24-hour or monthly mean NO standards which are the Uzbekistan MPC standards of 600, 250 and 120$\mu g/m^3$ respectively at the nearby sensitive areas.

5.68 The greatest impact on hourly mean NO concentrations as a result of the proposed and IFC plant when operating in combined cycle mode are 152.8 and 155.0$\mu g/m^3$ predicted at receptors H18 and H19 which are located in Bekobad over 8km to the east of the Site. At the remaining receptors the greatest impact is predicted to be 52.8$\mu g/m^3$ at Residential Area C which is located to the east of the Site. The predicted PCs at all of the sensitive receptors with the exception of H18 and H19 are less than 10% of the relevant standard and therefore considered to be insignificant in accordance with the significance criteria. It should be noted that at all locations the predicted PECs are less than 35% of the standard and therefore breaches are very unlikely. At the majority of the nearby sensitive receptors the overall predicted PECs will be reduced compared to current levels and therefore the overall impact will be beneficial.

5.69 Further modelling has been undertaken to investigate the number of instances in a year that the predicted hourly PCs will exceed the significance criteria of 10% of the relevant standard. At

the receptors with the highest PCs (H18 and H19) the PCs are predicted to exceed 10% of the relevant standard for 45 and 53 hours respectively in the worst-case year which equates to 0.5 and 0.6% of the year. It should be noted that for the assessment of NO concentrations, no conversion of NO to NO_2 is assumed, therefore the concentrations of NO are likely to be considerably lower than the predicted concentrations.

5.70 With regards to 24-hour NO concentrations, the greatest impacts as a result of the proposed and IFC plant when operating in combined cycle mode is predicted at receptors H18, H19 and Residential Area B. The predicted PCs at all sensitive receptors are less than 10% of the relevant standard and therefore the impact is considered to be insignificant in accordance with the significance criteria.

5.71 With regards to the future exposure within the Site itself, the greatest predicted hourly, 24 hour and monthly mean NO PEC concentrations are 114.7, 39.3 and 35.7 $\mu g/m^3$ respectively which are all lower than the relevant standards.

Carbon Monoxide (CO)

5.72 The maximum predicted ground-level annual CO concentrations at the nearest identified sensitive receptor locations are presented in Table 5.17, full results are presented in **Appendix C**.

Table 5.17: Maximum Predicted Long Term (Annual) CO Concentrations – Combined Cycle (μg/m³)

Receptor	Baseline (including existing TPP)	PC	PC as % of Standard	PEC (including retained TPP)	Overall Impact (PEC – Baseline)
Residential Area A (H3)	2200.01	2.0	0.07	2202.02	2.0
Residential Area B (H1)	2200.01	2.4	0.08	2202.42	2.4
Residential Area C (H5)	2200.02	1.7	0.06	2201.67	1.7
Residential Area D (new homes)	2200.03	0.8	0.03	2200.82	0.8
Residential Area E (accommodation blocks (H8)	2200.03	1.2	0.04	2201.26	1.2
H4	2200.01	0.9	0.03	2200.94	0.9
H6	2200.03	1.1	0.04	2201.07	1.0
H7	2200.03	1.2	0.04	2201.22	1.2
H9	2200.01	0.2	0.01	2200.18	0.2
H10	2200.01	0.2	0.01	2200.22	0.2
H11	2200.02	0.3	0.01	2200.34	0.3
H12	2200.02	0.6	0.02	2200.58	0.6
H18	2200.03	1.2	0.04	2201.18	1.1
H19	2200.04	1.2	0.04	2201.25	1.2
H27	2200.01	1.9	0.06	2201.89	1.9
H34	2200.04	0.6	0.02	2200.60	0.6
H35	2200.03	0.4	0.01	2200.46	0.4
H36	2200.04	0.5	0.02	2200.54	0.5
Standard	3000				

5.73 The results indicate that there will be no exceedances of the relevant annual mean CO standard (which is the Uzbekistan MPC of 3000μg/m³) within the nearby residential areas.

5.74 The greatest impact in annual mean CO concentrations as a result of the proposed and IFC plant when operating in combined cycle mode will be a PC of 2.4μg/m³ predicted at Residential Area B which is located close to the west boundary of the Site. This is less than 1% of the standard. Therefore, the impact is considered to be insignificant in accordance with the significance criteria.

5.75 The maximum predicted ground-level short term CO concentrations at the identified sensitive receptor locations are presented in Table 5.18.

Table 5.18: Maximum Predicted Short-Term (Hourly, 8 Hour, 24 Hour and Monthly) CO Concentrations – Combined Cycle (μg/m³)

Receptor	Baseline (including existing TPP)	PC	PC as % of Standard	PEC (including retained TPP)	Overall Impact (PEC – Baseline)
1-Hour					
Residential Area A (H3)	4402.7	59.0	1.2	4459.0	56.3
Residential Area B (H1)	4402.3	77.5	1.6	4477.5	75.3
Residential Area C (H5)	4402.6	81.0	1.6	4481.0	78.4
Residential Area D (new homes)	4402.8	43.4	0.9	4443.4	40.5
Residential Area E (accommodation blocks (H8)	4402.7	43.9	0.9	4443.9	41.1
Military Barracks	4402.8	43.6	0.9	4443.6	40.7
Sirdarya TPP (H2)	4400.1	50.5	1.0	4450.5	50.4
H4	4402.4	39.2	0.8	4439.3	36.8
H6	4403.0	43.9	0.9	4443.9	40.9
H7	4402.7	43.0	0.9	4443.0	40.3
H9	4402.6	39.1	0.8	4439.5	36.9
H10	4402.4	38.2	0.8	4438.3	35.9
H11	4401.9	41.9	0.8	4442.1	40.2
H12	4402.7	42.8	0.9	4442.8	40.1
H18	4402.2	234.4	4.7	4634.4	232.1
H19	4402.2	237.8	4.8	4637.8	235.6
H27	4402.7	49.0	1.0	4449.0	46.3
H34	4403.2	33.4	0.7	4433.4	30.2
H35	4403.0	45.3	0.9	4445.6	42.6
H36	4403.0	39.8	0.8	4439.8	36.8
8-Hour					
Residential Area A (H3)	4400.5	36.5	0.4	4436.5	36.0
Residential Area B (H1)	4400.4	43.0	0.4	4443.0	42.5
Residential Area C (H5)	4400.7	34.3	0.3	4434.3	33.6
Residential Area D (new homes)	4400.7	18.6	0.2	4418.6	17.9
Residential Area E (accommodation blocks (H8)	4400.9	21.9	0.2	4421.9	21.1
Military Barracks	4400.5	17.8	0.2	4417.8	17.3
Sirdarya TPP (H2)	4400.0	26.7	0.3	4426.7	26.7

Receptor	Baseline (including existing TPP)	PC	PC as % of Standard	PEC (including retained TPP)	Overall Impact (PEC – Baseline)
H4	4400.4	16.0	0.2	4416.0	15.6
H6	4400.8	14.7	0.1	4414.8	14.0
H7	4400.8	17.9	0.2	4418.0	17.2
H9	4400.6	7.1	0.1	4407.4	6.8
H10	4400.6	10.2	0.1	4410.5	9.9
H11	4400.7	12.9	0.1	4413.3	12.5
H12	4400.6	16.0	0.2	4416.2	15.5
H18	4400.7	45.2	0.5	4445.2	44.4
H19	4400.8	60.7	0.6	4460.7	59.9
H27	4400.6	28.1	0.3	4428.1	27.4
H34	4400.7	9.4	0.1	4409.5	8.8
H35	4400.6	9.5	0.1	4409.5	8.9
H36	4400.7	10.2	0.1	4410.2	9.5
24-Hour					
Residential Area A (H3)	4400.2	12.4	0.3	4412.4	12.2
Residential Area B (H1)	4400.1	27.2	0.7	4427.2	27.1
Residential Area C (H5)	4400.3	17.8	0.4	4417.8	17.4
Residential Area D (new homes)	4400.4	7.4	0.2	4407.4	7.0
Residential Area E (accommodation blocks (H8)	4400.5	12.5	0.3	4412.5	12.0
Military Barracks	4400.3	7.1	0.2	4407.1	6.8
Sirdarya TPP (H2)	4400.0	14.9	0.4	4414.9	14.9
H4	4400.2	7.3	0.2	4407.3	7.1
H6	4400.4	9.3	0.2	4409.3	8.9
H7	4400.4	11.2	0.3	4411.2	10.7
H9	4400.3	4.2	0.1	4404.3	4.0
H10	4400.2	4.5	0.1	4404.7	4.4
H11	4400.3	5.7	0.1	4405.8	5.5
H12	4400.4	10.1	0.3	4410.2	9.9
H18	4400.4	25.9	0.6	4426.0	25.6
H19	4400.4	32.8	0.8	4432.9	32.5
H27	4400.2	15.2	0.4	4415.2	15.0
H34	4400.4	3.5	0.1	4403.6	3.2

Receptor	Baseline (including existing TPP)	PC	PC as % of Standard	PEC (including retained TPP)	Overall Impact (PEC – Baseline)
H35	4400.3	4.2	0.1	4404.2	3.9
H36	4400.3	4.2	0.1	4404.3	4.0
Monthly					
Residential Area A (H3)	4400.02	3.9	0.11	4403.95	3.9
Residential Area B (H1)	4400.01	7.7	0.22	4407.74	7.7
Residential Area C (H5)	4400.05	4.1	0.12	4404.12	4.1
Residential Area D (new homes)	4400.10	1.6	0.05	4401.67	1.6
Residential Area E (accommodation blocks (H8)	4400.10	2.6	0.08	4402.65	2.6
Military Barracks	4400.05	2.3	0.07	4402.29	2.2
Sirdarya TPP (H2)	4400.00	3.3	0.09	4403.26	3.3
H4	4400.02	1.9	0.05	4401.90	1.9
H6	4400.09	1.9	0.05	4401.88	1.8
H7	4400.09	2.2	0.06	4402.24	2.1
H9	4400.04	0.5	0.01	4400.54	0.5
H10	4400.04	0.7	0.02	4400.69	0.6
H11	4400.04	0.7	0.02	4400.70	0.7
H12	4400.05	1.4	0.04	4401.39	1.3
H18	4400.06	2.9	0.08	4402.88	2.8
H19	4400.07	3.2	0.09	4403.27	3.2
H27	4400.03	5.9	0.17	4405.94	5.9
H34	4400.14	1.1	0.03	4401.17	1.0
H35	4400.07	1.1	0.03	4401.09	1.0
H36	4400.07	1.2	0.03	4401.19	1.1
1-Hour Standard	5000				
8-Hour Standard	10000				
24-Hour Standard	4000				
Monthly Standard	3500				

5.76 The most stringent standard for hourly mean CO is the Uzbekistan MPC of 5000μg/m^3. The results indicate that there will be no exceedances of this standard within the nearby sensitive areas. The predicted PCs arising from the combined emissions from the proposed and IFC plant when

operating in combined cycle mode will be less than 10% of this standard, therefore the impact on hourly mean CO concentrations is considered to be insignificant.

5.77 The 8 hour mean CO standard is the EU standard and WHO guideline of 10,000μg/m^3. The results indicate that there will be no exceedances of this standard and the predicted PCs will be less than 10% of this standard, therefore the impact on 8-hour mean CO concentrations is considered to be insignificant in accordance with significance criteria.

5.78 The 24-hour mean and monthly mean CO standards are the Uzbekistan MPCs of 4000μg/m^3 and 3500μg/m^3 respectively. The results indicate that these standards are likely to be breached across the study area due to the high background concentration. The predicted PCs arising from the combined emissions from the proposed and IFC plant when operating in combined cycle mode will be less than 10% of the respective standards, therefore the impact on 24-hour mean and monthly mean CO concentrations is considered to be insignificant in accordance with the significance criteria.

5.79 With regards to the future exposure within the Site itself, the greatest predicted hourly, 8 hour, 24-hour and monthly mean CO PEC concentrations are 4448.7, 4417.4, 4408.1 and 4402.4 μg/m^3 respectively. The predicted hourly and 8 hour mean concentrations within the Site are below the relevant standards. The predicted 24 hour and monthly mean CO PECs within the Site are above the relevant standards, however it should be noted that a worst-case assessment has been undertaken with regards to the local background concentrations.

6 SUMMARY AND CONCLUSIONS

6.1 An assessment has been carried out to determine the potential air quality impacts associated with the proposed CCGT Project. Further modelling was undertaken to determine the combined impact of a future CCGT project on adjacent land (referred to as IFC within this report). The modelling of the overall concentrations included a contribution from the Sirdarya TPP which is located adjacent to the Site.

6.2 The key pollutants considered in the assessment were NO_x (as NO_2 and NO) and CO. Concentrations of NH_3 arising from the ammonia slip associated with the NO_x abatement measures are also considered.

6.3 Detailed dispersion modelling of potential emissions from the proposed facility has been carried out using AERMOD. A review of monitoring data obtained from two distant monitoring stations and review of short-term monitoring in the immediate vicinity of the Site was undertaken. The background concentrations used in this assessment are likely to be higher than those likely to be experienced in the vicinity of the Site, therefore the assessment can be considered to be worst case. The background concentrations and PECs presented in this report should be considered to be indicative only.

Combined Cycle Operations

6.4 For Combined Cycle operations the predicted long-term NO_2, NO and CO PECs at the sensitive locations are all below the relevant standards. Although no ambient NH_3 monitoring data is available to determine the likely background NH_3 concentrations, the predicted concentrations of NH_3 arising from the proposed plant is very low, therefore it is unlikely that the standard would be breached. The impact of the emissions of NO_2, NO, CO and NH_3 on long term concentrations is predicted to be insignificant in accordance with the significance criteria.

6.5 For short term concentrations of NO_2 and NO, there are no exceedances of the relevant standards with the proposed plant operational. PCs in excess of 10% of the relevant standard are predicted at a number of receptors for hourly mean NO_2 concentrations, the impacts at these locations therefore cannot be considered to be insignificant in accordance with the significance criteria. However, the majority of receptors that experience an increase in concentration greater than 10% of the relevant standards are also predicted to experience an overall reduction in concentrations when compared to the existing levels as a result of the reductions due to the proposed upgrades to the Sirdarya TPP.

6.6 The predicted PCs on hourly mean NO, 24 hour mean NO_2 and NO and monthly mean NO_2 and NO concentrations are less than 10% of the relevant standards, therefore the impacts are considered to be insignificant.

6.7 For hourly and 8-hour mean concentrations of CO, there are no exceedances of the relevant standards. Exceedances of the 24-hour and monthly mean standards are predicted, however these are due to the high background concentrations assumed for the area of the Site. The predicted PCs for short-term CO concentrations are all below 10% of the relevant standards, the impacts on short term CO concentrations is therefore considered to be insignificant.

6.8 The predicted short-term NH_3 PC concentrations are all below 10% of the relevant standards, therefore the impacts on short term NH_3 concentrations is considered to be insignificant.

Simple Cycle Operations

6.9 For Simple Cycle operations, the predicted short-term concentrations for NO_2 and NO are below the relevant standards.

6.10 The predicted hourly and 8-hour mean CO concentrations are also below the relevant standards. The predicted 24-hour mean CO concentrations are above the relevant standard, however this is due to the high background concentration used for the assessment.

6.11 Although no NH_3 ambient monitoring data was available to establish a likely background concentration, the predicted NH_3 PCs are very low therefore it is considered unlikely that the standards would be breached.

6.12 The predicted PCs for NO_2, NO, CO and NH_3 are below 10% of the relevant standards and therefore the impacts on short-term concentrations are considered to be insignificant.

Additional Future Plant (IFC) Combined Cycle Operations

6.13 The predicted long-term NO_2, NO and CO PECs at the sensitive locations are all below the relevant standards. The impact of the emissions on long term concentrations is predicted to be insignificant in accordance with the significance criteria.

6.14 Exceedances of the hourly mean NO_2 standard are predicted at receptors H18 and H19. The exceedances are only predicted for a maximum of 12 and 14 hours per year at the respective locations. It should be noted that the assessment includes worst-case assumptions with regards

to the emission rates in particular from the future IFC plant for which no NOx abatement has been assumed. No other exceedances of the hourly mean NO_2 standard are predicted. No exceedances of the relevant standards are predicted for 24 hour or monthly mean NO_2 or any of the short-term standards for NO.

6.15 PCs in excess of 10% of the relevant standard are predicted at all of the nearby receptors for hourly mean NO_2 concentrations, the impacts at these locations cannot be considered to be insignificant in accordance with the significance criteria. However, the majority of receptors that experience an increase in concentrations greater than 10% of the relevant standard are also predicted to experience an overall reduction in concentration when compared to the existing levels as a result of the reductions due to the proposed upgrades to the Sirdarya TPP.

6.16 Four receptors are predicted to experience a greater than 10% increase in 24-hour NO_2 concentrations, however the overall predicted PECs are below the standard. The predicted PCs for monthly mean NO_2 are below 10% of the relevant standard and therefore the impact is considered to be insignificant.

6.17 PCs in excess of 10% of the relevant standard for NO are predicted only at receptors H18 and H19. The PCs are only predicted to exceed 10% of the standard for a maximum of 45 and 53 hours per year at the respective locations. It should be noted that the assessment includes worst-case assumptions with regards to the emission rates and assumes no conversion of NO to NO_2 for the assessment of NO concentrations. No other increases greater than 10% of the relevant standards were predicted for short-term NO concentrations, the impacts are therefore considered to be insignificant.

6.18 For hourly and 8-hour mean concentrations of CO, there are no exceedances of the relevant standards. Exceedances of the 24-hour and monthly mean standards are predicted, however these are due to the high background concentrations assumed for the area of the Site. The predicted PCs for short-term CO concentrations are all below 10% of the relevant standards, the impacts on short term CO concentrations is therefore considered to be insignificant.

APPENDIX A – Air Quality Terminology

Term	Definition
Accuracy	A measure of how well a set of data fits the true value.
Air quality objective	Policy target generally expressed as a maximum ambient concentration to be achieved, either without exception or with a permitted number of exceedences within a specific timescale (see also air quality standard).
Air quality standard	The concentrations of pollutants in the atmosphere which can broadly be taken to achieve a certain level of environmental quality. The standards are based on the assessment of the effects of each pollutant on human health including the effects on sensitive sub groups (see also air quality objective).
Ambient air	Outdoor air in the troposphere, excluding workplace air.
Annual mean	The average (mean) of the concentrations measured for each pollutant for one year. Usually this is for a calendar year, but some species are reported for the period April to March, known as a pollution year. This period avoids splitting winter season between 2 years, which is useful for pollutants that have higher concentrations during the winter months.
Exceedence	A period of time where the concentrations of a pollutant is greater than, or equal to, the appropriate air quality standard.
Fugitive emissions	Emissions arising from the passage of vehicles that do not arise from the exhaust system.
LDO	Light diesel oil
NO	Nitrogen monoxide, a.k.a. nitric oxide.
NO_2	Nitrogen dioxide.
NO_x	Nitrogen oxides.
O_3	Ozone.
Percentile	The percentage of results below a given value.
PM_{10}	Particulate matter with an aerodynamic diameter of less than 10 micrometres.
ppmw	Parts per million by mass (weight)
Ratification (Monitoring)	Involves a critical review of all information relating to a data set, in order to amend or reject the data. When the data have been ratified they represent the final data to be used (see also validation).
µg/m^3 micrograms per cubic metre	A measure of concentration in terms of mass per unit volume. A concentration of 1µg/m^3 means that one cubic metre of air contains one microgram (millionth of a gram) of pollutant.
Uncertainty	A measure, associated with the result of a measurement, which characterizes the range of values within which the true value is expected to lie. Uncertainty is usually expressed as the range within which the true value is expected to lie with a 95% probability, where standard statistical and other procedures have been used to evaluate this figure. Uncertainty is more clearly defined than the closely related parameter 'accuracy', and has replaced it on recent European legislation.

APPENDIX B – Stack Emission and Building Parameters

Table B1: Stack Emission Parameters (Main Stack)

Parameter / Fuel	Natural Gas
Stack Height (m)	60
Stack Diameter (m)	9.18
Temperature (K)	355.2
% Oxygen content (v/v)	10.62
% H_2O content (v/v)	10.04
Actual Flow Rate (Am^3/s)	984.4
Exit Velocity (m/s)	14.88
Concentration (mg/m^3)[(a)]	
NO_x (as NO_2)	32.5
CO	32.5
Emission Rate (g/s)	
NOx (as NO_2)	34.10
NOx (as NO)	22.24
CO	34.10
(a) Corrected to 273K, 15%O2, dry	

Table B2: Stack Emission Parameters (Bypass Stack)

Parameter / Fuel	Natural Gas
Stack Height (m)	45
Stack Diameter (m)	9.38
Temperature (K)	928
% Oxygen content (v/v)	10.62
% H_2O content (v/v)	10.04
Actual Flow Rate (Am^3/s)	2543.1
Exit Velocity (m/s)	36.82
Concentration (mg/m^3)[(a)]	
NO_x (as NO_2)	32.5
CO	32.5
Emission Rate (g/s)	
NOx (as NO_2)	33.72
NOx (as NO)	21.99

CO	21.99
(a) Corrected to 273K, 15%O2, dry	

Table B3: Sirdarya TPP Existing Stack Emission Parameters

Parameter / Fuel	Stack 1	Stack 2	Stack 3
Units	1 & 2	3 & 4	5 to 10
Stack Height (m)	180	180	320
Stack Diameter (m)	7.2	7.2	9.6
Temperature (K)	463	463	463
Actual Flow Rate (Am^3/s)	1062.3	1062.3	3189.2
Exit Velocity (m/s)	26.09	26.09	44.06
Concentration (mg/m^3)			
NO_x (as NO_2)	316.2	316.2	342.2
CO	7.98	7.98	7.98
Emission Rate (g/s)			
NOx (as NO_2)	335.9	335.9	1091.3
NOx (as NO)	219.1	219.1	711.7
CO	8.47	8.47	25.45

Table B4: Sirdarya TPP Remaining Stack Emission Parameters (following upgrade)

Parameter / Fuel	Stack 1	Stack 2	Stack 3
Units	-	3 & 4	5,6,9 & 10
Stack Height (m)	-	180	320
Stack Diameter (m)	-	7.2	9.6
Temperature (K)	-	463	463
Actual Flow Rate (Am^3/s)	-	1062.3	3189.2
Exit Velocity (m/s)	-	26.09	44.06
Concentration (mg/m^3)			
NO_x (as NO_2)	-	273.8	274.0
CO	-	6.38	7.18
Emission Rate (g/s)			
NOx (as $NO_{2)}$	-	290.8	582.1
NOx (as NO)		189.7	379.6
CO	-	6.78	15.3

Table B5: Stack Emission Parameters for IFC Plant (Main Stack)

Parameter / Fuel	Natural Gas
Stack Height (m)	60
Stack Diameter (m)	9.18
Temperature (K)	355.2
% Oxygen content (v/v)	10.62
% H_2O content (v/v)	10.04
Actual Flow Rate (Am^3/s)	984.4
Exit Velocity (m/s)	14.88
Concentration (mg/m^3)[(a)]	
NO_x (as NO_2)	50
CO	50
Emission Rate (g/s)	
NOx (as NO_2)	52.46
NOx (as NO)	34.20
CO	52.46
(b) Corrected to 273K, 15%O2, dry	

Table B6: Stack Emission Parameters for IFC Plant (Bypass Stack)

Parameter / Fuel	Natural Gas
Stack Height (m)	45
Stack Diameter (m)	9.38
Temperature (K)	928
% Oxygen content (v/v)	10.62
% H2O content (v/v)	10.04
Actual Flow Rate (Am^3/s)	2543.1
Exit Velocity (m/s)	36.82
Concentration (mg/m^3)[(a)]	
NO_x (as NO_2)	50
CO	50
Emission Rate (g/s)	
NOx (as NO_2)	51.87
NOx (as NO)	33.82
CO	51.87
(b) Corrected to 273K, 15%O2, dry	

Table B7: Building Parameters

Building	Height (m)	X Length (m)	Y Length (m)	Angle (deg)
Gas Turbine Building	25	88.2	37.9	30.7
Steam Turbine Building	25	72.7	65.4	30.8
Control Building	25	39.3	29.8	30.5
HRSG 1	40	19.4	34.2	29.4
HRSG 2	40	20.4	32.1	32
IFC Gas Turbine Building	25	88.2	37.9	30.7
IFC Steam Turbine Buildings	25	72.7	65.4	30.8
IFC Control Building	25	39.3	29.8	30.5
IFC HRSG 1	40	19.4	34.2	29.4
IFC HRSG 2	40	20.4	32.1	32

APPENDIX C – Full Results

Scenario One (Combined Cycle)

Table C1: Maximum Predicted Long Term (Annual) Concentrations – Combined Cycle (μg/m³)

Receptor	Annual NO_2				Annual NO				Annual CO				Annual NH_3	
	Baseline (including existing TPP)	PC	PC as % of Standard	PEC (including retained TPP)	Baseline (including existing TPP)	PC	PC as % of Standard	PEC (including retained TPP)	Baseline (including existing TPP)	PC	PC as % of Standard	PEC (including retained TPP)	PC	PC as % of Standard
Residential Area A (H3)	21.2	0.5	1.3	21.6	17.2	0.5	1.2	17.6	2200.01	0.7	0.02	2200.75	0.03	0.09
Residential Area B (H1)	21.2	0.7	1.7	21.8	17.2	0.6	1.6	17.7	2200.01	1.0	0.03	2200.99	0.05	0.12
Residential Area C (H5)	21.5	0.5	1.2	21.7	17.5	0.4	1.1	17.6	2200.02	0.7	0.02	2200.69	0.03	0.08
Residential Area D (new homes)	21.8	0.2	0.5	21.6	17.8	0.2	0.5	17.6	2200.03	0.3	0.01	2200.33	0.01	0.04
Residential Area E (accommodation blocks (H8)	21.8	0.4	0.9	21.7	17.8	0.3	0.9	17.7	2200.03	0.5	0.02	2200.54	0.02	0.06
H4	21.2	0.3	0.7	21.4	17.2	0.2	0.6	17.3	2200.01	0.4	0.01	2200.38	0.02	0.04
H6	21.9	0.3	0.8	21.7	17.8	0.3	0.7	17.7	2200.03	0.4	0.01	2200.45	0.02	0.05
H7	21.8	0.4	0.9	21.7	17.7	0.3	0.8	17.7	2200.03	0.5	0.02	2200.51	0.02	0.06
H9	21.3	0.0	0.1	21.2	17.3	0.0	0.1	17.2	2200.01	0.1	0.00	2200.07	0.00	0.01
H10	21.4	0.1	0.1	21.3	17.4	0.1	0.1	17.2	2200.01	0.1	0.00	2200.09	0.00	0.01
H11	21.5	0.1	0.2	21.3	17.4	0.1	0.2	17.3	2200.02	0.1	0.00	2200.14	0.01	0.02
H12	21.6	0.2	0.4	21.5	17.5	0.1	0.4	17.4	2200.02	0.2	0.01	2200.23	0.01	0.03
H13	21.4	0.1	0.2	21.3	17.4	0.1	0.2	17.3	2200.02	0.1	0.00	2200.11	0.01	0.01
H14	22.4	0.2	0.5	21.9	18.3	0.2	0.5	17.9	2200.05	0.3	0.01	2200.31	0.01	0.03
H15	22.1	0.2	0.5	21.8	18.0	0.2	0.5	17.7	2200.04	0.3	0.01	2200.31	0.01	0.03
H16	21.9	0.2	0.4	21.6	17.8	0.2	0.4	17.6	2200.03	0.2	0.01	2200.25	0.01	0.03
H17	22.3	0.2	0.5	21.9	18.2	0.2	0.4	17.8	2200.05	0.3	0.01	2200.29	0.01	0.03
H18	22.0	0.3	0.8	21.8	17.9	0.3	0.8	17.8	2200.03	0.5	0.02	2200.48	0.02	0.05

Receptor	Annual NO_2				Annual NO				Annual CO				Annual NH_3	
	Baseline (including existing TPP)	PC	PC as % of Standard	PEC (including retained TPP)	Baseline (including existing TPP)	PC	PC as % of Standard	PEC (including retained TPP)	Baseline (including existing TPP)	PC	PC as % of Standard	PEC (including retained TPP)	PC	PC as % of Standard
H19	22.1	0.3	0.9	21.9	18.0	0.3	0.8	17.8	2200.04	0.5	0.02	2200.51	0.02	0.06
H20	21.3	0.1	0.1	21.2	17.3	0.1	0.1	17.2	2200.01	0.1	0.00	2200.09	0.00	0.01
H21	21.3	0.0	0.1	21.2	17.3	0.0	0.1	17.2	2200.01	0.1	0.00	2200.08	0.00	0.01
H22	21.2	0.1	0.1	21.2	17.2	0.1	0.1	17.2	2200.01	0.1	0.00	2200.08	0.00	0.01
H23	21.3	0.1	0.2	21.2	17.3	0.1	0.2	17.2	2200.01	0.1	0.00	2200.10	0.00	0.01
H24	22.3	0.3	0.7	21.9	18.2	0.3	0.7	17.9	2200.04	0.4	0.01	2200.43	0.02	0.05
H25	22.6	0.3	0.7	22.1	18.4	0.3	0.7	18.0	2200.05	0.4	0.01	2200.43	0.02	0.05
H26	23.2	0.3	0.8	22.4	19.0	0.3	0.7	18.3	2200.08	0.4	0.01	2200.46	0.02	0.05
H27	21.4	0.6	1.4	21.7	17.4	0.5	1.3	17.6	2200.01	0.8	0.03	2200.79	0.04	0.09
H28	22.4	0.2	0.5	21.9	18.3	0.2	0.5	17.8	2200.05	0.3	0.01	2200.32	0.01	0.04
H29	23.4	0.3	0.7	22.5	19.2	0.3	0.7	18.4	2200.08	0.4	0.01	2200.43	0.02	0.05
H30	23.1	0.3	0.6	22.3	18.9	0.2	0.6	18.2	2200.07	0.4	0.01	2200.40	0.02	0.04
H31	22.3	0.2	0.4	21.9	18.2	0.2	0.4	17.8	2200.05	0.2	0.01	2200.27	0.01	0.03
H32	22.3	0.2	0.4	21.9	18.2	0.2	0.4	17.8	2200.05	0.2	0.01	2200.26	0.01	0.03
H33	22.0	0.1	0.4	21.6	17.9	0.1	0.4	17.6	2200.03	0.2	0.01	2200.23	0.01	0.02
H34	22.2	0.2	0.4	21.8	18.1	0.2	0.4	17.7	2200.04	0.2	0.01	2200.25	0.01	0.03
H35	21.8	0.1	0.3	21.5	17.7	0.1	0.3	17.5	2200.03	0.2	0.01	2200.19	0.01	0.02
H36	22.1	0.1	0.4	21.7	18.0	0.1	0.3	17.7	2200.04	0.2	0.01	2200.22	0.01	0.02
H37	23.3	0.3	0.8	22.5	19.2	0.3	0.8	18.4	2200.08	0.5	0.02	2200.49	0.02	0.05
H38	21.3	0.1	0.2	21.2	17.2	0.1	0.2	17.2	2200.01	0.1	0.00	2200.10	0.00	0.01
H39	21.3	0.1	0.2	21.2	17.3	0.1	0.2	17.2	2200.01	0.1	0.00	2200.13	0.01	0.01
H40	21.4	0.1	0.3	21.3	17.4	0.1	0.3	17.3	2200.01	0.2	0.01	2200.18	0.01	0.02
Standard	40				60				3000				40	

Table C2: Maximum Predicted Hourly Mean Concentrations – Combined Cycle (μg/m³)

Receptor	Hourly NO_2				Hourly NO				Hourly CO				Hourly NH_3	
	Baseline (including existing TPP)	PC	PC as % of Standard	PEC (including retained TPP)	Baseline (including existing TPP)	PC	PC as % of Standard	PEC (including retained TPP)	Baseline (including existing TPP)	PC	PC as % of Standard	PEC (including retained TPP)	PC	PC as % of Standard
Residential Area A (H3)	82.8	14.1	16.6	67.9	110.0	26.3	4.4	82.3	4402.7	40.4	0.1	4440.4	1.9	0.9
Residential Area B (H1)	83.1	14.6	17.1	73.2	110.6	27.2	4.5	92.2	4402.3	41.6	0.1	4441.7	1.9	1.0
Residential Area C (H5)	84.2	24.0	28.3	69.1	112.7	44.8	7.5	84.6	4402.6	68.6	0.2	4468.6	3.2	1.6
Residential Area D (new homes)	91.0	6.6	7.8	72.8	125.4	12.4	2.1	91.4	4402.8	19.0	0.1	4419.0	0.9	0.4
Residential Area E (accommodation blocks (H8)	87.6	7.0	8.3	70.5	119.0	13.1	2.2	87.1	4402.7	20.1	0.1	4419.6	0.9	0.5
Military Barracks	95.0	11.3	13.3	75.9	132.8	21.0	3.5	97.1	4402.8	32.2	0.1	4432.2	1.5	0.8
Sirdarya TPP Receptor 1 (H2)	42.7	7.1	8.3	49.1	35.4	13.2	2.2	47.2	4400.1	20.2	0.1	4420.2	0.9	0.5
Sirdarya TPP Receptor 2 (H2)	45.3	7.0	8.3	50.0	40.1	13.1	2.2	48.9	4400.2	20.0	0.1	4420.0	0.9	0.5
H4	80.5	5.3	6.3	65.7	105.7	9.9	1.7	78.1	4402.4	15.2	0.1	4415.2	0.7	0.4
H6	85.5	5.9	7.0	67.1	115.0	11.1	1.8	80.8	4403.0	16.9	0.1	4417.0	0.8	0.4
H7	81.1	5.6	6.6	65.3	106.9	10.5	1.7	77.5	4402.7	16.1	0.1	4416.1	0.7	0.4
H9	79.3	5.5	6.5	68.9	103.4	10.2	1.7	84.1	4402.6	15.7	0.1	4416.1	0.7	0.4
H10	76.0	5.5	6.4	66.8	97.4	10.2	1.7	80.2	4402.4	15.6	0.1	4416.0	0.7	0.4
H11	73.1	6.5	7.7	63.9	91.9	12.2	2.0	74.8	4401.9	18.7	0.1	4418.7	0.9	0.4
H12	80.8	6.9	8.1	68.1	106.3	12.8	2.1	82.7	4402.7	19.6	0.1	4419.7	0.9	0.5
H13	78.9	7.2	8.5	65.4	102.8	13.5	2.2	77.7	4402.3	20.7	0.1	4420.7	1.0	0.5
H14	83.7	5.4	6.3	69.3	111.7	10.0	1.7	84.8	4402.9	15.3	0.1	4415.5	0.7	0.4
H15	84.2	5.8	6.8	65.4	112.6	10.7	1.8	77.5	4402.9	16.5	0.1	4416.5	0.8	0.4
H16	83.0	5.9	7.0	65.1	110.4	11.1	1.8	77.1	4402.8	17.0	0.1	4417.0	0.8	0.4
H17	82.0	5.0	5.9	67.5	108.6	9.3	1.6	81.5	4402.8	14.3	0.0	4414.5	0.7	0.3
H18	74.3	33.7	39.7	75.7	94.1	62.8	10.5	96.8	4402.2	96.3	0.3	4496.3	4.5	2.2
H19	73.4	33.5	39.4	75.5	92.5	62.5	10.4	96.5	4402.2	95.8	0.3	4495.8	4.5	2.2
H20	71.8	4.2	4.9	60.4	89.6	7.8	1.3	68.3	4402.1	11.9	0.0	4412.5	0.6	0.3

Receptor	Hourly NO_2				Hourly NO				Hourly CO				Hourly NH_3	
	Baseline (including existing TPP)	PC	PC as % of Standard	PEC (including retained TPP)	Baseline (including existing TPP)	PC	PC as % of Standard	PEC (including retained TPP)	Baseline (including existing TPP)	PC	PC as % of Standard	PEC (including retained TPP)	PC	PC as % of Standard
H21	72.9	4.5	5.3	60.7	91.5	8.3	1.4	68.9	4401.9	12.8	0.0	4413.4	0.6	0.3
H22	78.9	4.7	5.5	63.6	102.8	8.7	1.4	74.2	4402.6	13.3	0.0	4413.6	0.6	0.3
H23	72.9	3.7	4.4	59.5	91.7	6.9	1.2	66.6	4402.1	10.6	0.0	4410.6	0.5	0.2
H24	75.6	4.7	5.5	61.2	96.6	8.8	1.5	69.8	4402.3	13.4	0.0	4413.4	0.6	0.3
H25	74.1	4.4	5.2	60.9	93.8	8.3	1.4	69.3	4402.2	12.7	0.0	4412.7	0.6	0.3
H26	74.3	5.3	6.2	61.0	94.2	9.8	1.6	69.3	4402.2	15.1	0.1	4415.4	0.7	0.4
H27	92.3	8.3	9.7	77.4	127.8	15.4	2.6	100.0	4402.7	23.6	0.1	4423.6	1.1	0.6
H28	89.0	6.4	7.5	70.8	121.6	11.9	2.0	87.7	4402.6	18.3	0.1	4418.3	0.9	0.4
H29	81.1	5.9	7.0	65.1	106.8	11.0	1.8	77.0	4402.7	16.9	0.1	4417.4	0.8	0.4
H30	85.1	4.4	5.2	66.1	114.3	8.2	1.4	78.8	4403.0	12.6	0.0	4413.2	0.6	0.3
H31	80.9	4.1	4.8	64.2	106.6	7.7	1.3	75.4	4402.7	11.8	0.0	4411.8	0.5	0.3
H32	80.6	3.9	4.6	66.3	105.9	7.3	1.2	79.3	4402.7	11.1	0.0	4411.1	0.5	0.3
H33	83.8	3.7	4.3	67.5	111.9	6.8	1.1	81.6	4402.9	10.5	0.0	4410.5	0.5	0.2
H34	87.8	4.5	5.2	72.8	119.3	8.3	1.4	91.5	4403.2	12.7	0.0	4412.8	0.6	0.3
H35	84.8	6.7	7.9	67.1	113.8	12.5	2.1	80.7	4403.0	19.1	0.1	4419.4	0.9	0.4
H36	84.9	5.7	6.8	70.0	114.0	10.7	1.8	86.2	4403.0	16.4	0.1	4416.4	0.8	0.4
H37	78.4	5.2	6.1	62.8	101.9	9.7	1.6	72.8	4402.6	14.9	0.0	4414.9	0.7	0.3
H38	82.4	4.4	5.2	65.1	109.4	8.2	1.4	77.0	4402.8	12.6	0.0	4413.0	0.6	0.3
H39	75.3	4.4	5.1	60.7	96.1	8.1	1.4	68.8	4402.3	12.5	0.0	4412.5	0.6	0.3
H40	78.0	4.2	5.0	62.4	101.0	7.9	1.3	72.0	4402.0	12.1	0.0	4412.1	0.6	0.3
D1: Central Control Building	94.3	1.9	2.2	73.1	131.4	3.5	0.6	92.0	4403.6	5.3	0.0	4407.4	0.2	0.1
D2: Workshop Area	94.9	4.4	5.2	74.4	132.6	8.2	1.4	94.4	4403.7	12.6	0.0	4412.6	0.6	0.3
D3: Admin Building	95.9	8.3	9.8	78.1	134.5	15.6	2.6	101.2	4403.8	23.8	0.1	4423.9	1.1	0.6
D4: Social Building	95.9	8.0	9.4	78.1	134.4	15.0	2.5	101.3	4403.8	22.9	0.1	4422.9	1.1	0.5
D5: Gatehouse	96.0	8.5	10.0	77.8	134.6	15.8	2.6	100.8	4403.8	24.2	0.1	4424.2	1.1	0.6

Receptor	Hourly NO_2				Hourly NO				Hourly CO				Hourly NH_3	
	Baseline (including existing TPP)	PC	PC as % of Standard	PEC (including retained TPP)	Baseline (including existing TPP)	PC	PC as % of Standard	PEC (including retained TPP)	Baseline (including existing TPP)	PC	PC as % of Standard	PEC (including retained TPP)	PC	PC as % of Standard
Standard	85				600				5000				200	

Table C3: Maximum Predicted 8 Hour Mean Concentrations – Combined Cycle (μg/m³)

Receptor	8 Hour CO			
	Baseline (including existing TPP)	PC	PC as % of Standard	PEC (including retained TPP)
Residential Area A (H3)	4400.5	13.8	0.14	4413.9
Residential Area B (H1)	4400.4	18.7	0.19	4418.7
Residential Area C (H5)	4400.7	26.7	0.27	4426.7
Residential Area D (new homes)	4400.7	8.6	0.09	4408.6
Residential Area E (accommodation blocks (H8)	4400.9	9.5	0.10	4409.6
Military Barracks	4400.5	7.7	0.08	4407.7
Sirdarya TPP Receptor 1 (H2)	4400.0	11.8	0.12	4411.8
Sirdarya TPP Receptor 2 (H2)	4400.0	11.1	0.11	4411.1
H4	4400.4	7.0	0.07	4407.0
H6	4400.8	6.3	0.06	4406.4
H7	4400.8	7.8	0.08	4407.8
H9	4400.6	2.5	0.03	4402.8
H10	4400.6	4.0	0.04	4404.3
H11	4400.7	5.2	0.05	4405.6
H12	4400.6	6.5	0.06	4406.6
H13	4400.9	4.5	0.05	4405.0

Receptor	8 Hour CO			
	Baseline (including existing TPP)	PC	PC as % of Standard	PEC (including retained TPP)
H14	4400.9	4.4	0.04	4404.8
H15	4400.8	4.2	0.04	4404.5
H16	4400.7	3.7	0.04	4404.1
H17	4400.8	4.3	0.04	4404.5
H18	4400.7	16.4	0.16	4416.4
H19	4400.8	24.0	0.24	4424.0
H20	4400.9	3.2	0.03	4403.7
H21	4400.5	3.0	0.03	4403.1
H22	4400.4	3.3	0.03	4403.4
H23	4400.3	3.0	0.03	4403.1
H24	4401.1	4.7	0.05	4404.9
H25	4401.2	4.6	0.05	4404.9
H26	4400.8	4.5	0.04	4404.7
H27	4400.6	13.0	0.13	4413.0
H28	4400.9	5.4	0.05	4405.5
H29	4400.9	4.3	0.04	4404.5
H30	4400.9	3.9	0.04	4404.2
H31	4400.6	2.9	0.03	4403.0
H32	4400.6	2.8	0.03	4402.9
H33	4400.5	3.2	0.03	4403.2
H34	4400.7	3.5	0.04	4403.6
H35	4400.6	3.9	0.04	4403.9
H36	4400.7	4.2	0.04	4404.2
H37	4401.0	4.8	0.05	4405.0
H38	4400.4	3.0	0.03	4403.1

Receptor	8 Hour CO			
	Baseline (including existing TPP)	PC	PC as % of Standard	PEC (including retained TPP)
H39	4400.3	4.1	0.04	4404.1
H40	4400.5	4.6	0.05	4404.6
D1: Central Control Building	4400.5	0.8	0.01	4401.1
D2: Workshop Area	4400.5	5.2	0.05	4405.2
D3: Admin Building	4400.5	6.3	0.06	4406.3
D4: Social Building	4400.5	7.2	0.07	4407.2
D5: Gatehouse	4400.5	7.0	0.07	4407.1
Standard	10000			

Table C4: Maximum Predicted 24 Hour Mean Concentrations – Combined Cycle (μg/m^3)

Receptor	24 Hour NO_2				24 Hour NO				24 Hour CO				24 Hour NH_3	
	Baseline (including existing TPP)	PC	PC as % of Standard	PEC (including retained TPP)	Baseline (including existing TPP)	PC	PC as % of Standard	PEC (including retained TPP)	Baseline (including existing TPP)	PC	PC as % of Standard	PEC (including retained TPP)	PC	PC as % of Standard
Residential Area A (H3)	44.6	2.0	3.4	44.2	38.8	3.8	1.5	38.2	4400.2	5.8	0.1	4404.6	0.3	0.2
Residential Area B (H1)	43.8	4.5	7.4	46.5	37.4	8.3	3.3	42.3	4400.1	12.7	0.3	4412.7	0.6	0.5
Residential Area C (H5)	46.4	4.8	8.1	46.8	42.2	9.0	3.6	43.0	4400.3	13.8	0.3	4413.8	0.6	0.5
Residential Area D (new homes)	48.6	1.2	2.0	45.4	46.3	2.2	0.9	40.3	4400.4	3.4	0.1	4403.4	0.2	0.1
Residential Area E (accommodation blocks (H8)	48.6	1.9	3.2	45.6	46.3	3.6	1.4	40.6	4400.5	5.5	0.1	4405.5	0.3	0.2
Military Barracks	46.3	1.2	1.9	44.2	42.0	2.1	0.9	38.1	4400.3	3.3	0.1	4403.3	0.2	0.1
Sirdarya TPP Receptor 1 (H2)	42.0	2.1	3.5	44.1	34.1	3.9	1.6	37.9	4400.0	6.1	0.2	4406.1	0.3	0.2
Sirdarya TPP Receptor 2 (H2)	42.1	2.4	4.0	44.4	34.3	4.5	1.8	38.5	4400.0	6.9	0.2	4406.9	0.3	0.3
H4	44.5	1.1	1.8	44.1	38.7	2.0	0.8	37.9	4400.2	3.1	0.1	4403.1	0.1	0.1

Receptor	24 Hour NO_2				24 Hour NO				24 Hour CO				24 Hour NH_3	
	Baseline (including existing TPP)	PC	PC as % of Standard	PEC (including retained TPP)	Baseline (including existing TPP)	PC	PC as % of Standard	PEC (including retained TPP)	Baseline (including existing TPP)	PC	PC as % of Standard	PEC (including retained TPP)	PC	PC as % of Standard
H6	48.0	1.3	2.2	45.7	45.1	2.5	1.0	40.9	4400.4	3.8	0.1	4403.8	0.2	0.1
H7	48.0	1.6	2.7	45.5	45.1	3.0	1.2	40.5	4400.4	4.6	0.1	4404.6	0.2	0.2
H9	46.0	0.5	0.8	44.6	41.5	0.9	0.4	38.9	4400.3	1.4	0.0	4401.6	0.1	0.1
H10	45.4	0.7	1.1	44.4	40.3	1.2	0.5	38.5	4400.2	1.9	0.0	4402.0	0.1	0.1
H11	46.5	0.9	1.5	45.1	42.4	1.6	0.7	39.8	4400.3	2.5	0.1	4402.6	0.1	0.1
H12	47.3	1.5	2.5	45.8	43.8	2.8	1.1	41.0	4400.4	4.3	0.1	4404.4	0.2	0.2
H13	46.1	0.6	1.0	44.8	41.6	1.1	0.4	39.2	4400.3	1.7	0.0	4401.8	0.1	0.1
H14	48.9	0.8	1.4	46.1	46.9	1.6	0.6	41.6	4400.5	2.4	0.1	4402.5	0.1	0.1
H15	48.2	0.7	1.2	46.0	45.5	1.4	0.5	41.4	4400.4	2.1	0.1	4402.2	0.1	0.1
H16	47.0	0.7	1.1	45.4	43.4	1.3	0.5	40.3	4400.4	2.0	0.0	4402.1	0.1	0.1
H17	48.8	0.8	1.3	46.0	46.7	1.4	0.6	41.5	4400.5	2.1	0.1	4402.3	0.1	0.1
H18	47.6	3.3	5.6	46.3	44.4	6.2	2.5	42.0	4400.4	9.6	0.2	4409.6	0.4	0.4
H19	47.8	4.6	7.7	47.6	44.8	8.6	3.4	44.4	4400.4	13.1	0.3	4413.2	0.6	0.5
H20	46.3	0.4	0.6	44.7	42.0	0.7	0.3	39.1	4400.3	1.1	0.0	4401.3	0.1	0.0
H21	45.0	0.5	0.8	43.9	39.6	0.9	0.3	37.6	4400.2	1.3	0.0	4401.4	0.1	0.1
H22	43.9	0.4	0.6	43.2	37.5	0.7	0.3	36.2	4400.1	1.1	0.0	4401.2	0.1	0.0
H23	43.7	0.3	0.5	43.0	37.1	0.6	0.2	35.9	4400.1	0.9	0.0	4400.9	0.0	0.0
H24	49.8	0.8	1.3	47.1	48.5	1.5	0.6	43.5	4400.6	2.3	0.1	4402.3	0.1	0.1
H25	50.2	0.7	1.2	47.1	49.2	1.3	0.5	43.5	4400.6	2.0	0.1	4402.2	0.1	0.1
H26	47.6	0.9	1.4	45.2	44.4	1.6	0.6	39.9	4400.4	2.5	0.1	4402.5	0.1	0.1
H27	45.0	2.1	3.5	44.1	39.6	3.9	1.6	37.9	4400.2	6.0	0.1	4406.0	0.3	0.2
H28	49.3	1.2	1.9	46.1	47.6	2.2	0.9	41.7	4400.5	3.3	0.1	4403.4	0.2	0.1
H29	50.8	0.8	1.3	46.8	50.5	1.4	0.6	43.0	4400.6	2.2	0.1	4402.3	0.1	0.1
H30	48.3	0.6	1.0	45.6	45.8	1.2	0.5	40.7	4400.4	1.8	0.0	4401.8	0.1	0.1
H31	46.9	0.5	0.9	44.8	43.2	1.0	0.4	39.2	4400.3	1.5	0.0	4401.5	0.1	0.1

Receptor	24 Hour NO_2				24 Hour NO				24 Hour CO				24 Hour NH_3	
	Baseline (including existing TPP)	PC	PC as % of Standard	PEC (including retained TPP)	Baseline (including existing TPP)	PC	PC as % of Standard	PEC (including retained TPP)	Baseline (including existing TPP)	PC	PC as % of Standard	PEC (including retained TPP)	PC	PC as % of Standard
H32	47.1	0.5	0.8	44.9	43.5	0.9	0.4	39.5	4400.4	1.5	0.0	4401.5	0.1	0.1
H33	46.2	0.6	0.9	44.4	41.8	1.1	0.4	38.5	4400.3	1.6	0.0	4401.6	0.1	0.1
H34	48.1	0.5	0.8	45.6	45.3	0.9	0.4	40.7	4400.4	1.3	0.0	4401.5	0.1	0.1
H35	46.4	0.6	1.0	44.6	42.2	1.1	0.4	38.8	4400.3	1.7	0.0	4401.7	0.1	0.1
H36	46.5	0.6	1.0	44.9	42.4	1.1	0.4	39.5	4400.3	1.7	0.0	4401.8	0.1	0.1
H37	50.7	0.9	1.4	47.2	50.1	1.6	0.6	43.7	4400.6	2.4	0.1	4402.6	0.1	0.1
H38	44.1	0.4	0.6	43.2	37.9	0.7	0.3	36.3	4400.1	1.0	0.0	4401.0	0.0	0.0
H39	43.8	0.5	0.8	43.1	37.3	0.9	0.4	36.0	4400.1	1.4	0.0	4401.4	0.1	0.1
H40	44.1	0.5	0.9	43.6	38.0	1.0	0.4	36.9	4400.2	1.5	0.0	4401.5	0.1	0.1
D1: Central Control Building	45.3	0.1	0.2	43.7	40.1	0.2	0.1	37.1	4400.2	0.3	0.0	4400.4	0.0	0.0
D2: Workshop Area	44.7	0.6	1.0	43.6	39.1	1.1	0.5	37.1	4400.2	1.8	0.0	4401.8	0.1	0.1
D3: Admin Building	44.4	0.9	1.5	43.9	38.4	1.7	0.7	37.6	4400.2	2.6	0.1	4402.6	0.1	0.1
D4: Social Building	44.4	1.1	1.9	43.9	38.4	2.1	0.8	37.6	4400.2	3.2	0.1	4403.2	0.2	0.1
D5: Gatehouse	44.4	1.0	1.7	43.9	38.4	1.9	0.8	37.5	4400.2	2.9	0.1	4402.9	0.1	0.1
Standard	60				250				4000				120	

Table C5: Maximum Predicted Monthly Mean Concentrations – Combined Cycle (μg/m³)

Receptor	Monthly NO_2				Monthly NO				Monthly CO				Monthly NH_3	
	Baseline (including existing TPP)	PC	PC as % of Standard	PEC (including retained TPP)	Baseline (including existing TPP)	PC	PC as % of Standard	PEC (including retained TPP)	Baseline (including existing TPP)	PC	PC as % of Standard	PEC (including retained TPP)	PC	PC as % of Standard
Residential Area A (H3)	42.3	0.5	1.0	42.5	34.6	0.9	0.8	35.0	4400.0	1.4	0.04	4401.4	0.07	0.11
Residential Area B (H1)	42.2	1.3	2.5	43.3	34.3	2.4	2.0	36.4	4400.0	3.6	0.10	4403.6	0.17	0.28
Residential Area C (H5)	42.7	0.6	1.2	43.0	35.3	1.1	1.0	35.8	4400.0	1.7	0.05	4401.8	0.08	0.14

Receptor	Monthly NO_2				Monthly NO				Monthly CO				Monthly NH_3	
	Baseline (including existing TPP)	PC	PC as % of Standard	PEC (including retained TPP)	Baseline (including existing TPP)	PC	PC as % of Standard	PEC (including retained TPP)	Baseline (including existing TPP)	PC	PC as % of Standard	PEC (including retained TPP)	PC	PC as % of Standard
Residential Area D (new homes)	43.5	0.2	0.5	43.0	36.8	0.4	0.4	35.9	4400.1	0.7	0.02	4400.7	0.03	0.05
Residential Area E (accommodation blocks (H8)	43.4	0.4	0.8	43.0	36.6	0.7	0.6	35.9	4400.1	1.1	0.03	4401.2	0.05	0.09
Military Barracks	42.7	0.3	0.7	42.5	35.3	0.6	0.5	35.0	4400.0	1.0	0.03	4401.0	0.05	0.08
Sirdarya TPP Receptor 1 (H2)	42.0	0.6	1.1	42.6	34.0	1.0	0.9	35.0	4400.0	1.6	0.05	4401.6	0.07	0.12
Sirdarya TPP Receptor 2 (H2)	42.0	0.5	0.9	42.5	34.0	0.9	0.7	34.9	4400.0	1.3	0.04	4401.3	0.06	0.10
H4	42.3	0.3	0.5	42.4	34.6	0.5	0.4	34.7	4400.0	0.7	0.02	4400.7	0.03	0.06
H6	43.3	0.3	0.5	43.0	36.5	0.5	0.4	35.8	4400.1	0.8	0.02	4400.8	0.04	0.06
H7	43.2	0.3	0.7	43.0	36.3	0.6	0.5	35.8	4400.1	0.9	0.03	4401.0	0.04	0.07
H9	42.5	0.1	0.1	42.3	34.9	0.1	0.1	34.6	4400.0	0.2	0.01	4400.2	0.01	0.01
H10	42.6	0.1	0.2	42.4	35.1	0.2	0.1	34.7	4400.0	0.3	0.01	4400.3	0.01	0.02
H11	42.5	0.1	0.2	42.4	35.0	0.2	0.1	34.7	4400.0	0.3	0.01	4400.3	0.01	0.02
H12	42.7	0.2	0.4	42.6	35.4	0.3	0.3	35.1	4400.1	0.5	0.02	4400.6	0.02	0.04
H13	42.6	0.1	0.2	42.4	35.1	0.2	0.1	34.7	4400.0	0.2	0.01	4400.3	0.01	0.02
H14	43.3	0.2	0.3	42.8	36.5	0.3	0.2	35.5	4400.1	0.5	0.01	4400.5	0.02	0.04
H15	43.2	0.2	0.3	42.8	36.2	0.3	0.2	35.4	4400.1	0.4	0.01	4400.5	0.02	0.03
H16	43.0	0.1	0.3	42.6	35.9	0.2	0.2	35.2	4400.1	0.4	0.01	4400.4	0.02	0.03
H17	43.2	0.1	0.3	42.8	36.3	0.3	0.2	35.5	4400.1	0.4	0.01	4400.4	0.02	0.03
H18	42.9	0.4	0.8	42.7	35.7	0.7	0.6	35.3	4400.1	1.1	0.03	4401.1	0.05	0.09
H19	43.0	0.5	0.9	42.8	35.8	0.8	0.7	35.4	4400.1	1.3	0.04	4401.3	0.06	0.10
H20	42.5	0.1	0.1	42.3	35.0	0.1	0.1	34.6	4400.0	0.2	0.00	4400.2	0.01	0.01
H21	42.5	0.1	0.1	42.3	34.9	0.1	0.1	34.6	4400.0	0.2	0.00	4400.2	0.01	0.01
H22	42.3	0.1	0.1	42.2	34.5	0.1	0.1	34.3	4400.0	0.2	0.01	4400.2	0.01	0.01

Receptor	Monthly NO_2				Monthly NO				Monthly CO				Monthly NH_3	
	Baseline (including existing TPP)	PC	PC as % of Standard	PEC (including retained TPP)	Baseline (including existing TPP)	PC	PC as % of Standard	PEC (including retained TPP)	Baseline (including existing TPP)	PC	PC as % of Standard	PEC (including retained TPP)	PC	PC as % of Standard
H23	42.3	0.1	0.2	42.2	34.5	0.2	0.1	34.4	4400.0	0.2	0.01	4400.3	0.01	0.02
H24	43.1	0.2	0.4	42.8	36.0	0.4	0.3	35.4	4400.1	0.5	0.02	4400.6	0.03	0.04
H25	43.2	0.2	0.4	42.8	36.3	0.3	0.3	35.5	4400.1	0.5	0.02	4400.6	0.02	0.04
H26	43.7	0.2	0.4	43.1	37.1	0.4	0.3	36.0	4400.1	0.6	0.02	4400.6	0.03	0.05
H27	42.5	0.7	1.5	42.8	34.8	1.4	1.1	35.5	4400.0	2.1	0.06	4402.1	0.10	0.16
H28	44.7	0.3	0.7	43.7	39.1	0.6	0.5	37.1	4400.2	0.9	0.03	4401.0	0.04	0.07
H29	44.3	0.2	0.5	43.4	38.2	0.4	0.4	36.6	4400.2	0.6	0.02	4400.7	0.03	0.05
H30	43.7	0.2	0.3	43.0	37.2	0.3	0.2	35.9	4400.1	0.5	0.01	4400.5	0.02	0.04
H31	43.5	0.1	0.2	42.9	36.9	0.2	0.2	35.7	4400.1	0.3	0.01	4400.4	0.02	0.03
H32	43.7	0.1	0.3	43.0	37.1	0.2	0.2	35.9	4400.1	0.4	0.01	4400.4	0.02	0.03
H33	43.5	0.1	0.2	42.9	36.8	0.2	0.2	35.6	4400.1	0.3	0.01	4400.4	0.02	0.03
H34	44.1	0.2	0.3	43.2	37.9	0.3	0.2	36.3	4400.1	0.4	0.01	4400.5	0.02	0.03
H35	43.1	0.1	0.3	42.7	36.0	0.3	0.2	35.3	4400.1	0.4	0.01	4400.5	0.02	0.03
H36	43.0	0.2	0.3	42.6	35.8	0.3	0.3	35.2	4400.1	0.5	0.01	4400.5	0.02	0.04
H37	44.1	0.3	0.5	43.3	37.9	0.5	0.4	36.5	4400.1	0.7	0.02	4400.8	0.03	0.06
H38	42.3	0.1	0.2	42.2	34.6	0.2	0.1	34.4	4400.0	0.2	0.01	4400.2	0.01	0.02
H39	42.3	0.1	0.2	42.3	34.6	0.2	0.2	34.5	4400.0	0.3	0.01	4400.3	0.01	0.02
H40	42.4	0.1	0.2	42.3	34.8	0.2	0.2	34.6	4400.0	0.3	0.01	4400.3	0.02	0.03
D1: Central Control Building	42.5	0.0	0.0	42.3	35.0	0.0	0.0	34.5	4400.0	0.0	0.00	4400.1	0.00	0.00
D2: Workshop Area	42.5	0.1	0.3	42.4	34.9	0.2	0.2	34.7	4400.0	0.4	0.01	4400.4	0.02	0.03
D3: Admin Building	42.4	0.3	0.7	42.4	34.8	0.6	0.5	34.8	4400.0	0.9	0.03	4400.9	0.04	0.07
D4: Social Building	42.4	0.3	0.6	42.4	34.8	0.6	0.5	34.8	4400.0	0.9	0.03	4400.9	0.04	0.07
D5: Gatehouse	42.5	0.3	0.6	42.5	34.9	0.6	0.5	34.9	4400.0	0.9	0.03	4400.9	0.04	0.07
Standard	50				120				3500				60	

Scenario Two (Simple Cycle)

Table C6: Maximum Predicted Hourly Mean Concentrations – Simple Cycle (μg/m³)

Receptor	Hourly NO_2				Hourly NO				Hourly CO				Hourly NH_3	
	Baseline (including existing TPP)	PC	PC as % of Standard	PEC (including retained TPP)	Baseline (including existing TPP)	PC	PC as % of Standard	PEC (including retained TPP)	Baseline (including existing TPP)	PC	PC as % of Standard	PEC (including retained TPP)	PC	PC as % of Standard
Residential Area A (H3)	82.8	1.8	2.1	69.0	110.0	3.3	0.6	84.3	4402.7	5.1	0.1	4406.5	0.24	0.12
Residential Area B (H1)	83.1	3.1	3.6	68.8	110.6	5.7	1.0	83.9	4402.3	8.8	0.2	4408.8	0.41	0.20
Residential Area C (H5)	84.2	1.4	1.7	64.5	112.7	2.6	0.4	75.9	4402.6	4.0	0.1	4409.0	0.19	0.09
Residential Area D (new homes)	91.0	1.6	1.9	69.4	125.4	3.0	0.5	85.0	4402.8	4.7	0.1	4406.5	0.22	0.11
Residential Area E (accommodation blocks (H8)	87.6	1.6	1.9	66.7	119.0	3.0	0.5	79.9	4402.7	4.7	0.1	4406.3	0.22	0.11
Military Barracks	95.0	1.6	1.9	73.9	132.8	3.1	0.5	93.4	4402.8	4.7	0.1	4406.8	0.22	0.11
Sirdarya TPP Receptor 1 (H2)	42.7	1.7	2.0	43.7	35.4	3.1	0.5	37.2	4400.1	4.8	0.1	4404.8	0.22	0.11
Sirdarya TPP Receptor 2 (H2)	45.3	1.6	1.9	47.7	40.1	3.1	0.5	44.6	4400.2	4.7	0.1	4405.0	0.22	0.11
H4	80.5	1.6	1.9	64.0	105.7	3.0	0.5	75.1	4402.4	4.5	0.1	4406.0	0.21	0.11
H6	85.5	1.4	1.6	66.4	115.0	2.6	0.4	79.4	4403.0	4.0	0.1	4405.2	0.19	0.09
H7	81.1	1.5	1.8	64.2	106.9	2.9	0.5	75.4	4402.7	4.4	0.1	4405.7	0.21	0.10
H9	79.3	1.6	1.9	66.8	103.4	3.0	0.5	80.3	4402.6	4.6	0.1	4406.2	0.21	0.11
H10	76.0	1.6	1.9	64.7	97.4	3.0	0.5	76.2	4402.4	4.5	0.1	4406.0	0.21	0.11
H11	73.1	1.3	1.5	61.3	91.9	2.3	0.4	69.9	4401.9	3.6	0.1	4404.7	0.17	0.08
H12	80.8	1.5	1.8	65.8	106.3	2.8	0.5	78.4	4402.7	4.3	0.1	4405.6	0.20	0.10
H13	78.9	1.6	1.9	63.6	102.8	3.0	0.5	74.3	4402.3	4.6	0.1	4406.0	0.21	0.11
H14	83.7	1.8	2.2	67.7	111.7	3.4	0.6	82.0	4402.9	5.2	0.1	4406.4	0.24	0.12
H15	84.2	1.7	2.0	64.8	112.6	3.2	0.5	76.5	4402.9	4.9	0.1	4406.2	0.23	0.11
H16	83.0	1.5	1.8	64.4	110.4	2.8	0.5	75.8	4402.8	4.3	0.1	4405.3	0.20	0.10
H17	82.0	1.8	2.2	66.1	108.6	3.4	0.6	78.8	4402.8	5.2	0.1	4406.3	0.24	0.12

Receptor	Hourly NO_2				Hourly NO				Hourly CO				Hourly NH_3	
	Baseline (including existing TPP)	PC	PC as % of Standard	PEC (including retained TPP)	Baseline (including existing TPP)	PC	PC as % of Standard	PEC (including retained TPP)	Baseline (including existing TPP)	PC	PC as % of Standard	PEC (including retained TPP)	PC	PC as % of Standard
H18	74.3	3.2	3.8	60.3	94.1	6.0	1.0	68.2	4402.2	9.2	0.2	4409.2	0.43	0.21
H19	73.4	3.3	3.8	60.1	92.5	6.1	1.0	67.8	4402.2	9.3	0.2	4409.3	0.43	0.22
H20	71.8	1.3	1.5	59.2	89.6	2.3	0.4	66.0	4402.1	3.6	0.1	4404.7	0.17	0.08
H21	72.9	1.4	1.6	59.6	91.5	2.6	0.4	66.8	4401.9	4.0	0.1	4405.1	0.18	0.09
H22	78.9	1.3	1.6	62.6	102.8	2.5	0.4	72.3	4402.6	3.8	0.1	4405.2	0.18	0.09
H23	72.9	1.2	1.4	59.0	91.7	2.2	0.4	65.7	4402.1	3.4	0.1	4404.3	0.16	0.08
H24	75.6	1.4	1.6	60.8	96.6	2.5	0.4	68.9	4402.3	3.9	0.1	4404.4	0.18	0.09
H25	74.1	1.3	1.6	60.4	93.8	2.5	0.4	68.2	4402.2	3.8	0.1	4404.4	0.18	0.09
H26	74.3	1.5	1.8	60.4	94.2	2.8	0.5	68.3	4402.2	4.3	0.1	4405.0	0.20	0.10
H27	92.3	1.7	2.0	75.8	127.8	3.2	0.5	96.9	4402.7	4.9	0.1	4406.8	0.23	0.11
H28	89.0	1.6	1.8	69.9	121.6	2.9	0.5	86.1	4402.6	4.4	0.1	4405.2	0.21	0.10
H29	81.1	1.5	1.7	64.7	106.8	2.7	0.5	76.3	4402.7	4.2	0.1	4405.2	0.20	0.10
H30	85.1	1.5	1.7	65.5	114.3	2.7	0.5	77.8	4403.0	4.2	0.1	4404.8	0.19	0.10
H31	80.9	1.3	1.5	63.6	106.6	2.3	0.4	74.2	4402.7	3.6	0.1	4405.0	0.17	0.08
H32	80.6	1.4	1.6	65.2	105.9	2.5	0.4	77.2	4402.7	3.9	0.1	4405.5	0.18	0.09
H33	83.8	1.3	1.5	66.4	111.9	2.4	0.4	79.5	4402.9	3.7	0.1	4405.3	0.17	0.09
H34	87.8	1.6	1.8	71.4	119.3	2.9	0.5	88.8	4403.2	4.5	0.1	4406.4	0.21	0.10
H35	84.8	1.5	1.7	66.2	113.8	2.7	0.5	79.2	4403.0	4.1	0.1	4405.3	0.19	0.10
H36	84.9	1.7	2.0	69.3	114.0	3.2	0.5	84.9	4403.0	4.9	0.1	4405.6	0.23	0.11
H37	78.4	1.5	1.7	61.9	101.9	2.7	0.5	71.1	4402.6	4.2	0.1	4404.7	0.20	0.10
H38	82.4	1.4	1.6	64.3	109.4	2.5	0.4	75.6	4402.8	3.9	0.1	4404.7	0.18	0.09
H39	75.3	1.3	1.5	60.3	96.1	2.4	0.4	68.0	4402.3	3.7	0.1	4404.6	0.17	0.09
H40	78.0	1.6	1.8	61.8	101.0	2.9	0.5	70.9	4402.0	4.5	0.1	4405.6	0.21	0.10
D1: Central Control Building	94.3	0.6	0.8	71.3	131.4	1.2	0.2	88.7	4403.6	1.8	0.0	4402.4	0.09	0.04
D2: Workshop Area	94.9	0.6	0.7	72.3	132.6	1.2	0.2	90.5	4403.7	1.8	0.0	4402.5	0.08	0.04

Receptor	Hourly NO_2				Hourly NO				Hourly CO				Hourly NH_3	
	Baseline (including existing TPP)	PC	PC as % of Standard	PEC (including retained TPP)	Baseline (including existing TPP)	PC	PC as % of Standard	PEC (including retained TPP)	Baseline (including existing TPP)	PC	PC as % of Standard	PEC (including retained TPP)	PC	PC as % of Standard
D3: Admin Building	95.9	1.2	1.4	74.4	134.5	2.2	0.4	94.3	4403.8	3.3	0.1	4403.7	0.16	0.08
D4: Social Building	95.9	1.1	1.2	74.5	134.4	2.0	0.3	94.5	4403.8	3.0	0.1	4403.6	0.14	0.07
D5: Gatehouse	96.0	1.1	1.3	74.1	134.6	2.0	0.3	93.9	4403.8	3.1	0.1	4403.6	0.14	0.07
Standard	85				600				5000				200	

Table C7: Maximum Predicted 8 Hour Mean Concentrations – Simple Cycle ($\mu g/m^3$)

Receptor	8 Hour CO			
	Baseline (including existing TPP)	PC	PC as % of Standard	PEC (including retained TPP)
Residential Area A (H3)	4400.5	2.3	0.02	4402.3
Residential Area B (H1)	4400.4	3.1	0.03	4403.1
Residential Area C (H5)	4400.7	2.8	0.03	4402.8
Residential Area D (new homes)	4400.7	0.8	0.01	4401.1
Residential Area E (accommodation blocks (H8)	4400.9	1.7	0.02	4401.8
Military Barracks	4400.5	1.2	0.01	4401.2
Sirdarya TPP Receptor 1 (H2)	4400.0	2.1	0.02	4402.1
Sirdarya TPP Receptor 2 (H2)	4400.0	1.6	0.02	4401.6
H4	4400.4	1.4	0.01	4401.5
H6	4400.8	1.3	0.01	4401.5
H7	4400.8	1.5	0.01	4401.6
H9	4400.6	0.8	0.01	4401.1
H10	4400.6	1.1	0.01	4401.4

Receptor	8 Hour CO			
	Baseline (including existing TPP)	PC	PC as % of Standard	PEC (including retained TPP)
H11	4400.7	1.3	0.01	4401.7
H12	4400.6	1.6	0.02	4401.7
H13	4400.9	1.2	0.01	4401.6
H14	4400.9	1.7	0.02	4402.1
H15	4400.8	1.7	0.02	4402.0
H16	4400.7	1.4	0.01	4401.8
H17	4400.8	1.8	0.02	4402.2
H18	4400.7	2.1	0.02	4402.3
H19	4400.8	2.5	0.03	4402.5
H20	4400.9	1.5	0.02	4402.0
H21	4400.5	0.8	0.01	4401.0
H22	4400.4	0.6	0.01	4400.8
H23	4400.3	0.9	0.01	4401.0
H24	4401.1	1.7	0.02	4402.2
H25	4401.2	1.6	0.02	4401.9
H26	4400.8	1.5	0.01	4401.8
H27	4400.6	2.1	0.02	4402.1
H28	4400.9	1.4	0.01	4401.6
H29	4400.9	1.4	0.01	4401.8
H30	4400.9	1.5	0.02	4402.0
H31	4400.6	1.0	0.01	4401.2
H32	4400.6	1.0	0.01	4401.2
H33	4400.5	0.9	0.01	4401.1
H34	4400.7	1.0	0.01	4401.3
H35	4400.6	0.9	0.01	4401.2

Receptor	8 Hour CO			
	Baseline (including existing TPP)	PC	PC as % of Standard	PEC (including retained TPP)
H36	4400.7	1.4	0.01	4401.7
H37	4401.0	1.7	0.02	4402.0
H38	4400.4	0.9	0.01	4401.0
H39	4400.3	1.1	0.01	4401.3
H40	4400.5	1.1	0.01	4401.3
D1: Central Control Building	4400.5	0.2	0.00	4400.5
D2: Workshop Area	4400.5	0.5	0.01	4400.5
D3: Admin Building	4400.5	1.3	0.01	4401.3
D4: Social Building	4400.5	1.3	0.01	4401.3
D5: Gatehouse	4400.5	1.0	0.01	4401.0
Standard	10000			

Table C8: Maximum Predicted 24 Hour Mean Concentrations – Simple Cycle (μg/m^3)

Receptor	24 Hour NO_2				24 Hour NO				24 Hour CO				24 Hour NH_3	
	Baseline (including existing TPP)	PC	PC as % of Standard	PEC (including retained TPP)	Baseline (including existing TPP)	PC	PC as % of Standard	PEC (including retained TPP)	Baseline (including existing TPP)	PC	PC as % of Standard	PEC (including retained TPP)	PC	PC as % of Standard
Residential Area A (H3)	44.6	0.3	0.5	43.6	38.8	0.6	0.2	37.0	4400.2	0.9	0.02	4400.9	0.04	0.03
Residential Area B (H1)	43.8	0.7	1.1	43.2	37.4	1.2	0.5	36.3	4400.1	1.9	0.05	4401.9	0.09	0.07
Residential Area C (H5)	46.4	0.4	0.7	44.1	42.2	0.8	0.3	38.0	4400.3	1.2	0.03	4401.2	0.05	0.05
Residential Area D (new homes)	48.6	0.0	0.0	45.5	46.3	0.0	0.0	40.5	4400.4	0.0	0.00	4400.4	0.00	0.00
Residential Area E (accommodation blocks (H8)	48.6	0.3	0.5	45.3	46.3	0.5	0.2	40.2	4400.5	0.8	0.02	4400.9	0.04	0.03
Military Barracks	46.3	0.1	0.2	43.6	42.0	0.3	0.1	37.0	4400.3	0.4	0.01	4400.4	0.02	0.02

Receptor	24 Hour NO_2				24 Hour NO				24 Hour CO				24 Hour NH_3	
	Baseline (including existing TPP)	PC	PC as % of Standard	PEC (including retained TPP)	Baseline (including existing TPP)	PC	PC as % of Standard	PEC (including retained TPP)	Baseline (including existing TPP)	PC	PC as % of Standard	PEC (including retained TPP)	PC	PC as % of Standard
Sirdarya TPP Receptor 1 (H2)	42.0	0.4	0.6	42.4	34.1	0.7	0.3	34.7	4400.0	1.0	0.03	4401.0	0.05	0.04
Sirdarya TPP Receptor 2 (H2)	42.1	0.4	0.6	42.4	34.3	0.7	0.3	34.7	4400.0	1.0	0.03	4401.0	0.05	0.04
H4	44.5	0.2	0.3	43.5	38.7	0.3	0.1	36.8	4400.2	0.5	0.01	4400.5	0.02	0.02
H6	48.0	0.2	0.4	45.2	45.1	0.4	0.2	39.9	4400.4	0.6	0.02	4400.7	0.03	0.03
H7	48.0	0.3	0.4	45.2	45.1	0.5	0.2	39.9	4400.4	0.7	0.02	4400.8	0.03	0.03
H9	46.0	0.2	0.3	44.3	41.5	0.3	0.1	38.3	4400.3	0.5	0.01	4400.6	0.02	0.02
H10	45.4	0.2	0.3	43.9	40.3	0.3	0.1	37.6	4400.2	0.5	0.01	4400.7	0.02	0.02
H11	46.5	0.2	0.3	44.5	42.4	0.4	0.1	38.6	4400.3	0.6	0.01	4400.7	0.03	0.02
H12	47.3	0.3	0.4	44.9	43.8	0.5	0.2	39.5	4400.4	0.7	0.02	4400.8	0.03	0.03
H13	46.1	0.1	0.2	44.4	41.6	0.3	0.1	38.4	4400.3	0.4	0.01	4400.6	0.02	0.02
H14	48.9	0.3	0.5	45.8	46.9	0.5	0.2	41.1	4400.5	0.8	0.02	4401.1	0.04	0.03
H15	48.2	0.3	0.5	45.5	45.5	0.5	0.2	40.5	4400.4	0.8	0.02	4401.0	0.04	0.03
H16	47.0	0.3	0.4	44.9	43.4	0.5	0.2	39.5	4400.4	0.7	0.02	4400.9	0.03	0.03
H17	48.8	0.3	0.5	45.8	46.7	0.6	0.2	41.0	4400.5	0.9	0.02	4401.1	0.04	0.04
H18	47.6	0.4	0.6	45.2	44.4	0.7	0.3	39.9	4400.4	1.1	0.03	4401.2	0.05	0.04
H19	47.8	0.5	0.8	45.3	44.8	0.9	0.4	40.1	4400.4	1.4	0.04	4401.5	0.07	0.06
H20	46.3	0.2	0.3	44.5	42.0	0.3	0.1	38.7	4400.3	0.5	0.01	4400.7	0.02	0.02
H21	45.0	0.1	0.2	43.8	39.6	0.2	0.1	37.3	4400.2	0.4	0.01	4400.5	0.02	0.01
H22	43.9	0.1	0.1	43.1	37.5	0.1	0.1	36.0	4400.1	0.2	0.01	4400.3	0.01	0.01
H23	43.7	0.1	0.2	42.9	37.1	0.2	0.1	35.7	4400.1	0.3	0.01	4400.3	0.01	0.01
H24	49.8	0.3	0.5	46.8	48.5	0.6	0.2	42.9	4400.6	0.9	0.02	4401.0	0.04	0.04
H25	50.2	0.3	0.5	46.9	49.2	0.6	0.2	43.2	4400.6	0.9	0.02	4401.0	0.04	0.03
H26	47.6	0.3	0.4	45.0	44.4	0.5	0.2	39.7	4400.4	0.8	0.02	4400.9	0.04	0.03
H27	45.0	0.4	0.6	43.7	39.6	0.7	0.3	37.1	4400.2	1.0	0.03	4401.0	0.05	0.04

Receptor	24 Hour NO_2				24 Hour NO				24 Hour CO				24 Hour NH_3	
	Baseline (including existing TPP)	PC	PC as % of Standard	PEC (including retained TPP)	Baseline (including existing TPP)	PC	PC as % of Standard	PEC (including retained TPP)	Baseline (including existing TPP)	PC	PC as % of Standard	PEC (including retained TPP)	PC	PC as % of Standard
H28	49.3	0.3	0.5	45.7	47.6	0.6	0.2	40.9	4400.5	0.9	0.02	4401.0	0.04	0.03
H29	50.8	0.2	0.3	46.7	50.5	0.4	0.1	42.7	4400.6	0.6	0.01	4400.8	0.03	0.02
H30	48.3	0.2	0.3	45.5	45.8	0.3	0.1	40.4	4400.4	0.5	0.01	4400.7	0.02	0.02
H31	46.9	0.2	0.3	44.7	43.2	0.3	0.1	39.0	4400.3	0.5	0.01	4400.6	0.02	0.02
H32	47.1	0.2	0.3	44.8	43.5	0.3	0.1	39.3	4400.4	0.5	0.01	4400.6	0.02	0.02
H33	46.2	0.2	0.3	44.3	41.8	0.3	0.1	38.4	4400.3	0.4	0.01	4400.6	0.02	0.02
H34	48.1	0.2	0.3	45.4	45.3	0.3	0.1	40.4	4400.4	0.5	0.01	4400.7	0.02	0.02
H35	46.4	0.2	0.3	44.5	42.2	0.3	0.1	38.6	4400.3	0.4	0.01	4400.5	0.02	0.02
H36	46.5	0.2	0.3	44.7	42.4	0.3	0.1	39.0	4400.3	0.5	0.01	4400.6	0.02	0.02
H37	50.7	0.3	0.4	46.8	50.1	0.5	0.2	42.9	4400.6	0.7	0.02	4401.1	0.03	0.03
H38	44.1	0.1	0.2	43.2	37.9	0.2	0.1	36.1	4400.1	0.3	0.01	4400.3	0.01	0.01
H39	43.8	0.1	0.2	43.0	37.3	0.3	0.1	35.8	4400.1	0.4	0.01	4400.4	0.02	0.01
H40	44.1	0.1	0.2	43.3	38.0	0.3	0.1	36.4	4400.2	0.4	0.01	4400.5	0.02	0.02
D1: Central Control Building	45.3	0.1	0.1	43.7	40.1	0.1	0.0	37.1	4400.2	0.2	0.00	4400.2	0.01	0.01
D2: Workshop Area	44.7	0.1	0.1	43.4	39.1	0.1	0.0	36.5	4400.2	0.2	0.00	4400.2	0.01	0.01
D3: Admin Building	44.4	0.2	0.3	43.4	38.4	0.3	0.1	36.7	4400.2	0.4	0.01	4400.4	0.02	0.02
D4: Social Building	44.4	0.2	0.3	43.4	38.4	0.4	0.1	36.7	4400.2	0.6	0.01	4400.6	0.03	0.02
D5: Gatehouse	44.4	0.1	0.2	43.4	38.4	0.2	0.1	36.7	4400.2	0.4	0.01	4400.4	0.02	0.01
Standard	60				250				4000				120	

Scenario Three - Additional IFC Plant (Combined Cycle)

Table C9: Maximum Predicted Long Term (Annual) Concentrations – Combined Cycle (μg/m³)

Receptor	Annual NO_2				Annual NO				Annual CO			
	Baseline (including existing TPP)	PC	PC as % of Standard	PEC (including retained TPP)	Baseline (including existing TPP)	PC	PC as % of Standard	PEC (including retained TPP)	Baseline (including existing TPP)	PC	PC as % of Standard	PEC (including retained TPP)
Residential Area A (H3)	21.2	1.4	3.5	22.5	17.2	1.3	2.2	18.4	2200.01	2.0	0.07	2202.02
Residential Area B (H1)	21.2	1.7	4.2	22.8	17.2	1.6	2.6	18.6	2200.01	2.4	0.08	2202.42
Residential Area C (H5)	21.5	1.2	2.9	22.4	17.5	1.1	1.8	18.3	2200.02	1.7	0.06	2201.67
Residential Area D (new homes)	21.8	0.6	1.4	22.0	17.8	0.5	0.9	17.9	2200.03	0.8	0.03	2200.82
Residential Area E (accommodation blocks (H8)	21.8	0.9	2.2	22.2	17.8	0.8	1.4	18.2	2200.03	1.2	0.04	2201.26
H4	21.2	0.7	1.6	21.8	17.2	0.6	1.0	17.7	2200.01	0.9	0.03	2200.94
H6	21.9	0.7	1.9	22.2	17.8	0.7	1.2	18.1	2200.03	1.1	0.04	2201.07
H7	21.8	0.8	2.1	22.2	17.7	0.8	1.3	18.1	2200.03	1.2	0.04	2201.22
H9	21.3	0.1	0.3	21.3	17.3	0.1	0.2	17.3	2200.01	0.2	0.01	2200.18
H10	21.4	0.1	0.4	21.3	17.4	0.1	0.2	17.3	2200.01	0.2	0.01	2200.22
H11	21.5	0.2	0.6	21.5	17.4	0.2	0.4	17.4	2200.02	0.3	0.01	2200.34
H12	21.6	0.4	1.0	21.7	17.5	0.4	0.6	17.6	2200.02	0.6	0.02	2200.58
H13	21.4	0.2	0.5	21.4	17.4	0.2	0.3	17.4	2200.02	0.3	0.01	2200.30
H14	22.4	0.5	1.3	22.2	18.3	0.5	0.8	18.1	2200.05	0.7	0.02	2200.75
H15	22.1	0.5	1.2	22.1	18.0	0.5	0.8	18.0	2200.04	0.7	0.02	2200.73
H16	21.9	0.4	1.0	21.9	17.8	0.4	0.6	17.8	2200.03	0.6	0.02	2200.61
H17	22.3	0.5	1.2	22.1	18.2	0.4	0.7	18.1	2200.05	0.7	0.02	2200.69
H18	22.0	0.8	2.0	22.3	17.9	0.8	1.3	18.2	2200.03	1.2	0.04	2201.18
H19	22.1	0.9	2.2	22.3	18.0	0.8	1.3	18.2	2200.04	1.2	0.04	2201.25
H20	21.3	0.2	0.4	21.3	17.3	0.1	0.2	17.3	2200.01	0.2	0.01	2200.23
H21	21.3	0.1	0.3	21.3	17.3	0.1	0.2	17.3	2200.01	0.2	0.01	2200.19

Receptor	Annual NO_2				Annual NO				Annual CO			
	Baseline (including existing TPP)	PC	PC as % of Standard	PEC (including retained TPP)	Baseline (including existing TPP)	PC	PC as % of Standard	PEC (including retained TPP)	Baseline (including existing TPP)	PC	PC as % of Standard	PEC (including retained TPP)
H22	21.2	0.1	0.3	21.2	17.2	0.1	0.2	17.2	2200.01	0.2	0.01	2200.19
H23	21.3	0.2	0.4	21.3	17.3	0.2	0.3	17.3	2200.01	0.2	0.01	2200.25
H24	22.3	0.7	1.8	22.4	18.2	0.7	1.1	18.3	2200.04	1.0	0.03	2201.05
H25	22.6	0.7	1.8	22.5	18.4	0.7	1.1	18.4	2200.05	1.0	0.03	2201.06
H26	23.2	0.8	1.9	22.8	19.0	0.7	1.2	18.7	2200.08	1.1	0.04	2201.13
H27	21.4	1.3	3.3	22.5	17.4	1.2	2.1	18.4	2200.01	1.9	0.06	2201.89
H28	22.4	0.5	1.3	22.2	18.3	0.5	0.8	18.1	2200.05	0.7	0.02	2200.75
H29	23.4	0.7	1.7	22.9	19.2	0.6	1.1	18.8	2200.08	1.0	0.03	2201.02
H30	23.1	0.6	1.6	22.7	18.9	0.6	1.0	18.6	2200.07	0.9	0.03	2200.94
H31	22.3	0.4	1.1	22.1	18.2	0.4	0.7	18.0	2200.05	0.6	0.02	2200.63
H32	22.3	0.4	1.0	22.1	18.2	0.4	0.6	18.0	2200.05	0.6	0.02	2200.62
H33	22.0	0.4	0.9	21.9	17.9	0.3	0.6	17.8	2200.03	0.5	0.02	2200.55
H34	22.2	0.4	1.0	22.0	18.1	0.4	0.6	17.9	2200.04	0.6	0.02	2200.60
H35	21.8	0.3	0.8	21.7	17.7	0.3	0.5	17.7	2200.03	0.4	0.01	2200.46
H36	22.1	0.4	0.9	21.9	18.0	0.3	0.6	17.9	2200.04	0.5	0.02	2200.54
H37	23.3	0.8	2.0	22.9	19.2	0.8	1.3	18.8	2200.08	1.2	0.04	2201.19
H38	21.3	0.2	0.4	21.3	17.2	0.2	0.3	17.3	2200.01	0.2	0.01	2200.24
H39	21.3	0.2	0.5	21.4	17.3	0.2	0.3	17.3	2200.01	0.3	0.01	2200.32
H40	21.4	0.3	0.7	21.5	17.4	0.3	0.5	17.5	2200.01	0.4	0.01	2200.42
Standard	40				60				3000			

Table C10: Maximum Predicted Hourly Mean Concentrations – Combined Cycle (μg/m³)

Receptor	Hourly NO_2				Hourly NO				Hourly CO			
	Baseline (including existing TPP)	PC	PC as % of Standard	PEC (including retained TPP)	Baseline (including existing TPP)	PC	PC as % of Standard	PEC (including retained TPP)	Baseline (including existing TPP)	PC	PC as % of Standard	PEC (including retained TPP)
Residential Area A (H3)	82.8	20.6	24.3	75.3	110.0	38.5	6.4	96.1	4402.7	59.0	1.2	4459.0
Residential Area B (H1)	83.1	27.1	31.9	80.4	110.6	50.5	8.4	105.6	4402.3	77.5	1.6	4477.5
Residential Area C (H5)	84.2	28.4	33.4	76.2	112.7	52.8	8.8	97.7	4402.6	81.0	1.6	4481.0
Residential Area D (new homes)	91.0	15.2	17.9	78.3	125.4	28.3	4.7	101.7	4402.8	43.4	0.9	4443.4
Residential Area E (accommodation blocks (H8)	87.6	15.3	18.1	76.0	119.0	28.6	4.8	97.4	4402.7	43.9	0.9	4443.9
Military Barracks	95.0	15.2	17.9	81.5	132.8	28.4	4.7	107.6	4402.8	43.6	0.9	4443.6
Sirdarya TPP Receptor 1 (H2)	42.7	17.7	20.8	59.7	35.4	32.9	5.5	67.0	4400.1	50.5	1.0	4450.5
Sirdarya TPP Receptor 2 (H2)	45.3	15.3	18.0	57.3	40.1	28.6	4.8	62.6	4400.2	43.8	0.9	4443.8
H4	80.5	13.7	16.2	71.5	105.7	25.6	4.3	89.0	4402.4	39.2	0.8	4439.3
H6	85.5	15.4	18.1	69.0	115.0	28.6	4.8	84.3	4403.0	43.9	0.9	4443.9
H7	81.1	15.0	17.7	68.3	106.9	28.0	4.7	83.1	4402.7	43.0	0.9	4443.0
H9	79.3	13.7	16.1	74.7	103.4	25.5	4.2	94.9	4402.6	39.1	0.8	4439.5
H10	76.0	13.4	15.7	72.2	97.4	24.9	4.1	90.2	4402.4	38.2	0.8	4438.3
H11	73.1	14.7	17.2	69.6	91.9	27.3	4.6	85.5	4401.9	41.9	0.8	4442.1
H12	80.8	15.0	17.6	73.0	106.3	27.9	4.7	91.7	4402.7	42.8	0.9	4442.8
H13	78.9	13.3	15.6	70.7	102.8	24.8	4.1	87.6	4402.3	38.0	0.8	4438.3
H14	83.7	13.3	15.7	73.9	111.7	24.9	4.1	93.4	4402.9	38.1	0.8	4438.3
H15	84.2	14.4	17.0	69.5	112.6	26.9	4.5	85.3	4402.9	41.3	0.8	4441.3
H16	83.0	14.8	17.4	67.7	110.4	27.6	4.6	81.9	4402.8	42.3	0.8	4442.4
H17	82.0	12.5	14.7	72.0	108.6	23.3	3.9	89.9	4402.8	35.7	0.7	4435.9
H18	74.3	82.0	96.5	124.0	94.1	152.8	25.5	186.8	4402.2	234.4	4.7	4634.4
H19	73.4	83.2	97.9	125.2	92.5	155.0	25.8	189.0	4402.2	237.8	4.8	4637.8
H20	71.8	10.3	12.1	63.8	89.6	19.1	3.2	74.6	4402.1	29.3	0.6	4429.9

Receptor	Hourly NO_2				Hourly NO				Hourly CO			
	Baseline (including existing TPP)	PC	PC as % of Standard	PEC (including retained TPP)	Baseline (including existing TPP)	PC	PC as % of Standard	PEC (including retained TPP)	Baseline (including existing TPP)	PC	PC as % of Standard	PEC (including retained TPP)
H21	72.9	11.6	13.7	65.3	91.5	21.6	3.6	77.3	4401.9	33.2	0.7	4433.7
H22	78.9	11.4	13.5	67.3	102.8	21.3	3.6	81.2	4402.6	32.7	0.7	4433.0
H23	72.9	9.4	11.1	61.8	91.7	17.6	2.9	70.9	4402.1	26.9	0.5	4426.9
H24	75.6	12.1	14.2	63.7	96.6	22.5	3.8	74.4	4402.3	34.5	0.7	4434.6
H25	74.1	11.4	13.4	63.3	93.8	21.2	3.5	73.7	4402.2	32.4	0.6	4432.5
H26	74.3	13.7	16.1	63.2	94.2	25.5	4.2	73.5	4402.2	39.1	0.8	4439.4
H27	92.3	17.1	20.2	82.9	127.8	31.9	5.3	110.2	4402.7	49.0	1.0	4449.0
H28	89.0	15.1	17.8	73.9	121.6	28.1	4.7	93.5	4402.6	43.1	0.9	4443.1
H29	81.1	15.1	17.8	66.9	106.8	28.1	4.7	80.5	4402.7	43.1	0.9	4443.6
H30	85.1	11.5	13.5	68.5	114.3	21.4	3.6	83.3	4403.0	32.8	0.7	4433.5
H31	80.9	10.3	12.2	67.5	106.6	19.3	3.2	81.4	4402.7	29.6	0.6	4429.6
H32	80.6	9.4	11.1	70.4	105.9	17.5	2.9	86.9	4402.7	26.9	0.5	4427.1
H33	83.8	9.5	11.2	71.2	111.9	17.7	2.9	88.4	4402.9	27.1	0.5	4427.1
H34	87.8	11.7	13.7	77.4	119.3	21.8	3.6	99.9	4403.2	33.4	0.7	4433.4
H35	84.8	15.9	18.7	70.4	113.8	29.6	4.9	86.9	4403.0	45.3	0.9	4445.6
H36	84.9	13.9	16.4	72.3	114.0	26.0	4.3	90.4	4403.0	39.8	0.8	4439.8
H37	78.4	12.9	15.2	68.0	101.9	24.1	4.0	82.5	4402.6	36.9	0.7	4437.0
H38	82.4	11.7	13.7	68.2	109.4	21.7	3.6	82.9	4402.8	33.3	0.7	4433.8
H39	75.3	11.0	13.0	63.5	96.1	20.5	3.4	74.1	4402.3	31.5	0.6	4431.5
H40	78.0	10.6	12.5	65.2	101.0	19.8	3.3	77.3	4402.0	30.4	0.6	4430.4
D1: Central Control Building	94.3	12.9	15.2	79.2	131.4	24.1	4.0	103.4	4403.6	36.9	0.7	4437.0
D2: Workshop Area	94.9	14.0	16.5	81.0	132.6	26.1	4.4	106.6	4403.7	40.1	0.8	4440.1
D3: Admin Building	95.9	17.0	20.0	85.3	134.5	31.7	5.3	114.7	4403.8	48.6	1.0	4448.6
D4: Social Building	95.9	16.5	19.4	85.2	134.4	30.7	5.1	114.6	4403.8	47.1	0.9	4447.1
D5: Gatehouse	96.0	17.0	20.0	85.1	134.6	31.7	5.3	114.3	4403.8	48.6	1.0	4448.7

Receptor	Hourly NO_2				Hourly NO				Hourly CO			
	Baseline (including existing TPP)	PC	PC as % of Standard	PEC (including retained TPP)	Baseline (including existing TPP)	PC	PC as % of Standard	PEC (including retained TPP)	Baseline (including existing TPP)	PC	PC as % of Standard	PEC (including retained TPP)
Standard	85				600				5000			

Table C11: Maximum Predicted 8 Hour Mean Concentrations – Combined Cycle (μg/m³)

Receptor	8 Hour CO			
	Baseline (including existing TPP)	PC	PC as % of Standard	PEC (including retained TPP)
Residential Area A (H3)	4400.5	36.5	0.4	4459.0
Residential Area B (H1)	4400.4	43.0	0.4	4477.5
Residential Area C (H5)	4400.7	34.3	0.3	4481.0
Residential Area D (new homes)	4400.7	18.6	0.2	4443.4
Residential Area E (accommodation blocks (H8)	4400.9	21.9	0.2	4443.9
Military Barracks	4400.5	17.8	0.2	4443.6
Sirdarya TPP Receptor 1 (H2)	4400.0	26.7	0.3	4450.5
Sirdarya TPP Receptor 2 (H2)	4400.0	24.9	0.2	4443.8
H4	4400.4	16.0	0.2	4439.3
H6	4400.8	14.7	0.1	4443.9
H7	4400.8	17.9	0.2	4443.0
H9	4400.6	7.1	0.1	4439.5
H10	4400.6	10.2	0.1	4438.3
H11	4400.7	12.9	0.1	4442.1
H12	4400.6	16.0	0.2	4442.8
H13	4400.9	10.8	0.1	4438.3

Receptor	8 Hour CO			
	Baseline (including existing TPP)	PC	PC as % of Standard	PEC (including retained TPP)
H14	4400.9	11.0	0.1	4438.3
H15	4400.8	10.8	0.1	4441.3
H16	4400.7	9.2	0.1	4442.4
H17	4400.8	10.9	0.1	4435.9
H18	4400.7	45.2	0.5	4634.4
H19	4400.8	60.7	0.6	4637.8
H20	4400.9	7.8	0.1	4429.9
H21	4400.5	7.9	0.1	4433.7
H22	4400.4	8.8	0.1	4433.0
H23	4400.3	7.2	0.1	4426.9
H24	4401.1	12.1	0.1	4434.6
H25	4401.2	11.7	0.1	4432.5
H26	4400.8	11.5	0.1	4439.4
H27	4400.6	28.1	0.3	4449.0
H28	4400.9	14.0	0.1	4443.1
H29	4400.9	10.9	0.1	4443.6
H30	4400.9	10.0	0.1	4433.5
H31	4400.6	7.1	0.1	4429.6
H32	4400.6	7.2	0.1	4427.1
H33	4400.5	8.4	0.1	4427.1
H34	4400.7	9.4	0.1	4433.4
H35	4400.6	9.5	0.1	4445.6
H36	4400.7	10.2	0.1	4439.8
H37	4401.0	12.3	0.1	4437.0
H38	4400.4	7.0	0.1	4433.8

Receptor	8 Hour CO			
	Baseline (including existing TPP)	PC	PC as % of Standard	PEC (including retained TPP)
H39	4400.3	9.9	0.1	4431.5
H40	4400.5	11.6	0.1	4430.4
D1: Central Control Building	4400.5	17.2	0.2	4437.0
D2: Workshop Area	4400.5	15.0	0.1	4440.1
D3: Admin Building	4400.5	17.2	0.2	4448.6
D4: Social Building	4400.5	16.4	0.2	4447.1
D5: Gatehouse	4400.5	17.4	0.2	4448.7
Standard	10000			

Table C12: Maximum Predicted 24 Hour Mean Concentrations – Combined Cycle (μg/m³)

Receptor	24 Hour NO_2				24 Hour NO				24 Hour CO			
	Baseline (including existing TPP)	PC	PC as % of Standard	PEC (including retained TPP)	Baseline (including existing TPP)	PC	PC as % of Standard	PEC (including retained TPP)	Baseline (including existing TPP)	PC	PC as % of Standard	PEC (including retained TPP)
Residential Area A (H3)	44.6	4.3	7.2	46.4	38.8	8.1	3.2	42.1	4400.2	12.4	0.3	4412.4
Residential Area B (H1)	43.8	9.5	15.9	51.5	37.4	17.8	7.1	51.8	4400.1	27.2	0.7	4427.2
Residential Area C (H5)	46.4	6.2	10.4	48.2	42.2	11.6	4.6	45.6	4400.3	17.8	0.4	4417.8
Residential Area D (new homes)	48.6	2.6	4.3	45.4	46.3	4.8	1.9	40.3	4400.4	7.4	0.2	4407.4
Residential Area E (accommodation blocks (H8)	48.6	4.4	7.3	46.9	46.3	8.1	3.3	43.2	4400.5	12.5	0.3	4412.5
Military Barracks	46.3	2.5	4.1	44.6	42.0	4.6	1.8	38.9	4400.3	7.1	0.2	4407.1
Sirdarya TPP Receptor 1 (H2)	42.0	5.2	8.7	47.2	34.1	9.7	3.9	43.7	4400.0	14.9	0.4	4414.9
Sirdarya TPP Receptor 2 (H2)	42.1	4.2	7.0	46.2	34.3	7.8	3.1	41.8	4400.0	12.0	0.3	4412.0
H4	44.5	2.5	4.2	45.2	38.7	4.7	1.9	39.9	4400.2	7.3	0.2	4407.3

Receptor	24 Hour NO_2				24 Hour NO				24 Hour CO			
	Baseline (including existing TPP)	PC	PC as % of Standard	PEC (including retained TPP)	Baseline (including existing TPP)	PC	PC as % of Standard	PEC (including retained TPP)	Baseline (including existing TPP)	PC	PC as % of Standard	PEC (including retained TPP)
H6	48.0	3.3	5.4	46.9	45.1	6.1	2.4	43.1	4400.4	9.3	0.2	4409.3
H7	48.0	3.9	6.5	46.9	45.1	7.3	2.9	43.0	4400.4	11.2	0.3	4411.2
H9	46.0	1.5	2.4	45.6	41.5	2.7	1.1	40.7	4400.3	4.2	0.1	4404.3
H10	45.4	1.6	2.6	45.3	40.3	3.0	1.2	40.2	4400.2	4.5	0.1	4404.7
H11	46.5	2.0	3.3	46.1	42.4	3.7	1.5	41.6	4400.3	5.7	0.1	4405.8
H12	47.3	3.5	5.9	47.1	43.8	6.6	2.6	43.5	4400.4	10.1	0.3	4410.2
H13	46.1	1.7	2.8	45.6	41.6	3.1	1.3	40.7	4400.3	4.8	0.1	4404.9
H14	48.9	2.1	3.5	47.0	46.9	3.9	1.6	43.3	4400.5	6.0	0.1	4406.1
H15	48.2	1.9	3.1	46.9	45.5	3.5	1.4	43.1	4400.4	5.3	0.1	4405.4
H16	47.0	1.7	2.8	46.4	43.4	3.2	1.3	42.2	4400.4	4.8	0.1	4405.0
H17	48.8	1.9	3.1	46.7	46.7	3.5	1.4	42.8	4400.5	5.4	0.1	4405.5
H18	47.6	9.1	15.1	52.0	44.4	16.9	6.8	52.7	4400.4	25.9	0.6	4426.0
H19	47.8	11.5	19.1	54.5	44.8	21.4	8.6	57.2	4400.4	32.8	0.8	4432.9
H20	46.3	0.9	1.5	45.3	42.0	1.7	0.7	40.1	4400.3	2.6	0.1	4402.8
H21	45.0	1.3	2.1	44.4	39.6	2.3	0.9	38.5	4400.2	3.6	0.1	4403.7
H22	43.9	1.0	1.7	43.9	37.5	1.9	0.8	37.5	4400.1	3.0	0.1	4403.0
H23	43.7	0.8	1.3	43.2	37.1	1.4	0.6	36.3	4400.1	2.2	0.1	4402.2
H24	49.8	2.0	3.4	47.9	48.5	3.8	1.5	45.1	4400.6	5.8	0.1	4405.9
H25	50.2	1.8	3.0	47.6	49.2	3.4	1.3	44.5	4400.6	5.2	0.1	4405.3
H26	47.6	2.1	3.6	45.7	44.4	4.0	1.6	40.9	4400.4	6.1	0.2	4406.1
H27	45.0	5.3	8.8	47.3	39.6	9.9	4.0	43.9	4400.2	15.2	0.4	4415.2
H28	49.3	3.1	5.2	47.0	47.6	5.9	2.3	43.4	4400.5	9.0	0.2	4409.1
H29	50.8	1.9	3.2	47.3	50.5	3.6	1.5	43.8	4400.6	5.6	0.1	4405.7
H30	48.3	1.6	2.6	46.0	45.8	2.9	1.2	41.5	4400.4	4.5	0.1	4404.5
H31	46.9	1.4	2.3	45.3	43.2	2.5	1.0	40.2	4400.3	3.9	0.1	4403.9

Receptor	24 Hour NO_2				24 Hour NO				24 Hour CO			
	Baseline (including existing TPP)	PC	PC as % of Standard	PEC (including retained TPP)	Baseline (including existing TPP)	PC	PC as % of Standard	PEC (including retained TPP)	Baseline (including existing TPP)	PC	PC as % of Standard	PEC (including retained TPP)
H32	47.1	1.3	2.1	45.3	43.5	2.4	1.0	40.1	4400.4	3.7	0.1	4403.7
H33	46.2	1.4	2.4	44.9	41.8	2.6	1.1	39.4	4400.3	4.1	0.1	4404.1
H34	48.1	1.2	2.0	46.1	45.3	2.3	0.9	41.6	4400.4	3.5	0.1	4403.6
H35	46.4	1.5	2.4	45.1	42.2	2.7	1.1	39.8	4400.3	4.2	0.1	4404.2
H36	46.5	1.5	2.5	45.5	42.4	2.7	1.1	40.5	4400.3	4.2	0.1	4404.3
H37	50.7	2.1	3.5	48.2	50.1	3.9	1.6	45.6	4400.6	6.0	0.2	4406.2
H38	44.1	0.9	1.4	43.5	37.9	1.6	0.6	36.7	4400.1	2.4	0.1	4402.5
H39	43.8	1.2	1.9	43.7	37.3	2.2	0.9	37.2	4400.1	3.3	0.1	4403.3
H40	44.1	1.4	2.3	44.2	38.0	2.5	1.0	38.1	4400.2	3.9	0.1	4403.9
D1: Central Control Building	45.3	2.8	4.7	44.9	40.1	5.3	2.1	39.4	4400.2	8.1	0.2	4408.1
D2: Workshop Area	44.7	2.0	3.4	44.6	39.1	3.8	1.5	38.9	4400.2	5.8	0.1	4405.8
D3: Admin Building	44.4	2.6	4.4	44.8	38.4	4.9	1.9	39.3	4400.2	7.5	0.2	4407.5
D4: Social Building	44.4	2.4	4.1	44.8	38.4	4.6	1.8	39.3	4400.2	7.0	0.2	4407.0
D5: Gatehouse	44.4	2.6	4.4	44.8	38.4	4.9	2.0	39.3	4400.2	7.5	0.2	4407.5
Standard	60				250				4000			

Table C13: Maximum Predicted Monthly Mean Concentrations – Combined Cycle (μg/m³)

Receptor	Monthly NO_2				Monthly NO				Monthly CO			
	Baseline (including existing TPP)	PC	PC as % of Standard	PEC (including retained TPP)	Baseline (including existing TPP)	PC	PC as % of Standard	PEC (including retained TPP)	Baseline (including existing TPP)	PC	PC as % of Standard	PEC (including retained TPP)
Residential Area A (H3)	42.3	1.4	2.8	43.4	34.6	2.6	2.1	36.6	4400.02	3.9	0.11	4403.95
Residential Area B (H1)	42.2	2.7	5.4	44.7	34.3	5.0	4.2	39.1	4400.01	7.7	0.22	4407.74
Residential Area C (H5)	42.7	1.4	2.9	43.8	35.3	2.7	2.2	37.3	4400.05	4.1	0.12	4404.12

Receptor	Monthly NO_2				Monthly NO				Monthly CO			
	Baseline (including existing TPP)	PC	PC as % of Standard	PEC (including retained TPP)	Baseline (including existing TPP)	PC	PC as % of Standard	PEC (including retained TPP)	Baseline (including existing TPP)	PC	PC as % of Standard	PEC (including retained TPP)
Residential Area D (new homes)	43.5	0.6	1.1	43.3	36.8	1.1	0.9	36.5	4400.10	1.6	0.05	4401.67
Residential Area E (accommodation blocks (H8)	43.4	0.9	1.8	43.4	36.6	1.7	1.4	36.6	4400.10	2.6	0.08	4402.65
Military Barracks	42.7	0.8	1.6	42.8	35.3	1.5	1.2	35.6	4400.05	2.3	0.07	4402.29
Sirdarya TPP Receptor 1 (H2)	42.0	1.1	2.3	43.1	34.0	2.1	1.8	36.1	4400.00	3.3	0.09	4403.26
Sirdarya TPP Receptor 2 (H2)	42.0	1.0	1.9	43.0	34.0	1.8	1.5	35.8	4400.00	2.7	0.08	4402.73
H4	42.3	0.7	1.3	42.8	34.6	1.2	1.0	35.5	4400.02	1.9	0.05	4401.90
H6	43.3	0.6	1.3	43.3	36.5	1.2	1.0	36.5	4400.09	1.9	0.05	4401.88
H7	43.2	0.8	1.6	43.4	36.3	1.4	1.2	36.6	4400.09	2.2	0.06	4402.24
H9	42.5	0.2	0.4	42.5	34.9	0.3	0.3	34.8	4400.04	0.5	0.01	4400.54
H10	42.6	0.2	0.5	42.5	35.1	0.4	0.4	35.0	4400.04	0.7	0.02	4400.69
H11	42.5	0.2	0.5	42.5	35.0	0.4	0.4	34.9	4400.04	0.7	0.02	4400.70
H12	42.7	0.5	1.0	42.9	35.4	0.9	0.7	35.6	4400.05	1.4	0.04	4401.39
H13	42.6	0.2	0.4	42.5	35.1	0.4	0.3	34.9	4400.04	0.6	0.02	4400.58
H14	43.3	0.4	0.8	43.0	36.5	0.7	0.6	35.9	4400.09	1.1	0.03	4401.17
H15	43.2	0.4	0.8	43.0	36.2	0.7	0.6	35.8	4400.08	1.1	0.03	4401.15
H16	43.0	0.3	0.7	42.8	35.9	0.6	0.5	35.5	4400.07	1.0	0.03	4400.98
H17	43.2	0.4	0.7	43.0	36.3	0.7	0.6	35.9	4400.09	1.0	0.03	4401.07
H18	42.9	1.0	2.0	43.3	35.7	1.9	1.6	36.4	4400.06	2.9	0.08	4402.88
H19	43.0	1.1	2.3	43.4	35.8	2.1	1.8	36.7	4400.07	3.2	0.09	4403.27
H20	42.5	0.1	0.3	42.4	35.0	0.3	0.2	34.8	4400.04	0.4	0.01	4400.41
H21	42.5	0.1	0.3	42.4	34.9	0.3	0.2	34.7	4400.03	0.4	0.01	4400.42
H22	42.3	0.2	0.3	42.3	34.5	0.3	0.2	34.5	4400.02	0.4	0.01	4400.45
H23	42.3	0.2	0.4	42.4	34.5	0.4	0.3	34.7	4400.02	0.6	0.02	4400.62
H24	43.1	0.5	1.0	43.0	36.0	0.9	0.8	35.9	4400.08	1.4	0.04	4401.41

Receptor	Monthly NO_2				Monthly NO				Monthly CO			
	Baseline (including existing TPP)	PC	PC as % of Standard	PEC (including retained TPP)	Baseline (including existing TPP)	PC	PC as % of Standard	PEC (including retained TPP)	Baseline (including existing TPP)	PC	PC as % of Standard	PEC (including retained TPP)
H25	43.2	0.5	0.9	43.1	36.3	0.9	0.7	36.0	4400.09	1.4	0.04	4401.39
H26	43.7	0.5	1.1	43.3	37.1	1.0	0.8	36.5	4400.12	1.5	0.04	4401.59
H27	42.5	2.1	4.2	44.2	34.8	3.9	3.2	38.0	4400.03	5.9	0.17	4405.94
H28	44.7	0.8	1.7	44.2	39.1	1.6	1.3	38.1	4400.19	2.4	0.07	4402.51
H29	44.3	0.6	1.2	43.7	38.2	1.1	0.9	37.2	4400.16	1.6	0.05	4401.72
H30	43.7	0.4	0.8	43.3	37.2	0.8	0.6	36.3	4400.12	1.2	0.03	4401.21
H31	43.5	0.3	0.6	43.1	36.9	0.6	0.5	36.0	4400.11	0.9	0.02	4400.93
H32	43.7	0.3	0.7	43.2	37.1	0.6	0.5	36.2	4400.12	0.9	0.03	4400.99
H33	43.5	0.3	0.6	43.0	36.8	0.6	0.5	35.9	4400.10	0.9	0.02	4400.91
H34	44.1	0.4	0.8	43.5	37.9	0.7	0.6	36.7	4400.14	1.1	0.03	4401.17
H35	43.1	0.4	0.7	42.9	36.0	0.7	0.6	35.7	4400.07	1.1	0.03	4401.09
H36	43.0	0.4	0.8	42.8	35.8	0.8	0.6	35.5	4400.07	1.2	0.03	4401.19
H37	44.1	0.7	1.3	43.6	37.9	1.2	1.0	37.0	4400.15	1.9	0.05	4401.94
H38	42.3	0.2	0.4	42.3	34.6	0.4	0.3	34.6	4400.02	0.6	0.02	4400.58
H39	42.3	0.3	0.5	42.4	34.6	0.5	0.4	34.7	4400.02	0.7	0.02	4400.73
H40	42.4	0.3	0.6	42.5	34.8	0.5	0.5	34.9	4400.03	0.8	0.02	4400.85
D1: Central Control Building	42.5	0.7	1.4	42.8	35.0	1.3	1.1	35.6	4400.04	2.0	0.06	4402.00
D2: Workshop Area	42.5	0.6	1.2	42.9	34.9	1.1	0.9	35.6	4400.04	1.7	0.05	4401.76
D3: Admin Building	42.4	0.8	1.6	42.9	34.8	1.5	1.2	35.6	4400.03	2.3	0.07	4402.28
D4: Social Building	42.4	0.8	1.7	42.9	34.8	1.5	1.3	35.6	4400.03	2.4	0.07	4402.36
D5: Gatehouse	42.5	0.8	1.5	42.9	34.9	1.4	1.2	35.7	4400.03	2.2	0.06	4402.16
Standard	50				120				3500			

APPENDIX L– NOISE MONITORING RESULTS

Annex 1. Data log

1.1. Basic scope

Table 0-1 Noise monitoring for weekday (28th May)

							Noise pressure level (in Gb at the oscillation speed Db and the average geometric frequency in the octave area)									Noise level (equivalent noise level in points)	Allowable amount
Point	**GPS coordinates**	Ambient temperature °C	Wind speed, m/s	Wind direction	Start time	End time	31.5	63	125	250	500	1000	2000	4000	8000		
	7:00 am – 23:00 pm	sunny					**79**	**63**	52	**45**	39	**35**	**32**	**30**	**28**	**40**	**55**
1	Lat: 40.236226° Lon: 69.101855°	29	0	South	07^{00}	07^{20}	68.1	60.1	47.8	41.3	38.4	33.8	29.6	26.8	24.6	38.8	49,6
		30	0	South	07^{40}	08^{00}	65.4	59.7	49.2	43.2	35.8	31.3	28.5	24.9	23.1	36.2	45,4
		32	0.2	South-East	08^{15}	08^{30}	60.0	55.4	47.5	41.8	33.4	28.6	25.4	22.3	21.0	34.5	41,8
3	Lat: 40.246446° Lon: 69.109537°	33	0.3	South-East	09^{00}	09^{20}	58.4	52.2	45.2	40.4	34.8	26.4	26.4	25.4	20.6	35.4	42,3
		35	0.5	South-East	09^{40}	10^{00}	62.5	54.2	47.2	42.8	34.4	27.6	26.4	23.2	21.4	34.8	42,0
		36	0.6	East	10^{15}	10^{35}	60.1	52.1	46.4	41.4	35.4	26.6	22.4	24.2	22.4	35.1	40,2
6	Lat: 40.237435° Lon: 69.121277°	37	1.2	East	11^{00}	11^{20}	58.2	50.0	44.2	38.6	34.2	28.6	26.4	22.0	23.4	32.1	42,1
		37	1.5	East	11^{40}	12^{00}	56.1	52.0	44.4	36.6	35.2	27.4	26.0	20.0	22.2	34.0	40,1

		37	1.8	East	12^{20}	12^{35}	54.2	53.1	40.2	34.6	36.1	28.2	28.1	22.1	24.1	36.1	42,0
7	Lat: 40.231497° Lon: 69.121150°	38	1.7	East	13^{00}	13^{20}	56.1	54.2	42.2	36.8	35.2	28.2	27.4	22.4	25.2	35.2	40,0
		38	1.7	East	13^{40}	14^{00}	55.2	55.1	43.0	36.8	35.2	28.2	27.4	22.4	25.2	34.0	40,2
		39	1.6	East	14^{20}	14^{40}	54.3	56.2	42.0	35.2	36.0	27.1	26.2	23.1	26.2	35.0	39,1
2	Lat: 40.246555° Lon: 69.098598°	39	1.7	East, North-East	15^{05}	15^{20}	52.0	55.2	42.1	36.1	35.0	26.2	26.0	23.0	25.1	36.0	40,1
		37	1	North-West, West	15^{40}	16^{00}	56.3	54.7	44.8	40.3	37.5	31.3	28.4	23.7	21.9	37.5	45,3
		36	1.1	West	16^{20}	16^{35}	60.1	58.8	46.6	39.4	35.5	34.1	30.5	27.1	24.3	38.6	46,9
4	Lat: 40.246868° Lon: 69.115726°	36	1.6	West	17^{05}	17^{20}	65.3	61.1	49.5	41.8	37.4	31.9	29.3	27.5	25.8	37.1	43,8
		35	1.4	West, South-West	17^{40}	18^{00}	61.1	58.6	51.9	40.6	35.5	29.8	26.6	25.9	27.3	40.0	45,7
		33	1.6	East	19^{10}	19^{30}	63.4	55.4	50.3	42.7	35.1	30.6	29.8	25.5	23.8	34.2	43,3
8	Lat: 40.228839° Lon: 69.112272°	33	1	East	20^{00}	20^{20}	61.8	57.1	48.6	40.3	38.2	31.4	30.1	29.3	25.4	37.5	49,4
		30	0.5	East	20^{40}	21^{00}	64.1	60.5	51.9	41.4	37.8	34.9	28.6	27.4	21.9	33.8	45,6
		27	0.6	East	21^{20}	21^{40}	60.5	59.8	50.3	38.6	35.4	33.5	30.8	28.9	25.6	36.6	47,8
5	Lat: 40.244618° Lon: 69.126085°	25	07	East. South-East	22^{00}	22^{15}	59.8	57.5	49.9	37.3	34.8	30.7	29.3	27.6	23.4	38.4	45.3
		25	0	-	22^{25}	22^{40}	61.7	56.4	51.9	40.6	33.5	34.9	27.4	25.9	21.5	35.7	45,5

		23	0.5	South	22^{45}	23^{00}	58.5	53.4	47.5	35.6	34.8	31.3	25.7	23.3	20.6	33.9	48,2
	23:00 pm - 7:00 am						**72**	**55**	**44**	**35**	**29**	**25**	**22**	20	**18**	**40**	45
1	Lat: 40.236226° Lon: 69.101855°	22	0.5	South-East	23^{00}	23^{05}	57.8	53.4	41.3	33.4	27.7	23.6	19.8	17.5	17.7	37.2	40,4
		22	0.8	South-East	23^{15}	23^{20}	60.0	50.2	40.1	30.8	27.1	22.2	21.4	19.8	15.6	35.9	42,5
		22	0	East	23^{30}	23^{35}	59.2	48.1	38.1	32.0	25.1	20.1	18.1	16.1	16.1	32.4	40,1
8	Lat: 40.228839° Lon: 69.112272°	25	0.8	East	23^{50}	23^{55}	57.1	49.1	36.1	33.0	24.0	21.1	16.0	14.1	14.1	30.1	38,1
		25	0.5	East	24^{05}	24^{10}	58.3	47.1	35.0	31.0	24.2	21.4	15.4	13.2	13.0	32.2	36,2
		25	0.6	East	24^{20}	24^{25}	59.2	47.0	34.2	31.2	25.2	20.2	16.2	13.5	14.2	34.0	40.1
2	Lat: 40.246555° Lon: 69.098598	24	0.4	East	24^{45}	24^{50}	58.1	46.0	33.0	31.4	25.2	21.1	16.0	13.2	14.0	32.0	39,2
		24	0.7	East	01^{00}	01^{05}	57.2	44.0	32.0	30.4	25.2	20.1	17.0	13.4	13.2	32.2	38,2
		23	0	East	01^{15}	01^{20}	59.2	47.0	34.2	31.2	25.2	20.2	16.2	13.5	14.2	34.0	40,1
3	Lat: 40.246446° Lon: 69.109537	22	0.5	East	01^{40}	01^{45}	58.2	45.0	32.0	30.4	25.2	21.1	17.0	13.4	13.0	33.2	39,2
		21	0.6	East	01^{55}	02^{05}	58.2	45.0	32.0	30.1	24.0	21.0	16.4	13.2	13.0	32.4	39,4
		21	0	East	02^{15}	02^{20}	58.2	45.0	32.0	31.2	25.2	21.1	17.0	13.4	13.0	33.2	38,1
4	Lat: 40.246868° Lon: 69.115726°	21	0.6	East	02^{35}	02^{40}	58.1	46.0	33.0	31.4	25.2	21.1	16.0	13.2	14.0	32.0	39,2

		22	0.5	East	02^{50}	02^{55}	60.1	44.1	32.0	30.5	20.1	19.1	17.2	14.1	12.1	32.1	36,4
		23	0.6	South, South-West	03^{05}	03^{10}	58.1	46.0	33.0	31.4	25.2	21.1	16.0	13.2	14.0	32.0	39,2
7	Lat: 40.231497° Lon: 69.121150°	24	0.7	South	03^{25}	03^{30}	56.0	53.7	48.8	34.8	30.5	28.7	24.9	22.3	18.	31.5	17.9
		24	0.4	South	03^{40}	03^{45}	58.2	45.0	32.0	30.1	24.0	21.0	16.4	13.2	13.0	32.4	39,4
		25	0.3	South	03^{55}	04^{00}	57.2	44.1	32.0	32.1	24.1	21.0	16.4	12.1	13.0	30.0	36,0
6	Lat: 40.237435° Lon: 69.121277°	26	0.7	South-East, East	04^{20}	04^{25}	58.1	46.0	33.0	31.4	25.2	21.1	16.0	13.2	14.0	32.0	39,2
		27	0.7	South-East	04^{35}	04^{40}	58.2	45.0	32.0	30.1	24.0	21.0	16.4	13.2	13.0	32.4	39,4
		27	0.6	South-East	04^{50}	04^{55}	58.4	46.0	33.0	31.4	25.2	21.1	16.0	13.2	14.0	32.0	35,2
5	Lat: 40.244618° Lon: 69.126085°	28	0.4	South-East	06^{10}	06^{15}	60.1	44.1	32.0	30.5	20.1	19.1	17.2	14.1	12.1	32.1	36,4
		28	0.7	East	06^{25}	06^{30}	58.1	46.0	33.0	31.4	25.2	21.1	16.0	13.2	14.0	32.0	39,4
		29	0.6	South-East	06^{40}	07^{00}	57.2	44.1	32.0	32.1	24.1	21.0	16.4	12.1	13.0	30.0	36,0

Table 0-2 Nose monitoring on weekend (31st May)

		Noise pressure level (in Gb at the oscillation speed Db and the average geometric frequency in the octave area)	Noise level (equivalent noise level in points)	Allowable amount

15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30		
Point	**GPS coordinates**	Ambient temperature °C	Wind speed	Wind direction	Start time	End time	31.5	63	125	250	500	1000	2000	4000	8000		
	7:00 am – 23:00 pm	sunny					79	63	52	45	39	35	32	30	28	40	55
1	Lat: 40.236226° Lon: 69.101855°	25	0.5	East	07^{00}	07^{20}	67.2	59.2	47.4	40.3	37.0	32.4	26.2	27.2	25.2	36.2	48.2
		25	1.1	East	07^{40}	08^{00}	68.4	59.0	46.2	39.1	36.0	32.4	25.1	25.1	24.1	35.1	47.0
		26	1.5	North-East	08^{20}	08^{40}	59.0	54.2	47.5	41.8	32.2	28.6	24.2	22.3	21.0	34.2	41.8
3	Lat: 40.236226° Lon: 69.101855°	26	1.3	East	09^{00}	09^{20}	65.1	58.0	45.2	39.1	35.0	32.4	24.1	25.0	24.4	35.2	46.0
		27	1.5	East	09^{40}	10^{00}	62.5	54.2	47.2	42.8	34.4	27.6	26.4	23.2	21.4	34.8	42.0
		29	1.6	East	10^{20}	10^{40}	60.1	52.1	46.4	41.4	35.4	26.6	22.4	24.2	22.4	35.1	40.2
6	Lat: 40.237435° Lon: 69.121277°	31	0.5	East	11^{00}	11^{20}	62.5	54.2	47.2	42.8	34.4	27.6	26.4	23.2	21.4	34.8	42.0
		33	0.4	East, North-East	11^{40}	12^{00}	54.1	52.1	44.2	35.6	35.2	25.4	26.0	20.1	22.6	35.0	40.4
		35	0.8	East	12^{20}	12^{40}	54.2	53.1	40.2	34.4	36.1	28.2	28.1	22.1	24.1	36.2	42.1
7	Lat: 40.231497° Lon: 69.121150°	38	0.7	East	13^{00}	13^{20}	55.1	52.2	42.1	35.8	1 35.1	28.2	27.4	22.4	252	35.1	40.1
		39	0	-	13^{40}	14^{00}	54.0	55.1	42.0	36.8	34.0	28.2	26.2	22.1	25.6	32.0	39.2
		39	0	-	14^{20}	14^{45}	53.3	56.2	43.0	35.2	36.0	27.4	26.2	23.1	26.2	34.0	38.2
		39	0	-	15^{05}	15^{20}	52.0	55.2	42.1	36.1	35.0	26.2	26.0	23.0	25.1	36.0	40.1

		39	0	-	15^{40}	16^{00}	55.3	54.7	42.2	40.2	37.5	31.2	28.4	23.4	21.2	36.1	44.1
		39	0	-	16^{20}	16^{40}	60.1	58.8	46.6	39.4	35.5	34.1	30.5	27.1	24.3	36.1	45.0
4	Lat: 40.246868° Lon: 69.115726°	38	0	-	17^{00}	17^{20}	65.3	61.1	49.5	41.8	37.4	31.9	29.3	27.5	25.8	37.1	43.8
		38	0.8	West	17^{40}	18^{00}	60.1	55.0	51.2	39.0	34.0	27.0	26.6	24.0	26.0	34.0	42.0
		36	0.8	West, North-West	18^{25}	18^{55}	63.4	55.4	50.3	42.7	35.1	30.6	29.8	25.5	23.8	34.0	43.3
8	Lat: 40.228839° Lon: 69.112272E	34	0.7	East	19^{15}	19^{35}	61.6	56.0	46.0	39.0	36.0	31.2	30.0	29.3	24.0	36.0	44.2
		29	0.4	East	20^{05}	20^{20}	62.0	60.5	51.9	41.4	37.8	32.0	28.6	27.4	21.9	33.8	45.6
		28	0.4	East	20^{40}	21^{00}	60.5	59.8	50.3	38.6	35.4	30.0	29.0	26.0	25.6	32.0	47.8
5	Lat: 40.244618° Lon: 69.126085°	27	0.2	South-East	21^{20}	21^{40}	56.0	54	49.9	37.3	34.8	30.7	29.3	27.6	23.4	38.4	45.3
		26	0.4	East	22^{00}	22^{20}	61.7	54.0	51.9	40.6	33.5	34.9	27.4	25.9	21.5	35.7	45.5
		25	0.6	East	22^{40}	22^{55}	56.0	52.0	46.0	36.0	34.0	31.3	25.7	22.0	19.0	32.0	46.0
	23:00 pm - 7:00 am																
							72	55	44	35	29	25	22	20	18	40	45
1	Lat: 40.236226° Lon: 69.101855°	24	0.2	East	23^{00}	23^{05}	56.0	52.0	40.1	32.2	26.4	22.5	18.1	16.4	16.0	32.0	36.0
		22	0.6	South	23^{15}	23^{20}	58.3	47.1	35.0	31.0	24.2	21.4	15.4	13.2	13.0	32.2	36.2

		22	0.5	South-West	23^{30}	23^{35}	59.2	48.1	38.1	32.0	25.1	20.1	18.1	16.1	16.1	32.4	40.1
8	Lat: 40.228839° Lon: 69.112272°	22	0.8	South-West	23^{50}	23^{55}	57.1	49.1	36.1	33.0	24.0	21.1	16.0	14.1	14.1	30.1	38.1
		22	0.8	South-West	00^{05}	00^{10}	58.1	46.0	33.0	31.4	25.2	21.1	16.0	13.2	14.0	32.0	39.2
		22	0.6	South-West	00^{20}	00^{25}	59.1	46.0	34.2	30.1	25.2	19.1	16.2	13.5	14.2	33.1	40.0
2	Lat: 40.246555° Lon: 69.098598	22	0.6	East	24^{45}	24^{50}	58.1	46.0	33.0	31.4	25.2	21.1	16.0	13.2	14.0	32.0	39.2
		22	0.4	East	01^{00}	01^{05}	57.2	44.0	32.0	30.4	25.2	20.1	17.0	13.4	13.2	32.2	38.2
		22	0.4	South-East	01^{15}	01^{20}	59.2	47.0	34.2	31.2	25.2	20.2	16.2	13.5	14.2	34.0	40.1
3	Lat: 40.246446° Lon: 69.109537	21	0	-	$0l^{40}$	$0l^{45}$	58.1	44.0	32.0	30.4	25.2	21.1	17.0	13.4	13.0	33.0	39.0
		21	0	-	01^{55}	02^{05}	56.2	44.0	32.1	30.4	24.0	21.0	16.0	14.0	13.0	32.4	37.0
		21	0	-	02^{15}	02^{20}	58.4	45.0	32.0	31.2	25.2	21.1	17.0	13.4	13.0	33.2	38.1
4	Lat: 40.246868° Lon: 69.115726°	21	0	-	02^{35}	02^{40}	58.1	46.0	33.0	31.4	25.2	21.1	16.0	13.2	14.0	32.0	39.2
		21	0	-	02^{50}	02^{55}	60.1	44.1	32.0	30.5	20.1	19.1	17.2	14.1	12.1	32.1	36.4
		21	0	-	03^{05}	03^{10}	58.1	45.0	32.0	31.4	25.2	20.1	15.0	13.2	14.0	32.4	37.4
7	Lat: 40.231497° Lon: 69.121150°	21	0.5	North	03^{25}	03^{30}	56.0	53.7	48.8	34.8	30.5	28.7	24.9	22.3	18.	31.5	17.9
		21	0.5	North-East,North	03^{40}	03^{45}	56.2	44.0	32.0	30.0	23.0	20.0	16.1	12.1	12.0	32.0	36.0
		21	0.3	East	03^{55}	04^{00}	56.2	42.2	32.0	30.0	24.1	21.0	15.0	13.0	12.0	31.0	34.0

6	Lat: 40.237435° Lon: 69.121277°	21	0.6	East	04^{20}	04^{25}	57.1	45.0	34.0	32.4	25.2	21.1	15.0	13.0	14.0	32.0	36.0
		21	0.8	East	04^{35}	04^{40}	57.0	44.0	32.0	31.0	23.0	21.0	16.4	12.0	13.0	30.2	37.2
		21	0.4	South-East	04^{50}	04^{55}	58.4	46.0	33.0	31.4	25.2	21.1	16.0	13.2	14.0	32.0	35.2
5	Lat: 40.244618° Lon: 69.126085°	21	0.6	East	06^{10}	06^{15}	60.0	45.1	33.0	30.5	21.0	19.1	18.0	13.2	12.4	32.0	35.0
		24	0.6	East	06^{25}	06^{30}	57.1	45.0	33.0	31.0	24.2	20.0	15.0	14.0	13.0	30.4	38.0
		24	0.6	East	06^{40}	07^{00}	58.0	43.2	32.0	33.2	24.0	21.4	15.2	13.2	14.1	31.0	35.0

1.2. Additional scope

Table 0-3 NM 1 (weekday)

№	Start time	End time	Sound pressure in octave bands with geometric mean frequencies, Hz									LAeq, dB	LAmax, dB	Additional noise sources	Meteo data			
			31,5	63	125	250	500	1000	2000	4000	8000				Temperature, ^{0}C	Wind speed, m/sec	Pressure, mm Hg	Wind direction
NM 1 – 23.06.2020 г. (weekday). Coordinates: 40°14'10.41"N 69° 06'6.68" E; h = 1,2 м.																		
1	10^{10}	10^{25}	44,2	43,3	42,1	41,3	41,1	41,3	42,1	41,2	40,4	45,3	48,0	Sirdarya TPP	36,8	1,28 – 2,34	725	NE
LA(min) Fast 35,0 – LA(max) Fast 37,1																		
2	10^{40}	11^{55}	44,9	43,7	42,1	41,3	41,0	41,3	42,2	41,2	40,2	41,3	47,2	Sirdarya TPP	36,4	1,7 – 2,4	725	NE
LA(min) Fast 35,9 – LA(max) Fast 37,1																		
3	11^{10}	11^{25}	32,6	32,5	32,3	32,1	32,0	31,8	31,7	31,5	32,6	34,2	45,0	Sirdarya TPP	38,2	1,16 – 2,19	725	SW
LA(min) Fast 27,9 – LA(max) Fast 30,1																		
4	11^{40}	11^{55}	34,6	34,3	34,1	33,0	32,8	32,7	32,0	31,8	31,7	36,2	47,2	Sirdarya TPP	38,7	1,64 – 2,81	725	SW

№	Start time	End time	Sound pressure in octave bands with geometric mean frequencies, Hz									LAeq, dB	LAmax, dB	Additional noise sources	Meteo data			
			31,5	63	125	250	500	1000	2000	4000	8000				Temperature, ^{0}C	Wind speed, m/sec	Pressure, mm Hg	Wind direction
LA(min) Fast 28,4 – LA(max) Fast 30,5																		
5	12^{05}	12^{20}	32,6	32,5	32,3	32,1	32,0	31,8	31,7	31,5	32,6	36,6	47,8	Sirdarya TPP	38,2	1,16 – 2,19	725	SE
LA(min) Fast 29,9 – LA(max) Fast 32,1																		
6	12^{35}	12^{50}	34,6	34,3	34,1	32,0	32,8	32,7	32,0	31,8	31,7	35,5	47,2	Sirdarya TPP	38,7	1,24 – 2,78	725	SE
LA(min) Fast 28,4 – LA(max) Fast 31,8																		
7	13^{15}	13^{30}	32,6	32,5	32,3	32,1	32,0	31,8	31,7	31,5	32,6	35,5	47,5	Sirdarya TPP	39,1	1,29 – 2,56	725	SE
LA(min) Fast 28,0 – LA(max) Fast 30,1																		
8	13^{40}	13^{55}	42,9	43,2	42,4	44,0	43,2	44,8	45,1	45,3	45,0	40,0	52,0	Sirdarya TPP, cars	39,4	1,97 – 2,04	725	SE
LA(min) Fast 28,7 – LA(max) Fast 31,0																		
9	14^{10}	14^{25}	32,1	32,3	32,6	32,3	33,2	33,8	33,6	33,3	33,1	42,0	51,8	Sirdarya TPP, cars	39,8	1,63 – 3,19	725	SE
LA(min) Fast 34,0 – LA(max) Fast 36,0																		
10	14^{35}	14^{50}	41,0	41,2	44,0	44,3	44,0	44,4	44,2	44,3	45,1	44,6	60,1	Sirdarya TPP, cars	39,2	1,94 – 3,24	725	SE
LA(min) Fast 34,4 – LA(max) Fast 35,9																		
11	15^{00}	15^{15}	41,0	41,2	44,0	44,3	44,0	44,4	43,2	43,3	43,1	43,8	59,8	Sirdarya TPP, cars	40,7	2,72 – 4,15	724	SW
LA(min) Fast 30,0 – LA(max) Fast 34,3																		
12	15^{40}	15^{55}	41,0	41,2	44,0	44,3	44,0	44,4	44,2	44,3	45,1	43,5	57,8	Sirdarya TPP, cars	40,4	2,12 – 3,46	724	SW
LA(min) Fast 31,0 – LA(max) Fast 34,0																		
13	16^{10}	16^{25}	34,2	34,7	34,4	33,6	34,2	34,4	35,4	32,7	31,3	33,8	56,4	Sirdarya TPP, cars	38,9	1,54 – 2,69	724	SE

№	Start time	End time	Sound pressure in octave bands with geometric mean frequencies, Hz									LAeq, dB	LAmax, dB	Additional noise sources	Meteo data			
			31,5	63	125	250	500	1000	2000	4000	8000				Temperature, ^{0}C	Wind speed, m/sec	Pressure, mm Hg	Wind direction
LA(min) Fast 31,2 – LA(max) Fast 34,4																		
14	16^{44}	16^{59}	34,2	35,7	35,4	34,6	36,2	34,4	35,4	32,7	32,3	34,6	58,9	Sirdarya TPP, cars	38,2	1,13 – 2,01	724	SE
LA(min) Fast 32,2 – LA(max) Fast 35,1																		
15	17^{03}	17^{18}	34,2	35,7	35,4	34,6	36,2	34,4	35,4	32,7	32,3	37,8	49,0	Sirdarya TPP,	38,6	1,63 – 2,7	724	SE
LA(min) Fast 32,2 – LA(max) Fast 33,9																		
16	17^{44}	17^{59}	34,2	35,7	35,4	34,6	36,2	34,4	35,4	32,7	32,3	37,8	49,4	Sirdarya TPP, cars	38,5	1,89 – 2,31	724	SE
LA(min) Fast 30,9 – LA(max) Fast 33,4																		
17	18^{00}	18^{12}	43,2	43,4	44,0	43,3	44,0	43,2	43,0	43,1	44,2	41,2	52,8	Sirdarya TPP, cars	36,3	0,79 – 1,27	724	SE
LA(min) Fast 30,0 – LA(max) Fast 31,0																		
18	18^{35}	18^{50}	43,8	43,4	44,0	43,3	44,0	43,4	44,0	43,1	44,0	40,4	43,9	Sirdarya TPP, cars	36,0	0,44 – 1,98	724	SE
LA(min) Fast 30,1 – LA(max) Fast 31,1																		
19	19^{00}	19^{15}	34,2	35,7	35,4	34,6	36,2	34,4	35,1	32,7	32,0	35,2	45,0	Sirdarya TPP, cars	34,2	0,38 – 0,61	724	NW
LA(min) Fast 32,9 – LA(max) Fast 35,4																		
20	19^{44}	19^{59}	34,2	35,7	35,4	34,6	36,2	34,4	35,4	32,7	32,3	32,2	42,1	Sirdarya TPP	34,2	0,31 – 0,89	724	NW
LA(min) Fast 32,2 – LA(max) Fast 36,9																		
21	20^{00}	20^{15}	44,3	45,1	45,3	46,0	45,2	46,3	46,1	45,2	46,2	43,4	52,2	Sirdarya TPP	31,3	0,68 – 1,13	724	NE
LA(min) Fast 43,0 – LA(max) Fast 45,0																		
22	20^{38}	20^{53}	44,9	45,1	45,3	46,0	45,2	46,2	46,1	45,2	46,0	43,2	59,8	Sirdarya TPP, cars	31,0	0,55 – 1,14	724	NE

№	Start time	End time	Sound pressure in octave bands with geometric mean frequencies, Hz									LAeq, dB	LAmax, dB	Additional noise sources	Meteo data			
			31,5	63	125	250	500	1000	2000	4000	8000				Temperature, ^{0}C	Wind speed, m/sec	Pressure, mm Hg	Wind direction
LA(min) Fast 43,7 – LA(max) Fast 45,8																		
23	21^{10}	21^{25}	55,0	54,0	53,0	53,4	52,2	55,0	55,2	53,3	53,4	50,6	62,1	Sirdarya TPP, cars	29,2	0,47 – 1,14	724	NE
LA(min) Fast 40,0 – LA(max) Fast 47,0																		
24	21^{40}	21^{55}	55,1	54,0	53,0	53,2	52,2	55,0	55,0	53,3	53,1	50,8	61,8	Sirdarya TPP, cars	29,1	0,64 – 1,19	724	NE
LA(min) Fast 41,2 – LA(max) Fast 47,9																		
25	22^{00}	22^{15}	41,0	41,2	44,0	44,3	44,0	44,4	45,2	45,3	45,1	44,4	50,0	Sirdarya TPP, cars	26,8	2,4 – 4,15	725	NE
LA(min) Fast 45,2 – LA(max) Fast 47,0																		
26	22^{38}	22^{53}	51,9	52,3	52,4	52,3	53,1	51,3	52,1	51,2	52,2	46,3	58,4	Sirdarya TPP, cars	26,2	2,77 – 3,98	725	NE
LA(min) Fast 47,0 – LA(max) Fast 50,0																		
27	23^{05}	23^{20}	51,1	51,4	51,4	52,3	52,1	52,0	50,4	51,3	52,4	49,4	57,4	Sirdarya TPP, cars	26,1	1,28 – 2,38	725	NE
LA(min) Fast 47,0 – LA(max) Fast 52,0																		
28	23^{38}	23^{53}	52,7	51,4	51,4	52,3	52,1	52,0	50,4	51,3	52,2	49,0	57,4	Sirdarya TPP, cars	26,0	1,55 – 2,68	725	NE
LA(min) Fast 47,4 – LA(max) Fast 50,9																		
NM 1 – 24.06.2020 (weekday). Coordinates: 40°14'10.41"N 69° 06'6.68" E; h = 1,2 m.																		
29	00^{07}	00^{22}	51,4	52,3	52,4	52,3	53,1	53,1	52,0	51,4	52,2	49,2	58,2	Sirdarya TPP, cars	26,8	2,4 – 4,15	725	NE
LA(min) Fast 46,0 – LA(max) Fast 51,0																		
30	00^{44}	00^{59}	51,7	52,3	52,4	52,3	53,2	53,1	52,0	51,4	52,3	47,5	54,7	Sirdarya TPP, cars	26,4	2,55 – 4,04	725	NE
LA(min) Fast 46,3 – LA(max) Fast 50,3																		

№	Start time	End time	Sound pressure in octave bands with geometric mean frequencies, Hz									LAeq, dB	LAmax, dB	Additional noise sources	Meteo data			
			31,5	63	125	250	500	1000	2000	4000	8000				Temperature, ^{0}C	Wind speed, m/sec	Pressure, mm Hg	Wind direction
31	01^{12}	01^{27}	50,3	51,1	51,3	52,4	51,0	51,2	51,3	51,0	51,2	46,6	54,1	Sirdarya TPP, frogs	24,3	0,97 – 2,15	726	NE
LA(min) Fast 45,5 – LA(max) Fast 49,0																		
32	01^{32}	01^{47}	40,9	41,4	41,3	42,4	41,0	41,2	41,3	41,0	41,1	46,5	55,1	Sirdarya TPP, frogs	24,1	0,36 – 2,94	726	NE
LA(min) Fast 45,0 – LA(max) Fast 48,8																		
33	02^{03}	02^{18}	52,2	54,3	52,4	53,1	52,1	53,0	52,4	52,1	53,1	46,5	55,3	Sirdarya TPP, frogs	23,6	0,69 – 1,19	726	NE
LA(min) Fast 43,9 – LA(max) Fast 48,0																		
34	02^{32}	02^{47}	52,2	54,3	52,4	53,1	52,1	53,0	52,4	52,1	53,1	46,4	54,4	Sirdarya TPP, frogs	23,0	0,44 – 1,56	726	NE
LA(min) Fast 43,9 – LA(max) Fast 48,8																		
35	03^{10}	03^{25}	43,2	43,3	43,0	42,4	43,1	42,4	43,2	42,3	43,1	47,4	57,2	Sirdarya TPP, frogs, cars	23,2	1,27 – 1,74	725	NE
LA(min) Fast 44,0 – LA(max) Fast 48,2																		
36	03^{36}	03^{51}	43,8	43,3	43,0	42,4	43,1	42,5	43,2	42,5	43,1	43,4	49,1	Sirdarya TPP, frogs	23,1	1,84 – 1,95	725	NE
LA(min) Fast 43,0 – LA(max) Fast 47,2																		
37	04^{00}	04^{15}	42,1	42,3	43,2	43,4	43,2	44,0	43,1	43,3	43,2	44,7	51,0	Sirdarya TPP, frogs	23,0	0,81 – 1,43	726	NE
LA(min) Fast 44,0 – LA(max) Fast 48,0																		
38	04^{22}	04^{37}	42,9	42,3	43,2	43,4	43,2	43,4	43,1	43,3	43,2	42,6	48,2	Sirdarya TPP, frogs	23,3	0,9 – 1,71	726	NE
LA(min) Fast 42,4 – LA(max) Fast 45,8																		

№	Start time	End time	Sound pressure in octave bands with geometric mean frequencies, Hz									LAeq, dB	LAmax, dB	Additional noise sources	Meteo data			
			31,5	63	125	250	500	1000	2000	4000	8000				Temperature, ^{0}C	Wind speed, m/sec	Pressure, mm Hg	Wind direction
39	05^{17}	05^{32}	51,1	51,4	52,0	52,4	52,1	51,3	51,2	51,4	53,1	51,7	58,0	Sirdarya TPP, frogs, cars	24,8	0,33 – 1,13	726	NW
LA(min) Fast 41,0 – LA(max) Fast 45,0																		
40	05^{43}	05^{58}	51,4	51,2	52,0	52,4	52,1	51,3	51,2	51,4	53,0	52,9	57,8	Sirdarya TPP, frogs, cars	24,7	0,51 – 1,89	726	NW
LA(min) Fast 42,1 – LA(max) Fast 45,8																		
41	06^{10}	06^{35}	54,4	54,1	54,0	55,0	54,4	54,0	54,3	54,2	53,4	48,8	59,0	Sirdarya TPP, frogs, cars	27,4	2,59 – 4,16	726	NE
LA(min) Fast 42,1 – LA(max) Fast 48,9																		
42	06^{45}	07^{00}	54,8	54,1	54,0	54,4	54,2	54,0	54,3	54,2	53,4	47,5	57,1	Sirdarya TPP, frogs, cars	27,5	2,4 – 3,78	726	NE
LA(min) Fast 41,8 – LA(max) Fast 48,6																		
43	07^{12}	07^{27}	41,0	41,2	44,0	44,3	44,0	44,4	45,2	45,3	45,1	43,2	52,0	Sirdarya TPP, frogs	31,5	0,15 – 0,93	726	NE
LA(min) Fast 42,4 – LA(max) Fast 44,3																		
44	07^{39}	07^{54}	43,1	43,2	44,0	43,4	43,0	43,1	43,3	43,4	44,4	44,2	54,2	Sirdarya TPP, frogs, cars	31,5	0,20 – 1,21	726	NE
LA(min) Fast 41,8 – LA(max) Fast 44,0																		
45	08^{00}	08^{15}	52,4	53,3	53,0	53,1	52,3	52,4	53,4	54,2	53,2	43,6	59,0	Sirdarya TPP, cars	31,6	0,57 – 1,89	727	NW
LA(min) Fast 42,8 – LA(max) Fast 45,0																		
46	08^{32}	08^{47}	52,6	53,3	53,1	53,1	52,3	52,4	53,2	54,2	53,2	50,6	62,0	Sirdarya TPP, cars	31,4	0,38 – 1,74	727	NW
LA(min) Fast 42,1 – LA(max) Fast 44,7																		
47	09^{10}	09^{25}	44,1	44,3	43,4	44,0	43,2	45,1	46,3	45,2	45,4	44,4	50,0	Sirdarya TPP	34,8	2,11 – 4,59	727	NW

№	Start time	End time	Sound pressure in octave bands with geometric mean frequencies, Hz									LAeq, dB	LAmax, dB	Additional noise sources	Meteo data			
			31,5	63	125	250	500	1000	2000	4000	8000				Temperature, ^{0}C	Wind speed, m/sec	Pressure, mm Hg	Wind direction
LA(min) Fast 43,0 – LA(max) Fast 48,0																		
48	09^{40}	09^{55}	44,1	44,3	43,4	44,0	43,2	45,1	46,3	45,2	45,4	41,2	50,2	Sirdarya TPP	34,7	2,55 – 4,28	727	NW
LA(min) Fast 40,0 – LA(max) Fast 41,7																		

Table 0-4 NM1 (weekend)

						Noise pressure level (in Gb at the oscillation speed Db and the average geometric frequency in the octave area)									Noise level (equivalent noise level in points)	Allowable amount
GPS coordinates	Ambient Temperature, °C	Wind speed, m/s	Wind direction	Start time	End time	31.5	63	125	250	500	1000	2000	4000	8000		
7:00 am – 23:00 pm	sunny					79	**63**	**52**	**45**	**39**	**35**	32	**30**	28	**40**	**55**
Lat: 40.236226° Lon: 69.101855°	22	1.2	South	07^{00}	07^{20}	64.2	59.2	46.4	40.2	36.4	32.1	27.1	25.2	23.2	36.4	46.4
	23	1.2	South	07^{40}	08^{00}	65.3	61.1	49.5	41.8	37.4	31.9	29.3	27.5	25.8	37.1	43.8
	24	1.6	South-East	08^{20}	08^{40}	60.2	55.1	45.5	41.8	33.4	28.4	25.4	22.3	22.0	34.2	41.1
	26	1.2	South-East	09^{00}	09^{20}	58.4	52.2	45.2	40.4	34.8	26.4	26.4	25.4	20.6	35.4	42.3
	27	1.1	South-East	09^{40}	10^{00}	61.8	57.1	48.6	40.3	38.2	31.4	30.1	29.3	25.4	37.5	49.4
	29	1.3	South	10^{20}	10^{40}	64.1	60.5	51.9	41.4	37.8	34.9	28.6	27.4	21.9	33.8	45.6
	33	0	-	11^{00}	11^{20}	56.1	51.0	44.2	38.6	34.2	28.7	26.4	21.0	23.0	30.1	40.1
	34	0	-	11^{40}	12^{00}	56.1	52.0	44.4	36.6	35.2	27.4	26.0	20.0	22.2	34.0	40.1
	36	0	-	12^{20}	12^{40}	54.2	53.1	40.2	34.6	36.1	28.2	28.1	22.1	24.1	36.1	42.0
	37	0	-	13^{00}	13^{20}	56.1	54.2	42.2	36.8	35.2	28.2	27.4	22.4	25.2	35.2	40.1

	38	0	-	13^{40}	14^{00}	54.2	55.0	42.0	36.8	35.2	28.2	27.4	20.4	25.2	32.0	40.0
	38	0.5	West	14^{20}	14^{40}	54.3	56.2	42.0	35.2	36.0	27.1	26.2	23.1	26.2	35.0	39.1
	38	0.8	West	15^{05}	15^{20}	52.0	55.2	42.1	36.1	35.0	26.2	26.0	23.0	25.1	36.0	40.1
	37	0.9	South-West	15^{40}	16^{00}	56.3	54.7	44.8	40.3	37.5	31.3	28.4	23.7	21.9	37.5	45.3
	36	0.4	South	16^{20}	16^{40}	65.2	61.1	49.5	41.8	37.4	31.9	29.3	27.5	25.8	37.1	43.8
	35	0.4	East	17^{00}	17^{20}	60.2	58.4	51.9	39.1	35.5	29.8	24.0	24.2	27.3	39.0	42.4
	34	0.2	East	17^{40}	18^{00}	60.2	55.4	50.3	42.7	34.0	30.6	27.2	24.0	23.8	32.1	42.0
	33	0.5	East	19^{20}	19^{40}	60.1	56.0	46.2	40.3	38.2	31.4	30.1	29.2	21.4	36.2	45.1
	33	0.4	East	20^{00}	20^{20}	62.1	54.0	51.9	41.4	37.4	34.9	28.6	27.0	21.9	32.4	44.0
	31	0.3	South-East	20^{40}	21^{00}	61.5	57.4	50.3	38.6	35.4	30.0	30.8	28.4	24.2	34.2	46.1
	29	0.5	South-East	21^{20}	21^{40}	59.8	57.5	49.9	37.3	34.8	30.7	29.3	27.6	23.4	36.4	44.3
	29	0.2	South-East	22^{00}	22^{20}	62.0	54.4	52.9	41.0	32.4	34.2	27.4	23.2	22.0	34.0	43.1
	28	0.5	South-East	22^{30}	22^{45}	56.4	52.0	45.2	36.1	34.8	31.3	25.0	23.3	21.4	33.2	47.4
23^{00} pm - 7^{00}am						72	55	44	35	29	25	22	20	18	40	45
Lat: 40.236226° Lon: 69.101855°	28 •	0	-	23^{20}	23^{35}	58.2	53.4	41.6	34.0	27.7	24.2	19.4	17.5	17.0	38.0	41.2

27	0	-	23^{50}	00^{05}	60.1	50.4	41.0	30.1	26.1	21.2	20.4	19.2	15.8	36.2	**43.4**
26	0	-	00^{20}	00^{35}	58.3	47.1	35.0	31.0	24.2	21.4	15.4	13.2	13.0	32.2	36.2
25	0	-	01^{00}	01^{20}	57.2	49.1	36.1	33.0	24.4	21.1	16.0	14.0	15.2	31.2	38.6
25	0	-	01^{40}	02^{00}	58.3	47.1	35.0	31.0	24.2	21.4	15.4	13.2	13.0	32.2	36.2
24	0	-	02^{20}	02^{40}	60.2	47.0	35.2	32.0	25.8	20.2	16.2	14.5	15.2	34.0	42.0
24	0.5	East	03^{00}	03^{20}	60.0	47.0	33.1	31.4	25.5	21.5	16.1	13.2	14.2	33.1	40.1
23	0.4	East	03^{40}	04^{00}	58.2	45.0	32.0	30.4	25.2	21.1	17.0	13.4	13.0	33.2	39.2
23	0.6	East	04^{20}	04^{40}	59.2	47.0	35.2	31.4	25.2	20.1	16.4	13.2	14.3	34.0	41.0
20	0.5	East	05^{00}	05^{20}	60.2	45.0	32.0	30.4	25.2	21.1	17.0	13.4	13.0	33.2	39.2
20	1.5	South-East	05^{40}	06^{00}	58.1	46.0	32.0	30.1	24.0	22.0	16.4	13.4	13.0	33.4	38.4
20	1.3	South-East	02^{35}	02^{40}	58.2	45.0	32.0	31.2	25.2	21.1	17.0	13.4	13.0	33.2	38.1
20	1.4	South-East	03^{50}	03^{55}	58.1	46.4	33.1	31.4	26.2	21.1	16.0	14.2	14.2	32.2	38.0
21	1.5	South-East	03^{05}	03^{10}	60.6	44.1	32.0	30.5	20.1	19.1	17.2	14.1	12.1	32.1	36.4
21	0.5	South-East	03^{25}	03^{30}	58.1	46.2	33.0	31.5	25.2	22.1	17.0	13.2	15.0	33.0	40.2
20	0.4	South-East	03^{45}	03^{55}	59.0	54.2	48.8	34.8	30.1	28.7	18.0	22.3	14.0	32.0	39.1

	20	0.6	South	04^{35}	04^{40}	58.2	45.0	32.0	30.1	24.0	21.0	16.4	13.2	13.0	32.4	39.4
	20	0	-	04^{45}	04^{50}	55.2	45.1	32.0	32.1	24.5	21.4	16.2	12.6	13.0	31.0	37.0
	20	0	-	05^{20}	05^{25}	59.1	46.0	33.0	32.4	26.2	21.0	16.4	13.6	15.0	34.0	39.9
	21	0	-	05^{35}	05^{40}	60.1	44.1	32.0	30.5	20.1	19.1	17.2	14.1	12.1	32.1	36.4
	21	0.5	West	06^{05}	06^{15}	58.4	46.0	33.0	31.4	25.2	21.1	16.0	13.2	14.0	32.0	35.2
	22	0.7	West	06^{20}	06^{25}	60.4	44.2	32.0	30.5	20.5	19.1	18.2	14.5	13.1	33.1	37.2
	22	0.4	West	06^{30}	06^{35}	59.4	47.0	33.0	32.4	25.2	21.1	17.0	13.2	15.0	34.0	40.1

Table 0-5 NM 2 (weekend)

№	Start time	End time	Sound pressure in octave bands with geometric mean frequencies, Hz									LAeq, dB	LAmax, dB	Additional noise sources	Meteo data			
			31,5	63	125	250	500	1000	2000	4000	8000				Temperature, ^{0}C	Wind speed, m/sec	Pressure, mmHg	Wind direction
NM 2 – 21.06.2020 (weekend). Coordinates: 40°14'47.60'' N, 69°5'54.95'' E; h = 1,2 - 1,3 м.																		
1	10^{10}	10^{25}	62,4	62,7	63,2	63,4	62,7	64,0	63,0	63,1	64,0	66,3	69,0	birds	31,3	2,31 – 4,16	724	NW
LA(min) Fast 64,0 – LA(max) Fast 67,1																		
2	10^{40}	11^{55}	62,1	62,6	63,0	63,1	62,4	63,7	63,0	63,2	64,0	65,3	67,2	birds	31,4	2,7 – 4,4	724	NW

№	Start time	End time	Sound pressure in octave bands with geometric mean frequencies, Hz									LAeq, dB	LAmax, dB	Additional noise sources	Meteo data			
			31,5	63	125	250	500	1000	2000	4000	8000				Temperature, ^{0}C	Wind speed, m/sec	Pressure, mmHg	Wind direction
LA(min) Fast 62,9 – LA(max) Fast 66,1																		
3	11^{10}	11^{25}	61,7	61,4	62,0	61,7	61,5	61,9	62,0	62,7	62,4	62,5	65,0	house. livestock	32,5	3,11 – 4,84	724	NW
LA(min) Fast 59,9 – LA(max) Fast 63,1																		
4	11^{40}	11^{55}	61,5	61,3	62,0	61,5	61,4	61,7	62,0	62,4	62,2	64,2	67,2	house. livestock	35,7	3,64 – 4,81	724	NW
LA(min) Fast 60,4 – LA(max) Fast 63,5																		
5	12^{05}	12^{20}	51,9	51,5	51,4	51,2	51,5	51,7	51,4	51,0	50,9	51,3	57,8	house, birds, trees	35,8	3,27 – 4,94	724	NW
LA(min) Fast 50,9 – LA(max) Fast 54,1																		
6	12^{35}	12^{50}	51,7	51,5	51,4	51,1	51,5	51,4	51,4	51,0	50,5	53,2	57,2	house. livestock, birds, trees	35,7	2,24 – 3,78	724	NW
LA(min) Fast 50,4 – LA(max) Fast 53,8																		
7	13^{15}	13^{30}	36,4	35,9	36,1	35,8	35,3	35,7	35,4	36,2	36,0	37,4	57,5	house. livestock, birds, cars	37,6	0,84 – 1,46	722	SW
LA(min) Fast 34,0 – LA(max) Fast 38,1																		
8	13^{40}	13^{55}	36,0	35,7	36,1	35,5	35,3	35,4	35,4	36,0	35,7	35,5	52,0	house. livestock, birds,	37,4	0,97 – 2,04	722	SW
LA(min) Fast 33,7 – LA(max) Fast 36,0																		

№	Start time	End time	Sound pressure in octave bands with geometric mean frequencies, Hz									LAeq, dB	LAmax, dB	Additional noise sources	Meteo data			
			31,5	63	125	250	500	1000	2000	4000	8000				Temperature, ^{0}C	Wind speed, m/sec	Pressure, mmHg	Wind direction
9	14^{10}	14^{25}	36,4	36,0	36,7	35,8	35,9	36,2	36,2	36,1	36,0	37,1	61,8	transport, birds, house. livestock	38,3	0,69 – 1,16	722	SW
LA(min) Fast 34,9 – LA(max) Fast 37,7																		
10	14^{35}	14^{50}	36,2	36,0	36,8	35,4	35,9	36,2	36,2	36,0	35,8	35,2	50,1	birds, house. livestock	38,1	0,94 – 1,24	722	SW
LA(min) Fast 32,4 – LA(max) Fast 35,9																		
11	15^{00}	15^{15}	32,2	33,4	33,1	33,0	33,0	33,1	33,0	33,0	33,0	33,8	49,8	birds, house. livestock, cars	38,7	0,94 – 1,66	722	SW
LA(min) Fast 32,0 – LA(max) Fast 34,3																		
12	15^{40}	15^{55}	32,2	33,4	33,1	33,0	33,0	33,1	33,0	33,0	33,0	33,5	37,8	birds, house. livestock	38,4	1,12 – 1,46	722	SW
LA(min) Fast 32,0 – LA(max) Fast 34,0																		
13	16^{10}	16^{25}	32,1	33,2	33,1	33,0	33,1	33,1	33,0	33,0	33,1	33,8	36,4	birds, house. livestock	38,4	1,28 – 1,36	722	SW
LA(min) Fast 31,2 – LA(max) Fast 34,4																		
14	16^{44}	16^{59}	32,1	33,2	33,0	32,0	33,1	33,0	33,0	33,0	33,1	34,6	38,9	birds, house. livestock	38,2	1,13 – 2,01	722	SW
LA(min) Fast 32,2 – LA(max) Fast 35,1																		
15	17^{03}	17^{18}	32,1	33,1	33,0	32,0	33,1	33,1	33,0	33,2	33,1	33,2	42,0	birds, house. livestock	36,4	2,05 – 2,80	722	SW
LA(min) Fast 30,2 – LA(max) Fast 33,9																		
16	17^{44}	17^{59}	32,1	33,1	33,0	32,0	33,1	33,1	33,0	33,2	33,1	36,0	49,4	birds, house. livestock	36,5	1,89 – 2,01	722	SW

№	Start time	End time	Sound pressure in octave bands with geometric mean frequencies, Hz									LAeq, dB	LAmax, dB	Additional noise sources	Meteo data			
			31,5	63	125	250	500	1000	2000	4000	8000				Temperature, ^{0}C	Wind speed, m/sec	Pressure, mmHg	Wind direction
LA(min) Fast 33,9 – LA(max) Fast 36,4																		
17	18^{00}	18^{12}	34,5	35,7	35,4	35,9	36,2	37,1	38,4	39,7	39,2	36,6	42,8	birds, house. livestock, frogs	36,4	0,32 – 0,78	722	SW
LA(min) Fast 34,0 – LA(max) Fast 39,0																		
18	18^{35}	18^{50}	34,2	35,7	35,4	35,6	36,2	37,4	38,4	39,7	39,3	36,2	43,9	birds, house. livestock, frogs	35,0	0,44 – 0,98	722	SW
LA(min) Fast 34,1 – LA(max) Fast 38,1																		
19	19^{00}	19^{15}	33,0	34,0	34,0	33,5	34,7	34,5	35,4	36,2	37,4	35,9	55,0	birds, house. livestock, frogs, transport	34,7	0,33 – 0,67	722	SW
LA(min) Fast 34,9 – LA(max) Fast 37,4																		
20	19^{44}	19^{59}	33,8	34,0	34,0	33,2	34,7	34,5	35,3	36,2	37,4	35,4	52,1	birds, house. livestock, frogs, transport	34,2	0,31 – 0,89	722	SW
LA(min) Fast 34,2 – LA(max) Fast 36,9																		
21	20^{00}	20^{15}	41,0	41,2	44,0	44,3	44,0	44,4	44,2	44,3	45,1	41,3	50,2	birds, house. livestock, crickets, transport	28,7	0,27 – 0,53	721	SW
LA(min) Fast 42,0 – LA(max) Fast 44,0																		

№	Start time	End time	Sound pressure in octave bands with geometric mean frequencies, Hz									LAeq, dB	LAmax, dB	Additional noise sources	Meteo data			
			31,5	63	125	250	500	1000	2000	4000	8000				Temperature, ^{0}C	Wind speed, m/sec	Pressure, mmHg	Wind direction
22	20^{38}	20^{53}	41,0	41,2	44,0	44,3	44,0	44,4	44,2	44,3	45,1	43,6	53,8	birds, house. livestock, crickets, transport	26,4	0,55 – 1,14	721	SW
LA(min) Fast 41,7 – LA(max) Fast 44,8																		
23	21^{10}	21^{25}	43,2	43,3	43,3	43,4	44,0	44,2	44,2	44,4	45,1	45,5	54,8	birds, house. livestock, crickets, frogs, transport	26,9	0,57 – 0,83	721	NE
LA(min) Fast 44,0 – LA(max) Fast 46,0																		
24	21^{40}	21^{55}	43,2	43,3	43,3	43,4	44,0	44,2	44,2	44,4	45,1	44,5	51,8	birds, house. livestock, crickets, frogs, transport	26,1	0,64 – 1,19	721	NE
LA(min) Fast 43,2 – LA(max) Fast 44,9																		
25	22^{00}	22^{15}	46,1	45,2	45,2	45,4	45,4	46,0	46,0	46,2	46,2	45,4	50,0	birds, house. livestock, crickets, frogs,	24,5	0,36 – 0,71	721	NE
LA(min) Fast 42,2 – LA(max) Fast 46,0																		

№	Start time	End time	Sound pressure in octave bands with geometric mean frequencies, Hz									LAeq, dB	LAmax, dB	Additional noise sources	Meteo data			
			31,5	63	125	250	500	1000	2000	4000	8000				Temperature, ^{0}C	Wind speed, m/sec	Pressure, mmHg	Wind direction
26	22^{38}	22^{53}	46,1	45,2	45,4	45,4	45,4	46,2	46,0	46,2	46,2	43,7	48,4	birds, house. livestock, crickets, frogs,	24,2	0,77 – 0,98	721	NE
LA(min) Fast 42,0 – LA(max) Fast 44,0																		
27	23^{05}	23^{20}	45,4	45,2	45,4	45,4	45,4	45,7	45,4	46,2	46,2	42,6	46,4	birds, house. livestock, crickets, frogs,	22,4	0,41 – 0,62	721	NE
LA(min) Fast 41,0 – LA(max) Fast 43,0																		
28	23^{38}	23^{53}	45,4	45,2	45,4	45,4	45,4	45,7	45,4	46,2	46,2	42,9	45,4	birds, house. livestock, crickets, frogs,	22,0	0,55 – 0,68	721	NE
LA(min) Fast 40,4 – LA(max) Fast 42,9																		
NM 2 – 22.06.2020 (weekday). Coordinates: 40˚14'47.60'' N, 69˚5'54.95'' E; h = 1,2 - 1,3 m																		
29	00^{07}	00^{22}	42,1	42,1	42,2	42,3	42,4	42,5	43,3	43,4	45,1	42,6	46,2	crickets, frogs,	22,1	0,41 – 0,81	721	NE
LA(min) Fast 41,0 – LA(max) Fast 43,0																		
30	00^{44}	00^{59}	42,1	42,1	42,2	42,3	42,4	42,5	43,3	43,4	45,1	42,0	44,7	crickets, frogs,	21,4	0,55 – 1,04	721	NE
LA(min) Fast 40,3 – LA(max) Fast 44,3																		
31	01^{12}	01^{27}	41,3	41,3	41,1	41,2	41,2	40,4	41,4	42,1	42,0	41,8	44,1	crickets, frogs,	21,4	0,56 – 0,93	721	NE
LA(min) Fast 40,5 – LA(max) Fast 42,0																		

№	Start time	End time	Sound pressure in octave bands with geometric mean frequencies, Hz									LAeq, dB	LAmax, dB	Additional noise sources	Meteo data			
			31,5	63	125	250	500	1000	2000	4000	8000				Temperature, ^{0}C	Wind speed, m/sec	Pressure, mmHg	Wind direction
32	01^{32}	01^{47}	41,3	41,3	41,1	41,2	41,2	40,4	41,4	42,1	42,0	41,1	45,1	crickets, frogs,	21,1	0,36 – 0,94	721	NE
LA(min) Fast 41,0 – LA(max) Fast 43,8																		
33	02^{03}	02^{18}	41,3	41,3	41,1	41,2	41,2	40,4	41,4	42,1	42,4	41,3	43,3	crickets, frogs, house.	21,0	0,43 – 1,06	721	NE
LA(min) Fast 40,9 – LA(max) Fast 43,0																		
34	02^{32}	02^{47}	41,3	41,3	41,2	41,1	41,2	40,4	41,1	42,1	42,4	40,6	44,0	crickets, frogs, house.	21,0	0,44 – 0,56	721	NE
LA(min) Fast 39,9 – LA(max) Fast 42,8																		
35	03^{10}	03^{25}	41,3	41,3	41,2	41,1	41,5	40,4	41,1	42,1	42,4	40,4	43,2	crickets, frogs, house.	20,3	0,71 – 0,91	721	NE
LA(min) Fast 40,0 – LA(max) Fast 42,2																		
36	03^{36}	03^{51}	41,3	41,3	41,2	41,1	41,5	40,9	41,1	42,0	42,1	43,4	49,1	crickets, frogs, house.	20,1	0,84 – 0,95	721	NE
LA(min) Fast 43,0 – LA(max) Fast 45,2																		
37	04^{00}	04^{15}	42,2	42,3	43,1	43,1	43,3	44,0	44,1	44,2	44,2	43,5	48,0	birds, house.	20,7	0,51 – 0,89	721	NE
LA(min) Fast 42,0 – LA(max) Fast 44,0																		
38	04^{22}	04^{37}	42,2	42,3	43,1	43,1	43,3	44,0	44,1	44,2	44,2	44,2	48,2	birds, house.	20,3	0,5 – 0,71	721	NE
LA(min) Fast 42,4 – LA(max) Fast 44,8																		
39	05^{17}	05^{32}	42,1	42,1	42,0	42,0	42,1	42,2	42,3	42,3	42,4	42,5	45,0	birds, house., frogs	20,9	1,13 – 1,76	721	NE
LA(min) Fast 41,0 – LA(max) Fast 43,0																		

№	Start time	End time	Sound pressure in octave bands with geometric mean frequencies, Hz									LAeq, dB	LAmax, dB	Additional noise sources	Meteo data			
			31,5	63	125	250	500	1000	2000	4000	8000				Temperature, ^{0}C	Wind speed, m/sec	Pressure, mmHg	Wind direction
40	05^{43}	05^{58}	42,5	42,1	42,0	42,2	42,1	42,2	42,3	42,3	42,4	43,3	44,8	birds, house.	20,7	0,51 – 0,89	721	NE
LA(min) Fast 42,1 – LA(max) Fast 43,8																		
41	06^{10}	06^{35}	42,5	42,1	42,1	42,2	42,1	42,2	42,3	42,3	42,7	43,7	49,0	birds, house.	20,4	0,63 – 0,95	721	NE
LA(min) Fast 40,1 – LA(max) Fast 44,9																		
42	06^{45}	07^{00}	42,5	42,1	42,0	42,0	42,1	42,2	42,2	42,3	42,4	43,8	47,1	birds, house.	20,5	0,4 – 0,78	721	NE
LA(min) Fast 41,8 – LA(max) Fast 44,6																		
43	07^{12}	07^{27}	43,4	44,0	44,2	44,4	45,1	43,4	46,0	46,0	45,0	47,5	52,0	birds, house., trees	23,8	2,16 – 4,32	721	NW
LA(min) Fast 45,4 – LA(max) Fast 48,3																		
44	07^{39}	07^{54}	43,4	44,0	44,2	44,4	45,1	43,4	46,0	46,0	45,0	48,0	54,2	birds, house., trees	23,5	2,20 – 4,21	721	NW
LA(min) Fast 44,8 – LA(max) Fast 49,0																		
45	08^{00}	08^{15}	No measurement due to wind speed > 5 m/s												27,3	**4,21 – 6,13**	721	NW
46	08^{32}	08^{47}	52,3	55,0	55,2	55,4	55,0	55,1	55,2	55,0	55,3	54,7	62,0	birds, house., trees, transport	27,4	3,38 – 4,74	721	NW
LA(min) Fast 52,1 – LA(max) Fast 55,7																		
47	09^{10}	09^{25}	61,3	61,0	62,0	62,3	63,0	63,1	64,0	65,0	65,0	62,3	66,0	birds, house., trees, transport	31,2	2,78 – 4,62	721	NW
LA(min) Fast 55,0 – LA(max) Fast 64,0																		

№	Start time	End time	Sound pressure in octave bands with geometric mean frequencies, Hz									LAeq, dB	LAmax, dB	Additional noise sources	Meteo data			
			31,5	63	125	250	500	1000	2000	4000	8000				Temperature, ^{0}C	Wind speed, m/sec	Pressure, mmHg	Wind direction
48	09^{40}	09^{55}	60,3	61,0	61,8	62,0	62,4	62,1	61,8	63,4	64,0	60,7	67,2	birds, house., trees, transport	31,7	2,55 – 4,78	721	NW
LA(min) Fast 50,0 – LA(max) Fast 62,7																		

Table 0-6 NM 2 (weekday)

NM 2 – 24.06.2020 (weekday). Coordinates: 40˚14'47.60" N, 69˚5'54.95" E; h = 1,2 - 1,3 m																		
49	11^{10}	11^{25}	51,4	53,0	50,3	51,2	51,4	52,2	53,1	51,1	51,0	51,4	58,0	birds, house., trees	28,5	2,71 – 4,56	727	NW
LA(min) Fast 50,8 – LA(max) Fast 53,9																		
50	11^{35}	10^{50}	51,5	53,0	50,3	51,6	51,4	52,2	53,4	51,1	51,0	51,3	58,4	birds, house., trees	28,4	2,38 -4,25	727	NW
LA(min) Fast 50,4 – LA(max) Fast 54,9																		
51	12^{00}	12^{15}	41,4	42,1	42,0	41,2	42,2	43,1	42,0	42,1	42,1	41,3	54,0	birds, house., trees	41,3	0,27 – 1,38	726	SW
LA(min) Fast 40,4 – LA(max) Fast 44,9																		
52	12^{30}	13^{45}	41,8	42,1	42,0	41,2	42,2	43,1	42,4	42,4	42,1	41,7	50,0	birds, house., trees	42,0	0,45 – 1,58	726	SW
LA(min) Fast 40,8 – LA(max) Fast 45,1																		
53	13^{10}	13^{25}	42,4	42,0	43,1	42,2	41,4	44,2	43,3	43,1	42,1	42,0	54,0	birds, house., trees	42,9	1,37 – 2,16	726	ЮВ
LA(min) Fast 40,8 – LA(max) Fast 45,1																		

54	13^{40}	13^{55}	42,8	42,0	43,2	42,2	41,4	44,1	43,3	43,1	42,1	43,4	51,8	birds, house., trees	43,0	1,46 – 2,9	726	IOB
LA(min) Fast 43,0 – LA(max) Fast 45,1																		
55	14^{00}	14^{15}	41,0	41,3	42,1	42,4	41,4	42,3	43,1	42,4	42,3	41,6	51,8	birds, house., trees	43,2	1,13 – 2,04	726	SW
LA(min) Fast 41,0 – LA(max) Fast 44,1																		
56	14^{40}	14^{55}	41,8	41,3	42,1	42,4	41,4	42,3	43,1	42,4	42,0	41,2	48,2	birds, house., trees	43,5	1,17 – 2,54	726	SW
LA(min) Fast 40,0 – LA(max) Fast 45,0																		
57	15^{10}	15^{25}	43,1	44,2	42,3	43,0	41,3	43,4	44,1	43,1	43,2	41,6	50,0	birds, house., trees	41,6	0,96 – 2,17	726	SW
LA(min) Fast 40,0 – LA(max) Fast 44,0																		
57	15^{40}	15^{55}	43,5	44,2	42,3	43,0	41,3	43,4	44,4	43,1	43,2	41,5	51,2	birds, house., trees	41,4	1,04 – 2,78	726	SW
LA(min) Fast 40,9 – LA(max) Fast 44,6																		
58	16^{00}	16^{15}	43,2	44,1	42,2	43,1	42,2	44,1	41,4	41,4	41,3	45,6	50,8	birds, house., trees	40,4	0,87 – 1,79	726	SW
LA(min) Fast 41,9 – LA(max) Fast 44,6																		
59	16^{35}	16^{50}	43,4	44,1	42,0	43,1	42,2	44,1	41,4	41,4	41,2	42,3	49,0	birds, house., trees	40,6	0,34 – 1,67	726	SW
LA(min) Fast 40,9 – LA(max) Fast 44,6																		
60	17^{14}	17^{29}	43,0	42,4	42,3	42,4	41,4	42,1	42,1	43,1	43,3	46,5	55,6	birds, house., trees	37,1	0,96 – 2,13	726	SW
LA(min) Fast 45,9 – LA(max) Fast 49,6																		
61	17^{40}	17^{55}	43,8	42,5	42,3	42,4	41,4	42,1	42,1	43,2	43,1	43,6	54,2	birds, house., trees	37,4	0,71 – 2,28	726	SW
LA(min) Fast 42,0 – LA(max) Fast 48,6																		
63	18^{00}	18^{15}	41,4	41,3	42,2	42,1	42,2	42,0	42,3	42,4	42,3	41,2	51,7	birds, house., trees	34,8	0,03 – 0,37	726	IOB
LA(min) Fast 40,0 – LA(max) Fast 45,0																		

64	18^{40}	18^{55}	41,9	41,5	42,2	42,1	42,2	42,0	42,3	42,4	42,3	41,6	51,0	birds, house., trees	34,4	0,4 – 0,75	726	IOB
LA(min) Fast 40,0 – LA(max) Fast 46,6																		
65	19^{00}	19^{15}	42,2	42,4	43,1	44,2	45,0	42,4	43,2	43,2	43,1	41,6	54,0	birds, house., frogs	31,4	0,24 – 0,48	726	NW
LA(min) Fast 40,0 – LA(max) Fast 46,6																		
66	19^{40}	19^{55}	42,8	42,4	43,1	44,5	45,0	42,4	43,2	43,2	43,0	41,6	54,5	birds, house., frogs	31,8	0,46 – 1,02	726	NW
LA(min) Fast 40,4 – LA(max) Fast 45,9																		
67	20^{05}	20^{20}	42,2	43,1	43,4	43,0	43,2	42,4	43,2	42,2	42,4	41,0	58,0	birds, house., frogs	29,7	0,34 – 0,62	726	IOB
LA(min) Fast 40,0 – LA(max) Fast 44,9																		
68	20^{40}	20^{55}	42,4	43,1	43,4	43,1	43,2	42,4	43,2	42,6	42,4	41,6	48,0	birds, house., frogs	29,5	0,78 – 1,25	726	IOB
LA(min) Fast 40,4 – LA(max) Fast 46,1																		
69	21^{00}	21^{15}	46,0	44,3	45,2	46,1	45,2	45,4	46,2	44,2	45,4	43,5	54,8	birds, house., frogs	27,3	1,75 – 3,12	727	NW
LA(min) Fast 42,4 – LA(max) Fast 48,1																		
70	21^{30}	21^{45}	46,6	44,3	45,2	46,1	45,2	45,2	46,2	44,2	45,0	43,3	61,8	birds, house., frogs	27,1	1,15 – 2,28	727	NW
LA(min) Fast 40,9 – LA(max) Fast 49,1																		
71	22^{00}	22^{15}	53,3	54,1	53,2	53,1	53,1	53,3	51,0	51,3	53,1	53,7	64,0	birds, house., frogs	25,3	1,52 – 3,11	727	NW
LA(min) Fast 52,1 – LA(max) Fast 58,5																		
72	22^{30}	22^{45}	53,9	54,2	53,2	53,1	53,0	53,3	51,0	51,3	53,0	53,0	61,0	birds, house., frogs	25,4	1,68 – 2,74	727	NW
LA(min) Fast 52,4 – LA(max) Fast 56,1																		
73	23^{00}	23^{15}	62,4	63,1	63,0	65,0	64,3	62,2	66,2	64,2	65,1	63,6	74,0	birds, house., frogs	24,9	2,54 – 4,28	727	NW
LA(min) Fast 63,8 – LA(max) Fast 68,5																		
74	23^{30}	23^{45}	62,8	63,1	63,0	65,0	64,3	62,2	66,2	64,4	65,2	64,7	71,4	birds, house., frogs	25,0	2,46 – 4,11	727	NW

LA(min) Fast 52,4 – LA(max) Fast 56,1																		
NM 2 – 25.06.2020 (weekday). Coordinates: 40°14'47.60'' N, 69°5'54.95'' E; h = 1,2 - 1,3 m.																		
75	00^{12}	00^{27}	No measurement due to wind speed > 5 m/s											birds, house., frogs, wind	24,3	**3,11 – 7,22**	727	NW
76	00^{33}	00^{48}	No measurement due to wind speed > 5 m/s											birds, house., frogs, wind	24,8	**3,78 – 7,24**	727	NW
77	01^{00}	01^{15}	No measurement due to wind speed > 5 m/s											birds, house., frogs, wind	24,1	**4,63 – 7,42**	727	NW
78	01^{25}	01^{40}	No measurement due to wind speed > 5 m/s											birds, house., frogs, wind	24,0	**4,46 – 7,74**	727	NW
79	02^{00}	02^{15}	51,4	52,1	52,3	53,1	52,0	51,2	54,1	55,1	53,3	56,1	64,7	birds, house., frogs	22,3	2,95 – 4,56	727	NW
LA(min) Fast 52,0 – LA(max) Fast 56,7																		
80	02^{30}	02^{45}	51,8	52,5	52,3	53,1	52,0	51,2	54,1	55,5	53,3	52,7	68,1	birds, house., frogs	22,2	2,34 – 4,38	727	NW
LA(min) Fast 50,0 – LA(max) Fast 55,5																		
81	03^{00}	03^{15}	54,3	55,1	53,2	54,1	53,1	54,3	52,0	52,3	54,1	56,3	58,0	house., frogs, wind	21,0	2,89 – 4,43	727	SW
LA(min) Fast 52,0 – LA(max) Fast 57,5																		
82	03^{40}	03^{55}	54,5	55,1	53,2	54,2	53,1	54,3	52,0	52,2	54,1	54,3	58,0	house., frogs, wind	21,0	2,34 – 4,25	727	SW
LA(min) Fast 50,0 – LA(max) Fast 55,1																		
83	04^{00}	04^{15}	52,3	54,1	53,2	52,0	53,3	54,0	51,4	52,4	54,2	53,4	59,0	house., frogs, wind	21,7	2,64 – 4,21	727	SW
LA(min) Fast 50,0 – LA(max) Fast 54,0																		
84	04^{25}	04^{40}	52,6	54,2	53,2	52,1	53,3	54,0	51,8	52,4	54,1	54,3	59,0	house., frogs, wind	21,7	2,38 – 4,77	727	SW
LA(min) Fast 50,0 – LA(max) Fast 55,1																		
85	05^{10}	05^{25}	54,1	53,4	55,2	56,3	53,4	55,2	53,3	52,2	53,1	56,4	61,0	house., frogs	22,5	1,73 – 3,45	727	SW
LA(min) Fast 52,0 – LA(max) Fast 57,2																		
86	05^{35}	05^{50}	54,4	53,4	55,2	56,2	53,4	55,2	53,6	52,2	53,0	55,2	61,8	house., frogs	22,1	1,82 – 3,08	727	SW

LA(min) Fast 50,0 – LA(max) Fast 56,0																		
87	06^{00}	06^{15}	53,2	54,2	53,8	53,7	53,4	53,1	52,9	53,1	52,2	51,2	58,2	house., frogs	25,6	2,8 – 4,79	727	SW
LA(min) Fast 50,0 – LA(max) Fast 54,0																		
88	06^{40}	06^{55}	53,4	54,3	53,8	53,7	53,6	53,1	52,9	53,1	52,1	54,4	58,4	house., frogs	25,4	2,4 – 4,52	727	SW
LA(min) Fast 50,0 – LA(max) Fast 55,2																		
89	07^{00}	07^{15}	No measurement due to wind speed > 5 m/s											house., birds, wind	26,9	**3,25 – 8,05**	726	NW
90	07^{30}	07^{45}	No measurement due to wind speed > 5 m/s											house., birds, wind	26,2	**4,01 – 7,46**	726	NW
91	08^{10}	08^{35}	No measurement due to wind speed > 5 m/s											house., birds, wind	28,1	**3,78 – 6,16**	726	NW
92	08^{40}	08^{55}	No measurement due to wind speed > 5 m/s											house., wind	28,4	**4,02 – 6,47**	726	NW
93	09^{04}	09^{19}	No measurement due to wind speed > 5 m/s											house., birds, wind	30,1	**8,86 – 12,74**	726	NW
94	09^{30}	09^{45}	No measurement due to wind speed > 5 m/s											house., birds, wind	30,2	**9,01 – 10,36**	726	NW
95	10^{01}	10^{16}	No measurement due to wind speed > 5 m/s											house., birds, wind	31,9	**7,41 – 10,18**	726	NW
96	10^{40}	10^{55}	No measurement due to wind speed > 5 m/s											house., birds, wind	32,0	**8,23 – 9,27**	726	NW

Table 0-7 NM 3 (weekday)

№	Start time	End time	Sound pressure in octave bands with geometric mean frequencies, Hz									LAeq, dB	LAmax, dB	Additional noise sources	Meteo data			
			31,5	63	125	250	500	1000	2000	4000	8000				Temperature, ^{0}C	Wind speed, m/sec	Pressure, mm Hg	Wind direction
NM 3 – 23.06.2020 (weekday). Coordinates: 40˚14'47.21'' N, 69˚6'34.33'' E; h = 1,2 m																		
1	10^{10}	10^{25}	44,2	43,3	42,1	41,3	41,1	41,3	42,1	41,2	40,4	46,3	49,0	house. livestock, birds. trees	35,1	2,31 – 4,16	725	SE
LA(min) Fast 44,0 – LA(max) Fast 47,1																		
2	10^{40}	11^{55}	44,9	43,7	42,1	41,3	41,0	41,3	42,2	41,2	40,2	41,3	47,2	house. livestock, birds. trees	35,4	2,7 – 4,4	725	SE
LA(min) Fast 40,9 – LA(max) Fast 42,1																		
3	11^{10}	11^{25}	44,2	43,9	42,1	41,3	41,0	41,3	42,4	41,2	40,0	42,5	45,0	house. livestock, birds	36,8	1,28 – 2,34	725	NE
LA(min) Fast 39,9 – LA(max) Fast 43,1																		
4	11^{40}	11^{55}	44,4	53,9	52,1	51,3	51,0	51,2	52,4	51,2	50,0	46,2	57,2	house. livestock, birds	36,7	1,64 – 2,81	725	NE
LA(min) Fast 40,4 – LA(max) Fast 43,5																		
5	12^{05}	12^{20}	44,1	44,0	42,3	42,3	43,0	42,2	42,0	42,2	42,3	41,3	47,8	house. livestock, birds, trees	38,2	1,16 – 2,19	725	SE
LA(min) Fast 44,9 – LA(max) Fast 47,1																		

№	Start time	End time	Sound pressure in octave bands with geometric mean frequencies, Hz									LAeq, dB	LAmax, dB	Additional noise sources	Meteo data			
			31,5	63	125	250	500	1000	2000	4000	8000				Temperature, ^{0}C	Wind speed, m/sec	Pressure, mm Hg	Wind direction
6	12^{35}	12^{50}	44,1	44,0	42,3	42,3	43,0	42,2	42,0	42,2	42,3	43,2	52,2	house. livestock, birds, trees	38,7	1,24 – 2,78	725	SE
LA(min) Fast 44,4 – LA(max) Fast 47,8																		
7	13^{15}	13^{30}	42,3	43,2	42,4	44,0	43,2	44,2	45,1	45,3	45,4	43,0	47,5	house. livestock, birds, car	39,1	1,29 – 2,56	725	SE
LA(min) Fast 42,0 – LA(max) Fast 45,1																		
8	13^{40}	13^{55}	42,9	43,2	42,4	44,0	43,2	44,8	45,1	45,3	45,0	43,2	52,0	house. livestock, birds,	39,4	1,97 – 2,04	725	SE
LA(min) Fast 41,7 – LA(max) Fast 46,0																		
9	14^{10}	14^{25}	50,3	51,1	50,0	51,2	52,2	51,4	52,3	51,2	51,0	52,0	61,8	birds, house. livestock, trees	39,8	1,63 – 3,19	725	SE
LA(min) Fast 51,0 – LA(max) Fast 54,0																		
10	14^{35}	14^{50}	50,8	51,0	51,0	51,2	52,2	51,4	52,3	51,2	51,0	52,6	60,1	birds, house. livestock, trees	39,2	1,94 – 3,24	725	SE
LA(min) Fast 50,4 – LA(max) Fast 55,9																		
11	15^{00}	15^{15}	53,0	51,0	51,2	51,3	51,4	51,1	51,2	51,4	51,1	53,8	59,8	birds, house. livestock, car	40,7	2,92 – 4,15	724	SW
LA(min) Fast 50,0 – LA(max) Fast 54,3																		
12	15^{40}	15^{55}	53,4	51,0	51,0	51,3	51,4	51,1	51,2	51,2	51,1	53,5	57,8	birds, house. livestock	40,4	2,12 – 3,46	724	SW
LA(min) Fast 51,0 – LA(max) Fast 54,0																		

№	Start time	End time	Sound pressure in octave bands with geometric mean frequencies, Hz									LAeq, dB	LAmax, dB	Additional noise sources	Meteo data			
			31,5	63	125	250	500	1000	2000	4000	8000				Temperature, ^{0}C	Wind speed, m/sec	Pressure, mm Hg	Wind direction
13	16^{10}	16^{25}	51,0	50,4	51,2	51,3	51,1	51,2	50,4	51,1	51,2	53,8	56,4	birds, house. livestock	38,9	1,12 – 2,69	724	SE
LA(min) Fast 51,2 – LA(max) Fast 54,4																		
14	16^{44}	16^{59}	52,1	53,2	53,0	52,0	53,1	53,0	53,0	53,0	53,1	54,6	58,9	birds, house. livestock	38,2	1,13 – 2,01	724	SE
LA(min) Fast 52,2 – LA(max) Fast 55,1																		
15	17^{03}	17^{18}	43,1	42,4	42,2	43,3	43,0	42,2	43,2	43,3	43,1	43,1	49,0	birds, house. livestock	38,6	1,63 – 2,7	724	SE
LA(min) Fast 40,2 – LA(max) Fast 46,9																		
16	17^{44}	17^{59}	44,1	42,4	42,0	43,3	43,0	43,2	43,2	43,3	43,0	42,4	49,4	birds, house. livestock	38,5	1,89 – 2,31	724	SE
LA(min) Fast 40,9 – LA(max) Fast 46,4																		
17	18^{00}	18^{12}	43,2	43,4	44,0	43,3	44,0	43,2	43,0	43,1	44,2	43,6	52,8	birds, house. livestock, trees	36,3	0,79 – 1,27	724	SE
LA(min) Fast 42,0 – LA(max) Fast 45,0																		
18	18^{35}	18^{50}	43,8	43,4	44,0	43,3	44,0	43,4	44,0	43,1	44,0	36,2	43,9	birds, house. livestock, trees	36,0	0,44 – 1,98	724	SE
LA(min) Fast 34,1 – LA(max) Fast 38,1																		
19	19^{00}	19^{15}	43,8	43,4	44,0	43,3	44,0	43,4	44,0	43,1	44,0	44,4	55,0	birds, house. livestock, frogs, trees	34,2	0,38 – 0,61	724	NW
LA(min) Fast 42,9 – LA(max) Fast 47,4																		

№	Start time	End time	Sound pressure in octave bands with geometric mean frequencies, Hz									LAeq, dB	LAmax, dB	Additional noise sources	Meteo data			
			31,5	63	125	250	500	1000	2000	4000	8000				Temperature, ^{0}C	Wind speed, m/sec	Pressure, mm Hg	Wind direction
20	19^{44}	19^{59}	43,8	43,2	44,0	43,4	43,0	43,0	43,3	43,4	44,0	44,0	52,1	birds, house. livestock, frogs, trees	34,2	0,31 – 0,89	724	NW
LA(min) Fast 42,2 – LA(max) Fast 46,9																		
21	20^{00}	20^{15}	44,3	45,1	45,3	46,0	45,2	46,3	46,1	45,2	46,2	47,6	54,2	birds, house. livestock, Crickets, frogs	31,3	0,68 – 1,13	724	NE
LA(min) Fast 45,0 – LA(max) Fast 49,0																		
22	20^{38}	20^{53}	44,9	45,1	45,3	46,0	45,2	46,2	46,1	45,2	46,0	47,0	53,8	birds, house. livestock, Crickets, frogs	31,0	0,55 – 1,14	724	NE
LA(min) Fast 45,7 – LA(max) Fast 49,8																		
23	21^{10}	21^{25}	55,0	54,0	53,0	53,4	52,2	55,0	55,2	53,3	53,4	55,4	62,1	birds, house. livestock, Crickets, frogs, tractor	29,2	0,47 – 1,14	724	NE
LA(min) Fast 52,0 – LA(max) Fast 56,0																		
24	21^{40}	21^{55}	55,1	54,0	53,0	53,2	52,2	55,0	55,0	53,3	53,1	54,3	61,8	birds, house. livestock, Crickets, frogs, tractor	29,1	0,64 – 1,19	724	NE
LA(min) Fast 51,2 – LA(max) Fast 54,9																		
25	22^{00}	22^{15}	51,4	52,3	52,4	52,3	53,1	51,3	52,0	51,4	52,2	55,4	60,0	birds, house. livestock, tractor, frogs,	26,8	2,4 – 4,15	725	NE

№	Start time	End time	Sound pressure in octave bands with geometric mean frequencies, Hz									LAeq, dB	LAmax, dB	Additional noise sources	Meteo data			
			31,5	63	125	250	500	1000	2000	4000	8000				Temperature, ^{0}C	Wind speed, m/sec	Pressure, mm Hg	Wind direction
LA(min) Fast 52,2 – LA(max) Fast 56,0																		
26	22^{38}	22^{53}	51,9	52,3	52,4	52,3	53,1	51,3	52,1	51,2	52,2	56,0	58,4	birds, house. livestock, tractor, frogs,	26,2	2,77 – 3,98	725	NE
LA(min) Fast 52,0 – LA(max) Fast 57,0																		
27	23^{05}	23^{20}	51,1	51,4	51,4	52,3	52,1	52,0	50,4	51,3	52,4	54,0	62,4	birds, house. livestock, tractor, frogs,	26,1	1,28 – 2,38	725	NE
LA(min) Fast 51,0 – LA(max) Fast 55,0																		
28	23^{38}	23^{53}	52,7	51,4	51,4	52,3	52,1	52,0	50,4	51,3	52,2	53,8	57,4	birds, house. livestock, tractor, frogs,	26,0	1,55 – 2,68	725	NE
LA(min) Fast 50,4 – LA(max) Fast 55,9																		
NM 3 – 24.06.2020 (weekday). Coordinates: 40˚14'47.21" N, 69˚6'34.33" E; h = 1,2 - 1,3 m.																		
29	00^{07}	00^{22}	51,4	52,3	52,4	52,3	53,1	53,1	52,0	51,4	52,2	53,8	58,2	house. livestock, frogs, tractor	26,8	2,4 – 4,15	725	NE
LA(min) Fast 51,0 – LA(max) Fast 55,0																		
30	00^{44}	00^{59}	51,7	52,3	52,4	52,3	53,2	53,1	52,0	51,4	52,3	53,9	59,7	Crickets, frogs,	26,4	2,55 – 4,04	725	NE
LA(min) Fast 50,3 – LA(max) Fast 55,3																		
31	01^{12}	01^{27}	50,3	51,1	51,3	52,4	51,0	51,2	51,3	51,0	51,2	51,5	54,1	house. livestock frogs,	24,3	0,97 – 2,15	726	NE
LA(min) Fast 50,5 – LA(max) Fast 53,0																		

№	Start time	End time	Sound pressure in octave bands with geometric mean frequencies, Hz									LAeq, dB	LAmax, dB	Additional noise sources	Meteo data			
			31,5	63	125	250	500	1000	2000	4000	8000				Temperature, ^{0}C	Wind speed, m/sec	Pressure, mm Hg	Wind direction
32	01^{32}	01^{47}	50,9	51,4	51,3	52,4	51,0	51,2	51,3	51,0	51,1	51,1	55,1	Crickets, frogs,	24,1	0,36 – 2,94	726	NE
LA(min) Fast 41,0 – LA(max) Fast 53,8																		
33	02^{03}	02^{18}	52,2	54,3	52,4	53,1	52,1	53,0	52,4	52,1	53,1	51,3	55,3	Crickets, frogs, house.livestock	23,6	0,69 – 1,19	726	NE
LA(min) Fast 50,9 – LA(max) Fast 53,0																		
34	02^{32}	02^{47}	52,2	54,3	52,4	53,1	52,1	53,0	52,4	52,1	53,1	50,6	54,4	Crickets, frogs, house.livestock	23,0	0,44 – 1,56	726	NE
LA(min) Fast 49,9 – LA(max) Fast 53,8																		
35	03^{10}	03^{25}	43,2	43,3	43,0	42,4	43,1	42,4	43,2	42,3	43,1	39,9	47,2	Crickets, frogs, house.livestock	23,2	1,27 – 1,74	725	NE
LA(min) Fast 40,0 – LA(max) Fast 45,2																		
36	03^{36}	03^{51}	43,8	43,3	43,0	42,4	43,1	42,5	43,2	42,5	43,1	43,4	49,1	Crickets, frogs, house. livestock	23,1	1,84 – 1,95	725	NE
LA(min) Fast 43,0 – LA(max) Fast 45,2																		
37	04^{00}	04^{15}	42,1	42,3	43,2	43,4	43,2	44,0	43,1	43,3	43,2	42,1	48,0	birds, house. livestock	23,0	0,81 – 1,43	726	NE

№	Start time	End time	Sound pressure in octave bands with geometric mean frequencies, Hz									LAeq, dB	LAmax, dB	Additional noise sources	Meteo data			
			31,5	63	125	250	500	1000	2000	4000	8000				Temperature, ^{0}C	Wind speed, m/sec	Pressure, mm Hg	Wind direction
LA(min) Fast 42,0 – LA(max) Fast 46,0																		
38	04^{22}	04^{37}	42,9	42,3	43,2	43,4	43,2	43,4	43,1	43,3	43,2	42,6	48,2	birds, house. livestock	23,3	0,9 – 1,71	726	NE
LA(min) Fast 42,4 – LA(max) Fast 45,8																		
39	05^{17}	05^{32}	51,1	51,4	52,0	52,4	52,1	51,3	51,2	51,4	53,1	51,7	58,0	Crickets house. livestock, frogs	24,8	0,33 – 1,13	726	NW
LA(min) Fast 51,0 – LA(max) Fast 55,0																		
40	05^{43}	05^{58}	51,4	51,2	52,0	52,4	52,1	51,3	51,2	51,4	53,0	52,9	57,8	frogs, house. livestock	24,7	0,51 – 1,89	726	NW
LA(min) Fast 52,1 – LA(max) Fast 55,8																		
41	06^{10}	06^{35}	54,4	54,1	54,0	55,0	54,4	54,0	54,3	54,2	53,4	53,7	59,0	birds, house .livestock, tractor	27,4	2,59 – 4,16	726	NE
LA(min) Fast 50,1 – LA(max) Fast 54,9																		
42	06^{45}	07^{00}	54,8	54,1	54,0	54,4	54,2	54,0	54,3	54,2	53,4	53,8	57,1	birds, house. livestock, tractor	27,5	2,4 – 3,78	726	NE
LA(min) Fast 51,8 – LA(max) Fast 54,6																		
43	07^{12}	07^{27}	55,0	54,2	54,4	58,0	57,7	53,1	52,3	53,2	54,4	57,5	62,0	birds, house. livestock, tractor	31,5	0,15 – 0,93	726	NE
LA(min) Fast 55,4 – LA(max) Fast 58,3																		

№	Start time	End time	Sound pressure in octave bands with geometric mean frequencies, Hz									LAeq, dB	LAmax, dB	Additional noise sources	Meteo data			
			31,5	63	125	250	500	1000	2000	4000	8000				Temperature, ^{0}C	Wind speed, m/sec	Pressure, mm Hg	Wind direction
44	07^{39}	07^{54}	55,4	54,2	54,4	57,0	57,7	53,1	52,3	53,2	54,4	58,0	64,2	birds, house. livestock, tractor	31,5	0,20 – 1,21	726	NE
LA(min) Fast 54,8 – LA(max) Fast 59,0																		
45	08^{00}	08^{15}	52,4	53,3	53,0	53,1	52,3	52,4	53,4	54,2	53,2	53,6	59,0	birds, house. livestock, tractor	31,6	0,57 – 1,89	727	NW
LA(min) Fast 52,8 – LA(max) Fast 55,0																		
46	08^{32}	08^{47}	52,6	53,3	53,1	53,1	52,3	52,4	53,2	54,2	53,2	54,7	62,0	birds, house. livestock, tractor	31,4	0,38 – 1,74	727	NW
LA(min) Fast 52,1 – LA(max) Fast 55,7																		
47	09^{10}	09^{25}	44,1	44,3	43,4	44,0	43,2	45,1	46,3	45,2	45,4	45,3	56,0	birds, house.l ivestock, trees, tractor	34,8	2,11 – 4,59	727	NW
LA(min) Fast 45,0 – LA(max) Fast 48,0																		
48	09^{40}	09^{55}	44,1	44,3	43,4	44,0	43,2	45,1	46,3	45,2	45,4	49,8	60,2	birds, house. livestock, trees, tractor	34,7	2,55 – 4,28	727	NW
LA(min) Fast 45,0 – LA(max) Fast 47,7																		

Table 0-8 NM 3 (weekend)

							Noise pressure level (in Gb at the oscillation speed Db and the average geometric frequency in the octave area)									Noise level (equivalent noise level in points)	Allowable amount
15	**16**	17	18	19	20	21	22	23	24	25	26	27	28	29			
Point	GPS coordinates	Ambient Temperature, °C	Wind speed, m/s	Wind direction	Start time	End time	31.5	63	125	250	500	1000	2000	4000	0008		
	7:00 am – 23:00 pm	**sunny**					**79**	**63**	**52**	**45**	**39**	35	**32**	30	**28**	**40**	55
3	Lat: 40.246446° Long:69.109537°	**21**	1,2	East	07^{00}	07^{20}	66.0	59.1	46.2	40.3	37.0	31.4	26.2	26.2	21.2	34.2	46.2
		22	1,2	South-East	07^{40}	08^{00}	54.1	52.1	44.2	35.6	35.2	25.4	26.0	20.1	22.6	35.0	40.4
		22	1,2	East	08^{20}	08^{40}	58.0	53.2	47.5	41.8	32.2	28.6	25.2	22.3	20.0	35.1	38.2
		23	1.2	East	09^{00}	09^{20}	64.1	58.0	45.2	38.1	35.0	30.4	24.1	24.0	24.4	34.2	42.0
		24	0	-	09^{40}	10^{00}	60.5	54.2	46.2	42.8	34.4	27.6	25.4	23.2	20.4	32.8	40.0
		24	0	-	10^{20}	10^{40}	61.1	50.1	46.4	40.4	35.4	26.6	22.4	21.2	22.4	34.0	38.2
		27	0	-	11^{00}	11^{20}	60.5	52.2	47.2	42.8	31.4	27.6	21.4	23.2	20.4	32.4	37.4
		33	0	-	11^{40}	12^{00}	50.1	48.4	44.1	35.6	35.2	24.4	26.0	20.0	22.2	32.0	36.1
		35	0	-	12^{20}	12^{40}	54.2	53.1	40.2	34.4	36.1	28.2	28.1	22.1	24.1	34.2	40.0

		35	0.6	East	13^{00}	13^{20}	55.1	54.2	40.1	36.8	34.2	28.2	27.2	22.1	24.0	32.1	36.4
		36	1.1	East	13^{40}	14^{00}	54.2	54.0	42.0	36.8	35.2	29.0	27.4	21.4	25.2	33.4	38.0
		37	0	-	14^{20}	14^{40}	52.3	56.2	40.0	35.2	33.0	27.1	26.2	23.1	26.2	32.0	36.2
		37	0	-	15^{05}	15^{20}	56.3	54.7	44.8	40.3	37.5	31.3	28.4	23.7	21.9	36.4	40.1
		37	0	-	15^{40}	16^{00}	54.1	50.2	42.1	35.8	35.1	28.2	27.2	22.0	25.2	34.2	39.0
		34	0	-	16^{20}	16^{40}	53.0	55.1	42.1	36.8	34.0	28.1	26.2	22.1	25.6	33.0	40.1
		30	0.6	East	17^{00}	17^{20}	54.3	55.0	42.0	33.2	34.0	24.4	26.2	20.4	22.6	32,0	38,2
		28	0.7	East	17^{40}	18^{00}	52.0	55.4	43.1	36.1	35.1	26.1	26.0	23.1	25.1	35.2	40.1
		28	0.6	East	19^{20}	19^{40}	55.3	54.4	42.3	40.2	37.4	31.2	28.4	23.2	20.2	34.2	39.6
		27	0.3	East	20^{00}	20^{20}	58.1	58.8	46.2	39.4	35.5	34.2	30.5	27.4	24.3	35.4	41.4
		27	1.2	East	20^{40}	21^{00}	65.9	61.6	49.5	42.8	37.4	31.9	27.4	27.5	22.4	36.2	42.3
		26	0.6	South-East	21^{20}	21^{40}	60,4	57,2	49,1	36,3	32,8	28,7	26.1	25.6	22.1	34.2	40,4
		25	0.6	East	22^{00}	22^{20}	62,0	52,2	50,1	40,0	32.4	34,2	27,1	23,2	23,0	36,0	41.4
		25	0.7	East	22^{40}	22^{55}	52,4	51,0	42,2	36,4	32,4	31,1	26,0	23.1	20,2	32,4	38,2
	23:00 pm-7:00 am						**72**	**55**	**44**	**35**	**29**	**25**	**22**	**20**	**18**	**40**	**45**

3	Lat: 40.246446° Long:69.10953°	25	0.5	East	23^{00}	23^{05}	54.0	50.0	38.1	32.4	25.6	23.4	19.0	18.4	14.12	34.0	36.1
		25	0.7	East	23^{15}	23^{20}	56.1	47.2	34.0	30.1	24.2	22.4	15.4	14.2	12.8	32.0	37.4
		24	0.5	South-East	23^{30}	23^{35}	58.1	48.4	38.1	33.0	25.4	19.1	16.4	15.4	14.8	32.6	38.4
		24	0.3	East	23^{50}	23^{55}	59.4	45.0	34.2	30.2	25.2	18.4	16.2	14.2	14.2	32.6	36.9
		23	0	-	24^{05}	24^{10}	58.4	46.0	32.0	30.2	24.0	22.0	16.4	13.1	13.0	32.2	36.2
		23	1.1	East	24^{20}	24^{25}	58.2	44.0	32.1	30.4	25.0	21.0	15.2	14.0	14.5	34.4	36.4
		22	1.5	South-East	24^{45}	24^{50}	56.2	45.0	32.0	31.2	24.0	20.1	15.8	13.4	14.0	32.4	38.6
		22	1.5	East	01^{00}	01^{05}	59.3	44.6	32.8	31.4	25.2	21.9	15.1	13.2	13.5	32.2	36.4
		21	1.2	East	01^{15}	01^{20}	59.2	47.0	35.2	31.1	24.0	19.1	16.4	14.1	13.2	32.5	38.2
		2021	1.6	South-West	01^{40}	01^{45}	60.4	45.0	32.0	31.7	25.2	21.1	17.0	13.4	13.0	32.4	36.1
		20	0.5	South-West	01^{55}	02^{05}	58.6	46.4	32.0	30.8	23.0	22.8	16.1	13.1	13.8	33.2	38.0
		20	0.6	South-West	02^{15}	02^{20}	54.2	42.4	32.7	31.1	24.0	21.5	15.1	14.0	13.0	34.5	38.1
		20	0.8	South-West	02^{35}	02^{40}	57.2	45.0	32.0	31.5	25.2	20.0	17.0	13.4	13.0	32.4	39.2
		20	0.3	East	02^{50}	02^{55}	58.4	46.0	33.2	31.4	25.2	21.1	16.0	13.1	14.7	32.6	38.4
		20	0.7	East	03^{05}	03^{10}	60.4	45.2	32.0	30.5	20.4	19.1	17.5	15.1	13.2	33.5	37.2

		19	0.4	East	03^{25}	03^{30}	58.1	48.1	40.4	32.4	24.6	22.0	17.2	18.6	14.3	32.8	38.0
		19	0.5	East	03^{40}	03^{45}	57.2	44.0	32.0	30.1	24.0	21.0	16.4	12.4	14.0	32.0	36.1
		19	0.4	East	03^{55}	04^{00}	56.4	45.1	32.0	32.5	24.5	21.4	16.1	12.6	13.8	31.4	37.8
		19	0.5	South-East	04^{20}	04^{25}	59.5	44.0	33.7	32.4	25.0	21.0	16.4	13.0	15.0	34.8	38.2
		19	0.3	South-East	04^{35}	04^{40}	59.2	42.1	32.0	30.1	21.1	19.0	16.8	14.0	15.2	32.6	38.2
		20	0.7	South-East	04^{50}	04^{55}	58.2	46.0	33.5	31.4	24.2	21.1	15.1	14.8	15.1	34.0	37.4
		20	0.7	South-East	05^{10}	05^{15}	59.2	42.2	32.5	30.2	20.1	19.8	17.2	15.5	14.0	32.4	38.0
		19	0.3	South-East	05^{25}	05^{30}	60.1	45.0	34.0	32.5	24.6	21.8	17.5	14.1	15.6	32.0	39.1
		19	0.6	South-East	06^{40}	07^{00}	60.4	48.2	33.4	30.6	25.2	20.8	17.1	12.9	15.4	33.5	39.8

Table 0-9 NM 4 (weekend)

№	Start time	End time	Sound pressure in octave bands with geometric mean frequencies, Hz									LAeq, dB	LAmax, dB	Additional noise sources	Meteo data			
			31,5	63	125	250	500	1000	2000	4000	8000				Temperature, ^{0}C	Wind speed, m/sec	Pressure, mmHg	Wind direction
NM 4 – 21.06.2020 (weekend). Coordinates: 40˚14'48.73" N, 69˚6'56.61" E; h = 1,2 m.																		

№	Start time	End time	Sound pressure in octave bands with geometric mean frequencies, Hz									LAeq, dB	LAmax, dB	Additional noise sources	Meteo data			
			31,5	63	125	250	500	1000	2000	4000	8000				Temperature, ^{0}C	Wind speed, m/sec	Pressure, mmHg	Wind direction
1	10^{10}	10^{25}	34,2	33,3	32,1	31,3	31,1	31,3	32,1	31,2	30,4	36,3	39,0	birds	31,3	2,31 – 4,16	724	NE
LA(min) Fast 34,0 – LA(max) Fast 37,1																		
2	10^{40}	11^{55}	34,9	33,7	32,1	31,3	31,0	31,3	32,2	31,2	30,2	31,3	37,2	birds	31,4	2,7 – 4,4	724	NE
LA(min) Fast 30,9 – LA(max) Fast 32,1																		
3	11^{10}	11^{25}	44,2	43,9	42,1	41,3	41,0	41,3	42,4	41,2	40,0	42,5	45,0	birds	32,5	3,11 – 4,76	724	SW
LA(min) Fast 39,9 – LA(max) Fast 43,1																		
4	11^{40}	11^{55}	No measurements due to wind speed											birds	32,7	**3,64 – 5,81**	724	SW
5	12^{05}	12^{20}	No measurements due to wind speed											birds	35,8	**3,27 – 5,65**	724	SW
6	12^{35}	12^{50}	No measurements due to wind speed											birds	38,7	**3,24 – 5,78**	724	SW
7	13^{15}	13^{30}	32,3	33,2	32,4	34,0	33,2	34,2	35,1	35,3	35,4	34,0	47,5	birds	37,6	0,84 – 1,46	722	SW
8	13^{40}	13^{55}	32,9	33,2	32,4	34,0	33,2	34,8	35,1	35,3	35,0	33,2	42,0	birds	37,4	0,97 – 1,04	722	SW
LA(min) Fast 31,7 – LA(max) Fast 36,0																		
9	14^{10}	14^{25}	30,3	31,1	30,0	31,2	32,2	31,4	32,3	31,2	31,0	32,0	51,8	birds	38,3	0,69 – 1,16	722	SW
LA(min) Fast 31,0 – LA(max) Fast 34,0																		
10	14^{35}	14^{50}	30,8	31,0	31,0	31,2	32,2	31,4	32,3	31,2	31,0	32,6	50,1	birds	38,2	0,94 – 1,24	722	SW
LA(min) Fast 30,4 – LA(max) Fast 35,9																		
11	15^{00}	15^{15}	33,0	31,0	31,2	31,3	31,4	31,1	31,2	31,4	31,1	33,8	49,8	birds	38,8	0,94 – 1,66	722	SW
LA(min) Fast 30,0 – LA(max) Fast 36,3																		

№	Start time	End time	Sound pressure in octave bands with geometric mean frequencies, Hz									LAeq, dB	LAmax, dB	Additional noise sources	Meteo data			
			31,5	63	125	250	500	1000	2000	4000	8000				Temperature, ^{0}C	Wind speed, m/sec	Pressure, mmHg	Wind direction
12	15^{40}	15^{55}	33,4	31,0	31,0	31,3	31,4	31,1	31,2	31,2	31,1	33,5	47,8	birds	38,4	1,12 – 2,46	722	SW
LA(min) Fast 31,0 – LA(max) Fast 36,0																		
13	16^{10}	16^{25}	31,0	30,4	31,2	31,3	31,1	31,2	30,4	31,1	31,2	33,8	46,4	birds	39,7	1,12 – 1,97	722	SW
LA(min) Fast 31,2 – LA(max) Fast 35,4																		
14	16^{44}	16^{59}	32,1	33,2	33,0	32,0	33,1	33,0	33,0	33,0	33,1	34,6	48,9	birds	39,2	1,13 – 2,01	722	SW
LA(min) Fast 30,2 – LA(max) Fast 35,1																		
15	17^{03}	17^{18}	27,1	26,4	27,2	27,3	27,0	26,2	26,2	27,3	27,1	29,3	39,0	birds	40,4	1,62 – 2,13	722	SW
LA(min) Fast 24,2 – LA(max) Fast 31,9																		
16	17^{44}	17^{59}	30,1	30,4	30,0	30,3	30,0	29,2	29,2	29,3	29,0	29,7	39,4	birds	40,5	1,89 – 2,31	722	SW
LA(min) Fast 27,9 – LA(max) Fast 31,4																		
17	18^{00}	18^{12}	31,2	30,4	31,0	30,3	31,0	29,2	29,0	29,1	29,2	33,6	42,8	birds	38,4	0,79 – 1,27	722	SW
LA(min) Fast 26,0 – LA(max) Fast 32,0																		
18	18^{35}	18^{50}	23,8	23,4	24,0	23,3	24,0	23,4	24,0	23,1	24,0	36,2	43,9	birds	38,0	0,32 – 0,78	722	SW
LA(min) Fast 24,1 – LA(max) Fast 32,1																		
19	19^{00}	19^{15}	27,1	27,2	27,0	27,4	27,0	27,1	26,3	26,4	26,4	27,5	35,0	birds, frogs	37,7	0,38 – 0,61	722	SW
LA(min) Fast 25,9 – LA(max) Fast 30,4																		
20	19^{44}	19^{59}	27,8	27,2	27,0	27,4	27,0	27,0	26,3	26,4	26,0	27,0	32,1	birds, frogs	37,2	0,33 – 0,67	722	SW
LA(min) Fast 25,2 – LA(max) Fast 29,9																		

№	Start time	End time	Sound pressure in octave bands with geometric mean frequencies, Hz									LAeq, dB	LAmax, dB	Additional noise sources	Meteo data			
			31,5	63	125	250	500	1000	2000	4000	8000				Temperature, ^{0}C	Wind speed, m/sec	Pressure, mmHg	Wind direction
21	20^{00}	20^{15}	31,3	32,1	32,3	31,0	31,2	30,3	30,1	30,2	30,2	32,6	34,2	birds, frogs	28,7	0,68 – 1,13	721	SW
LA(min) Fast 30,0 – LA(max) Fast 32,0																		
22	20^{38}	20^{53}	31,9	33,1	33,3	35,0	34,2	35,2	35,1	35,2	33,0	36,0	36,8	birds, frogs	28,0	0,27 – 0,53	721	SW
LA(min) Fast 30,7 – LA(max) Fast 33,8																		
23	21^{10}	21^{25}	45,0	44,0	43,0	43,4	42,2	45,0	45,2	43,3	43,4	45,4	52,1	birds, frogs	26,9	0,57 – 0,83	722	NE
LA(min) Fast 40,0 – LA(max) Fast 44,0																		
24	21^{40}	21^{55}	45,1	44,0	43,0	43,2	42,2	45,0	45,0	43,3	43,1	44,3	51,8	birds, frogs	26,1	0,64 – 1,19	722	NE
LA(min) Fast 41,2 – LA(max) Fast 44,9																		
25	22^{00}	22^{15}	41,4	42,3	42,4	42,3	43,1	41,3	42,0	41,4	42,2	45,4	50,0	birds, frogs, sounds from cafe	24,5	0,36 – 0,71	721	NE
LA(min) Fast 42,2 – LA(max) Fast 46,0																		
26	22^{38}	22^{53}	41,4	42,3	42,4	42,3	43,1	41,3	42,0	41,4	42,2	45,2	56,4	birds, frogs, sounds from cafe	24,2	0,76 – 1,22	721	NE
LA(min) Fast 42,0 – LA(max) Fast 45,0																		
27	23^{05}	23^{20}	44,2	43,9	42,1	41,3	41,0	41,3	42,4	41,2	40,0	44,0	52,4	birds, frogs	22,4	0,41 – 0,62	721	NE
LA(min) Fast 38,0 – LA(max) Fast 42,0																		
28	23^{38}	23^{53}	44,0	43,9	42,1	41,0	41,0	41,3	42,0	41,2	40,0	43,8	57,4	birds, frogs	22,0	1,55 – 2,68	721	NE
LA(min) Fast 38,4 – LA(max) Fast 42,9																		
NM 4 – 22.06.2020 (weekday). Coordinates: 40˚14'48.73'' N, 69˚6'56.61'' E; h = 1,2 m.																		

№	Start time	End time	Sound pressure in octave bands with geometric mean frequencies, Hz									LAeq, dB	LAmax, dB	Additional noise sources	Meteo data			
			31,5	63	125	250	500	1000	2000	4000	8000				Temperature, ^{0}C	Wind speed, m/sec	Pressure, mmHg	Wind direction
29	00^{07}	00^{22}	44,2	43,9	42,1	41,3	41,0	41,3	42,4	41,2	40,0	43,8	48,2	birds, frogs	22,8	0,42 – 0,81	721	NE
LA(min) Fast 40,0 – LA(max) Fast 42,0																		
30	00^{44}	00^{59}	41,4	42,3	42,4	42,3	43,1	41,3	42,0	41,4	42,2	43,9	47,7	birds, frogs	22,4	0,55 – 0,91	721	NE
LA(min) Fast 40,3 – LA(max) Fast 43,3																		
31	01^{12}	01^{27}	43,8	43,4	44,0	43,3	44,0	43,4	44,0	43,1	44,0	39,5	44,1	birds, frogs	21,4	0,97 – 2,15	721	NE
LA(min) Fast 36,5 – LA(max) Fast 38,0																		
32	01^{32}	01^{47}	43,8	43,4	44,0	43,3	44,0	43,4	44,0	41,1	41,0	41,1	45,1	Crickets, frogs,	21,1	0,56 – 0,93	721	NE
LA(min) Fast 36,0 – LA(max) Fast 38,8																		
33	02^{03}	02^{18}	31,9	33,1	33,3	35,0	34,2	35,2	35,1	35,2	33,0	41,3	45,3	Crickets, frogs,	21,0	0,43 – 1,06	721	NE
LA(min) Fast 32,9 – LA(max) Fast 36,0																		
34	02^{32}	02^{47}	31,9	33,1	33,3	35,0	34,2	35,2	35,1	35,2	33,0	40,6	44,4	Crickets, frogs,	21,0	0,44 – 1,56	721	NE
LA(min) Fast 31,9 – LA(max) Fast 36,8																		
35	03^{10}	03^{25}	31,9	33,1	33,3	35,0	34,2	35,2	35,1	35,2	33,0	37,9	47,2	Crickets, frogs,	20,3	1,27 – 1,74	721	NE
LA(min) Fast 32,0 – LA(max) Fast 36,2																		
36	03^{36}	03^{51}	33,9	33,1	33,3	34,0	34,2	35,2	35,1	35,2	33,0	33,4	39,1	Crickets, frogs,	20,1	0,71 – 0,91	721	NE
LA(min) Fast 33,0 – LA(max) Fast 35,2																		

№	Start time	End time	Sound pressure in octave bands with geometric mean frequencies, Hz									LAeq, dB	LAmax, dB	Additional noise sources	Meteo data			
			31,5	63	125	250	500	1000	2000	4000	8000				Temperature, ^{0}C	Wind speed, m/sec	Pressure, mmHg	Wind direction
37	04^{00}	04^{15}	32,1	32,3	33,2	33,4	33,2	34,0	33,1	33,3	33,2	32,1	38,0	Crickets, frogs,	21,7	0,51 – 0,89	721	NE
LA(min) Fast 34,0 – LA(max) Fast 36,0																		
38	04^{22}	04^{37}	32,1	32,3	33,2	33,4	33,2	34,0	33,1	33,3	33,2	32,6	38,2	Crickets, frogs,	21,3	0,9 – 1,71	721	NE
LA(min) Fast 32,4 – LA(max) Fast 35,8																		
39	05^{17}	05^{32}	31,9	33,1	33,3	35,0	34,2	35,2	35,1	35,2	33,0	41,7	48,0	Crickets frogs	20,4	0,33 – 1,13	721	NE
LA(min) Fast 31,0 – LA(max) Fast 38,0																		
40	05^{43}	05^{58}	31,9	33,1	33,3	35,0	34,2	35,2	35,1	35,2	33,0	40,9	47,8	frogs	20,7	1,13 – 1,76	721	NE
LA(min) Fast 32,1 – LA(max) Fast 38,8																		
41	06^{10}	06^{35}	43,2	43,4	44,0	43,3	44,0	43,2	43,0	43,1	44,2	43,7	49,0	birds, frogs	23,8	2,59 – 4,16	721	NE
LA(min) Fast 40,1 – LA(max) Fast 44,9																		
42	06^{45}	07^{00}	43,1	43,2	44,0	43,4	43,0	43,1	43,3	43,4	44,4	43,8	47,1	birds, frogs	23,5	2,16 – 4,32	721	NE
LA(min) Fast 11,8 – LA(max) Fast 44,6																		
43	07^{12}	07^{27}	43,8	43,2	44,0	43,4	43,0	43,0	43,3	43,4	44,0	46,5	52,0	birds, sound from livestock	23,8	2,16 – 4,32	721	NE
LA(min) Fast 40,4 – LA(max) Fast 47,3																		
44	07^{39}	07^{54}	44,3	45,1	45,3	46,0	45,2	46,3	46,1	45,2	46,2	46,0	54,2	birds, sound from livestock	23,0	0,20 – 1,21	721	NE

№	Start time	End time	Sound pressure in octave bands with geometric mean frequencies, Hz									LAeq, dB	LAmax, dB	Additional noise sources	Meteo data			
			31,5	63	125	250	500	1000	2000	4000	8000				Temperature, ^{0}C	Wind speed, m/sec	Pressure, mmHg	Wind direction
LA(min) Fast 40,8 – LA(max) Fast 49,0																		
45	08^{00}	08^{15}	No measurements due to wind speed											birds, sound from livestock, wind	27,3	**4,21 – 6,73**	721	NE
46	08^{32}	08^{47}	No measurements due to wind speed											birds, sound from livestock, wind	27,4	**4,38 – 6,42**	721	NE
47	09^{10}	09^{25}	44,1	44,3	43,4	44,0	43,2	45,1	46,3	45,2	45,4	43,3	46,0	birds, sound from livestock	31,2	2,11 – 4,59	721	NE
LA(min) Fast 38,0 – LA(max) Fast 42,0																		
48	09^{40}	09^{55}	44,1	44,3	43,4	44,0	43,2	45,1	46,3	45,2	45,4	40,7	50,2	birds, sound from livestock	31,7	2,55 – 4,28	721	NE
LA(min) Fast 35,0 – LA(max) Fast 42,7																		

Table 0-10 NM 4 (weekday)

NM 4 – 24.06.2020 (weekday). Coordinates: 40˚14'48.73'' N, 69˚6'56.61'' E; h = 1,2 ,m.																		
49	11^{10}	11^{25}	44,1	44,3	43,4	44,0	43,2	45,1	46,3	45,2	45,4	43,2	54,0	birds, wind	37,3	2,71 – 4,56	727	NE
LA(min) Fast 41,0 – LA(max) Fast 43,7																		

50	11^{40}	11^{55}	44,1	44,3	43,4	44,0	43,2	45,1	46,3	45,2	45,4	44,0	54,8	birds, wind	37,5	2,78 – 4,64	727	NE
LA(min) Fast 41,0 – LA(max) Fast 43,0																		
51	12^{02}	12^{17}	32,2	33,4	33,1	33,0	33,0	33,1	33,0	33,0	33,0	32,8	44,1	birds	41,3	0,27 – 1,38	726	SW
LA(min) Fast 25,0 – LA(max) Fast 30,0																		
52	12^{36}	12^{51}	32,1	33,2	33,1	33,0	33,1	33,1	33,0	33,0	33,1	32,9	41,4	birds	41,0	0,29 – 1,45	726	SW
LA(min) Fast 26,0 – LA(max) Fast 30,0																		
53	13^{00}	13^{15}	32,1	33,2	33,0	32,0	33,1	33,0	33,0	33,0	33,1	28,0	38,7	birds	42,9	1,37 – 2,16	726	SW
LA(min) Fast 23,0 – LA(max) Fast 25,0																		
54	13^{40}	13^{55}	31,1	31,1	31,0	30,0	31,1	31,0	31,0	31,2	31,1	29,6	41,0	birds	42,5	1,34 – 2,48	726	SW
LA(min) Fast 23,1 – LA(max) Fast 25,4																		
55	10^{00}	14^{15}	32,1	33,2	33,1	33,0	33,1	33,1	33,0	33,0	33,1	31,3	40,5	birds	42,3	1,13 – 2,04	726	SW
LA(min) Fast 30,1 – LA(max) Fast 32,4																		
56	14^{41}	14^{56}	32,1	33,2	33,1	33,0	33,1	33,1	33,0	33,0	33,1	33,5	44,0	birds	42,5	1,19 – 2,09	726	SW
LA(min) Fast 30,0 – LA(max) Fast 32,0																		
57	15^{08}	15^{23}	33,8	34,0	34,0	33,2	34,7	34,5	35,3	36,2	37,4	30,1	40,0	birds	41,6	0,96 – 2,17	726	SW
LA(min) Fast 26,0 – LA(max) Fast 30,0																		
58	15^{35}	15^{50}	34,2	35,7	35,4	35,6	36,2	37,4	38,4	39,7	39,3	36,4	48,0	birds	41,4	0,94 – 2,33	726	SW
LA(min) Fast 26,7 – LA(max) Fast 30,4																		
59	16^{00}	16^{15}	33,0	34,0	34,0	33,5	34,7	34,5	35,4	36,2	37,4	34,3	44,8	birds	40,4	0,87 – 1,79	726	SW
LA(min) Fast 30,0 – LA(max) Fast 32,8																		
60	16^{40}	16^{55}	32,1	33,2	33,0	32,0	33,1	33,0	33,0	33,0	32,1	31,5	42,0	birds	40,5	0,82 – 1,4	726	SW
LA(min) Fast 30,0 – LA(max) Fast 32,0																		
61	17^{02}	17^{17}	41,0	41,2	44,0	44,3	44,0	44,4	44,2	44,3	45,1	45,4	57,4	birds, tracktor	37,1	0,96 – 2,13	726	SW
LA(min) Fast 37,0 – LA(max) Fast 40,0																		

62	17^{40}	17^{55}	41,0	41,2	44,0	44,3	44,0	44,4	44,2	44,3	45,1	41,0	52,1	birds	37,0	0,94 – 2,33	726	IOB
LA(min) Fast 37,0 – LA(max) Fast 38,0																		
63	18^{04}	18^{19}	33,8	34,0	34,0	33,2	34,7	34,5	35,3	36,2	37,4	34,1	44,6	birds	34,8	0,03 – 0,37	726	IOB
LA(min) Fast 28,0 – LA(max) Fast 30,0																		
64	18^{32}	18^{47}	32,2	33,4	33,1	33,0	33,0	33,1	33,0	33,0	33,0	30,6	42,0	birds	35,1	0,4 – 0,68	726	SW
LA(min) Fast 27,9 – LA(max) Fast 30,1																		
65	19^{01}	19^{16}	43,2	43,3	43,3	43,4	44,0	44,2	44,2	44,4	45,1	46,8	57,0	birds, tracktor	31,4	0,24 – 0,48	726	NE
LA(min) Fast 40,0 – LA(max) Fast 47,0																		
66	19^{30}	19^{45}	41,0	41,2	44,0	44,3	44,0	44,4	44,2	44,3	45,1	44,1	55,9	birds, tracktor	31,0	0,22 – 0,44	726	NE
LA(min) Fast 40,5 – LA(max) Fast 47,3																		
67	20^{00}	20^{15}	33,8	34,0	34,0	33,2	34,7	34,5	35,3	36,2	37,4	32,2	41,8	birds	29,7	0,34 – 0,62	726	IOB
LA(min) Fast 28,1 – LA(max) Fast 33,3																		
68	20^{40}	20^{55}	32,1	33,1	33,0	32,0	33,1	33,1	33,0	33,2	33,1	30,1	40,4	birds	29,0	0,68 – 1,09	726	IOB
LA(min) Fast 28,0 – LA(max) Fast 33,0																		
69	21^{00}	21^{15}	34,5	35,7	35,4	35,9	36,2	37,1	38,4	39,7	39,2	35,8	45,0	birds, wind	27,3	1,75 – 3,12	727	NE
LA(min) Fast 34,1 – LA(max) Fast 38,3																		
70	21^{40}	21^{55}	32,1	33,1	33,0	32,0	33,1	33,1	33,0	33,2	33,1	34,9	42,9	birds, wind	27,0	1,84 – 3,08	727	NE
LA(min) Fast 34,0 – LA(max) Fast 37,2																		
71	22^{04}	22^{19}	33,0	34,0	34,0	33,5	34,7	34,5	35,4	36,2	37,4	35,6	44,0	birds, wind	25,3	1,52 – 3,11	727	NE
LA(min) Fast 33,0 – LA(max) Fast 36,2																		
72	22^{43}	22^{58}	34,5	35,7	35,4	35,9	36,2	37,1	38,4	39,7	39,2	37,4	48,0	birds, wind	25,0	1,66 – 3,4	727	NE
LA(min) Fast 33,0 – LA(max) Fast 36,0																		
73	23^{00}	23^{12}	No measurements due to wind speed											birds, wind	29,4	**3,54 – 5,28**	727	NE
74	23^{40}	23^{55}	No measurements due to wind speed											birds, wind	29,5	**3,78 – 6,42**	727	NE

NM 4 – 25.06.2020 (weekday). Coordiantes: 40°14'48.73'' N, 69°6'56.61'' E; h = 1,2 m.																		
75	00^{01}	00^{16}	No measurements due to wind speed											birds, wind	24,3	**3,54 – 5,26**	727	NE
76	00^{38}	00^{53}	No measurements due to wind speed											birds, wind	24,0	**4,48 – 6,22**	727	NE
77	01^{08}	08^{23}	No measurements due to wind speed											birds, wind	24,1	**4,63 – 7,42**	727	NE
78	01^{40}	01^{55}	No measurements due to wind speed											birds, wind	24,0	**4,48 – 6,89**	727	NE
79	02^{10}	02^{25}	52,3	55,0	55,2	55,4	55,0	55,1	55,2	55,0	55,3	51,0	59,8	birds, wind	22,3	2,95 – 4,56	727	NE
LA(min) Fast 48,0 – LA(max) Fast 52,0																		
80	02^{40}	02^{55}	51,4	53,0	50,3	51,2	51,4	52,2	53,1	51,1	51,0	51,8	63,2	birds, wind, car	22,0	2,34 – 4,47	727	NE
LA(min) Fast 48,4 – LA(max) Fast 51,8																		
81	03^{10}	03^{25}	51,5	53,0	50,3	51,6	51,4	52,2	53,4	51,1	51,0	52,2	63,8	birds, wind, car	21,0	2,89 – 4,43	727	SW
LA(min) Fast 49,0 – LA(max) Fast 54,0																		
82	03^{40}	03^{55}	53,3	54,1	53,2	53,1	53,1	53,3	51,0	51,3	53,1	51,4	61,8	birds, wind	21,0	2,4 – 4,78	727	SW
LA(min) Fast 48,4 – LA(max) Fast 52,6																		
83	04^{00}	04^{15}	54,4	53,9	52,1	51,3	51,0	51,2	52,4	51,2	50,0	52,1	61,0	birds, wind	21,5	2,64 – 4,21	727	SW
LA(min) Fast 50,4 – LA(max) Fast 51,6																		
84	04^{37}	04^{52}	53,0	51,0	51,2	51,3	51,4	51,1	51,2	51,4	51,1	50,6	59,9	birds, wind	21,7	2,88 – 4,46	727	SW
LA(min) Fast 50,0 – LA(max) Fast 52,1																		
85	05^{04}	05^{19}	53,4	51,0	51,0	51,3	51,4	51,1	51,2	51,2	51,1	41,8	53,2	birds, wind	22,0	1,73 – 2,45	727	SW
LA(min) Fast 36,0 – LA(max) Fast 38,0																		
86	05^{32}	05^{47}	43,1	42,4	42,2	43,3	43,0	42,2	43,2	43,3	43,1	42,3	55,0	birds, wind	22,5	1,88 – 2,67	727	SW
LA(min) Fast 35,9 – LA(max) Fast 38,4																		
87	06^{00}	06^{15}	44,1	42,4	42,0	43,3	43,0	43,2	43,2	43,3	43,0	46,1	58,1	birds, wind	25,6	2,8 – 4,79	726	NE
LA(min) Fast 33,9 – LA(max) Fast 38,0																		

88	06^{33}	06^{48}	55,0	54,0	53,0	53,4	52,2	55,0	55,2	53,3	53,4	50,0	62,0	birds, wind, car	26,0	3,1 – 4,75	726	NE
LA(min) Fast 34,0 – LA(max) Fast 39,0																		
89	07^{10}	07^{25}	No measurements due to wind speed											birds, wind	26,4	**3,25 – 8,25**	726	NE
90	07^{40}	07^{55}	No measurements due to wind speed											birds, wind	26,9	**4,94 – 6,88**	726	NE
91	08^{02}	08^{17}	No measurements due to wind speed											birds, wind	28,1	**3,78 – 6,16**	726	NE
92	08^{36}	08^{51}	No measurements due to wind speed											birds, wind	28,0	**4,05 – 7,08**	726	NE
93	09^{00}	09^{15}	No measurements due to wind speed											birds, wind	30,0	**8,86 – 12,7**	726	NE
94	09^{40}	09^{55}	No measurements due to wind speed											birds, wind	30,1	**8,31 – 10,2**	726	NE
95	10^{02}	10^{17}	No measurements due to wind speed											birds, wind	31,9	**7,41 – 10,2**	726	NE
96	10^{42}	10^{57}	No measurements due to wind speed											birds, wind	31,7	**7,32 – 9,44**	726	NE

Table 0-11 NM 5 (weekday)

№	**Start time**	**End time**	**Sound pressure in octave bands with geometric mean frequencies, Hz**									**LAeq, dB**	**LAmax, dB**	**Additional noise sources**	**Meteo data**			
			31,5	**63**	**125**	**250**	**500**	**1000**	**2000**	**4000**	**8000**				**Temperature, ^{0}C**	**Wind speed, m/sec**	**Pressure, mmHg**	**Wind direction**
NM 5 – 25.06.2020 (weekday). Coordinates: 40°14'40.63"N 69° 7'33.91" E; h = 1,2 m.																		
1	11^{10}	11^{25}	55,0	54,0	53,0	53,4	52,2	55,0	55,2	53,3	53,4	50,5	63,0	birds, house. livestock, wind	33,1	2,94 – 5,00	725	NE
LA(min) Fast 54,9 – LA(max) Fast 59,1																		

2	11^{40}	11^{55}	55,0	54,0	53,2	53,4	52,2	55,5	55,2	53,3	53,0	57,9	64,2	birds, house. livestock, wind	33,7	3,64 – 4,81	725	NE
LA(min) Fast 55,0 – LA(max) Fast 58,5																		
3	12^{05}	12^{20}	No measurement due to wind speed > 5 m/s											birds, house. livestock, wind	35,4	**3,39 – 5,9**	725	NE
4	12^{35}	12^{50}	No measurement due to wind speed > 5 m/s											birds, house. livestock, wind	35,7	**3,24 – 5,78**	725	NE
5	13^{15}	13^{30}	44,9	45,1	45,3	46,0	45,2	46,2	46,1	45,2	46,0	51,6	57,5	birds, house. livestock, wind	36,7	2,19 – 4,71	725	SW
LA(min) Fast 43,0 – LA(max) Fast 48,1																		
6	13^{40}	13^{55}	44,3	45,1	45,3	46,0	45,2	46,3	46,1	45,2	46,2	49,5	52,0	birds, house. livestock, wind	36,4	2,97 – 4,04	725	SW
LA(min) Fast 43,7 – LA(max) Fast 46,0																		
7	14^{10}	14^{25}	44,9	45,1	45,3	46,0	45,2	46,2	46,1	45,2	46,0	47,1	51,8	birds, house. livestock, wind	36,8	2,95 – 4,35	725	NE
LA(min) Fast 40,9 – LA(max) Fast 46,7																		
8	14^{35}	14^{50}	44,3	45,1	45,3	46,0	45,2	46,3	46,1	45,2	46,2	45,2	50,1	birds, house. livestock, wind	36,1	2,94 – 4,24	725	NE
LA(min) Fast 40,4 – LA(max) Fast 45,9																		
9	15^{00}	15^{15}	43,8	43,4	44,0	43,3	44,0	43,4	44,0	43,1	44,0	53,8	59,8	birds, house. livestock, wind	36,2	2,48 – 4,53	725	NE
LA(min) Fast 40,0 – LA(max) Fast 44,3																		
10	15^{40}	15^{55}	43,2	43,4	44,0	43,3	44,0	43,2	43,0	43,1	44,2	53,5	57,8	birds, house. livestock, wind	36,4	2,12 – 4,46	725	NE

LA(min) Fast 42,0 – LA(max) Fast 44,0																		
11	16^{10}	16^{25}	42,1	42,3	43,2	43,4	43,2	44,0	43,1	43,3	43,2	42,1	48,4	birds, house. livestock	36,7	2,58 – 3,85	722	NE
LA(min) Fast 38,2 – LA(max) Fast 42,4																		
12	16^{44}	16^{59}	43,8	43,3	43,0	42,4	43,1	42,5	43,2	42,5	43,1	44,6	48,9	birds, house. livestock	36,2	2,13 – 3,01	722	NE
LA(min) Fast 39,2 – LA(max) Fast 43,1																		
13	17^{03}	17^{18}	42,3	43,1	42,2	44,3	45,2	43,1	44,2	43,0	43,4	41,4	49,0	birds, cars	35,6	2,7 – 3,75	722	SW
LA(min) Fast 32,2 – LA(max) Fast 35,9																		
14	17^{44}	17^{59}	42,5	43,1	42,2	44,3	45,2	43,6	44,2	43,0	43,4	46,0	52,4	birds, cars	35,5	2,89 – 3,01	722	SW
LA(min) Fast 33,9 – LA(max) Fast 36,4																		
15	18^{00}	18^{12}	43,2	43,3	43,0	42,4	43,1	42,4	43,2	42,3	43,1	41,4	48,8	birds, cars,	34,6	1,64 – 2,91	722	SW
LA(min) Fast 30,0 – LA(max) Fast 34,0																		
16	18^{35}	18^{50}	34,2	35,7	35,4	34,6	36,2	34,4	35,4	32,7	32,3	33,7	49,9	birds, cars,	34,0	1,44 – 2,98	722	SW
LA(min) Fast 30,1 – LA(max) Fast 33,1																		
17	19^{00}	19^{15}	34,2	35,7	35,4	34,6	36,2	34,4	35,4	32,7	32,3	32,8	40,0	birds, cars,	33,1	1,15 – 2,43	722	NE
LA(min) Fast 31,9 – LA(max) Fast 34,4																		
18	19^{44}	19^{59}	32,1	32,3	32,6	32,3	33,2	33,8	33,6	33,3	33,1	32,4	42,1	birds, cars,	33,2	1,31 – 2,89	722	NE
LA(min) Fast 31,2 – LA(max) Fast 36,9																		
19	20^{00}	20^{15}	41,2	44,0	44,3	44,0	44,4	43,2	43,3	43,1	41,2	41,3	50,2	birds, cars, frogs	30,8	1,21 – 1,98	722	NE
LA(min) Fast 31,0 – LA(max) Fast 35,0																		
20	20^{38}	20^{53}	41,0	41,2	44,0	44,3	44,0	44,4	44,2	44,3	45,1	36,8	43,8	birds, cars, frogs	30,4	1,55 – 2,14	722	NE
LA(min) Fast 32,7 – LA(max) Fast 34,8																		
21	21^{10}	21^{25}	41,0	41,2	44,0	44,3	44,0	44,4	44,2	44,3	45,1	43,6	49,8	birds, cars, frogs	29,1	1,47 – 2,04	722	SW
LA(min) Fast 36,0 – LA(max) Fast 40,0																		

22	21^{40}	21^{55}	41,0	41,2	44,0	44,3	44,0	44,4	44,2	44,3	45,1	42,2	51,8	birds, cars, frogs	29,1	1,64 – 2,19	722	SW
LA(min) Fast 37,0 – LA(max) Fast 40,9																		
23	22^{00}	22^{15}	46,4	45,1	46,2	44,3	45,2	46,1	47,2	48,3	47,2	47,4	50,0	birds, cars, crickets, frogs,	27,3	0,36 – 0,71	722	NE
LA(min) Fast 44,2 – LA(max) Fast 46,0																		
24	22^{38}	22^{53}	46,4	45,1	46,2	44,3	45,2	46,1	47,2	48,3	47,2	46,2	48,4	birds, cars, crickets, frogs,	27,2	0,77 – 0,98	722	NE
LA(min) Fast 44,0 – LA(max) Fast 46,0																		
25	23^{05}	23^{20}	42,3	43,1	46,2	44,0	45,1	43,3	44,2	46,4	45,8	46,6	49,4	birds, cars, frogs	27,6	0,79 – 1,16	722	NE
LA(min) Fast 46,0 – LA(max) Fast 48,0																		
26	23^{38}	23^{53}	42,2	43,1	46,2	44,4	45,1	43,6	44,2	46,4	45,8	46,3	51,4	birds, cars, frogs	27,0	0,55 – 1,68	722	NE
LA(min) Fast 43,4 – LA(max) Fast 47,9																		
NM 5 – 26.06.2020 (weekend). Coordinates: 40°14'40.63"N 69° 7'33.91" E; h = 1,2 m.																		
27	00^{07}	00^{22}	44,3	45,1	45,3	46,0	45,2	46,3	46,1	45,2	46,2	47,9	49,9	birds, frogs	25,9	1,1 – 2,06	722	NE
LA(min) Fast 45,0 – LA(max) Fast 49,0																		
28	00^{44}	00^{59}	42,4	43,1	45,2	44,3	45,2	44,4	45,3	46,1	44,2	42,0	49,9	birds, frogs	25,4	1,55 – 2,04	722	NE
LA(min) Fast 42,3 – LA(max) Fast 49,3																		
29	01^{12}	01^{27}	46,1	49,3	47,2	48,1	47,2	45,4	46,3	47,1	48,2	47,5	54,1	birds, frogs	25,2	1,14 – 1,73	722	NE
LA(min) Fast 41,5 – LA(max) Fast 48,0																		
30	01^{32}	01^{47}	46,1	49,3	47,2	48,1	47,7	45,4	46,3	47,4	48,2	42,9	54,1	birds, frogs	25,1	1,36 – 1,94	722	NE
LA(min) Fast 42,0 – LA(max) Fast 48,8																		
31	02^{03}	02^{18}	43,2	43,4	44,0	43,3	44,0	43,2	43,0	43,1	44,2	42,8	53,3	birds, frogs	23,9	0,87 – 1,36	722	NE
LA(min) Fast 42,0 – LA(max) Fast 44,0																		
32	02^{32}	02^{47}	41,3	54,0	52,5	51,1	53,3	54,3	53,0	53,4	52,2	51,8	54,0	birds, frogs	23,0	0,44 – 1,56	722	NE

LA(min) Fast 41,9 – LA(max) Fast 44,8																		
33	03^{10}	03^{25}	43,8	43,4	44,0	43,3	44,0	43,4	44,0	43,1	44,0	43,4	53,2	birds, frogs	23,4	1,32 – 1,66	722	NE
LA(min) Fast 42,0 – LA(max) Fast 44,2																		
34	03^{36}	03^{51}	43,2	43,4	44,0	43,3	44,0	43,2	43,0	43,1	44,2	44,4	50,1	birds, frogs	23,1	1,84 – 1,95	722	NE
LA(min) Fast 43,0 – LA(max) Fast 45,2																		
35	04^{00}	04^{15}	34,2	35,7	35,4	34,6	36,2	34,4	35,4	32,7	32,3	32,2	48,0	birds, frogs	23,7	0,54 – 1,26	722	NE
LA(min) Fast 31,0 – LA(max) Fast 33,0																		
36	04^{22}	04^{37}	34,2	35,7	35,4	34,6	36,2	34,4	35,4	32,7	32,3	32,8	48,2	birds, frogs	23,3	0,5 – 1,71	722	NE
LA(min) Fast 30,4 – LA(max) Fast 32,8																		
37	05^{17}	05^{32}	32,1	32,3	32,6	32,3	33,2	33,8	33,6	33,3	33,1	33,5	35,9	frogs, birds	25,1	1,14 – 2,22	722	NE
LA(min) Fast 29,0 – LA(max) Fast 31,0																		
38	05^{43}	05^{58}	34,2	35,7	35,4	34,6	36,2	34,4	35,4	32,7	32,3	34,3	44,8	frogs, birds	25,7	1,51 – 1,89	722	NE
LA(min) Fast 30,1 – LA(max) Fast 32,8																		
39	06^{10}	06^{35}	34,2	34,7	34,4	33,6	34,2	34,4	35,4	32,7	31,3	34,7	39,0	frogs, birds	26,7	1,18 – 1,96	722	NE
LA(min) Fast 26,1 – LA(max) Fast 28,9																		
40	06^{45}	07^{00}	34,2	35,7	35,4	34,6	36,2	34,4	35,4	32,7	32,3	34,8	37,1	frogs, birds	26,5	1,4 – 1,78	722	NE
LA(min) Fast 26,8 – LA(max) Fast 29,6																		
41	07^{12}	07^{27}	34,2	35,7	35,4	34,6	36,2	34,4	35,1	32,7	32,0	34,5	37,0	birds	28,3	1,67 – 2,19	722	NE
LA(min) Fast 26,4 – LA(max) Fast 30,3																		
42	07^{39}	07^{54}	34,2	35,7	35,4	34,6	36,2	34,4	35,4	32,7	32,3	34,8	38,2	birds	28,5	1,20 – 2,21	722	NE
LA(min) Fast 26,8 – LA(max) Fast 29,0																		
43	08^{00}	08^{15}	32,6	32,5	32,3	32,1	32,0	31,8	31,7	31,5	32,6	32,2	42,4	birds	29,7	1,36 – 2,19	723	NE
LA(min) Fast 31,8 – LA(max) Fast 33,0																		
44	08^{32}	08^{47}	34,6	34,3	34,1	33,0	32,8	32,7	32,0	31,8	31,7	33,0	42,0	birds	29,4	1,38 – 2,74	723	NE

LA(min) Fast 32,1 – LA(max) Fast 33,7																		
45	09^{10}	09^{25}	33,4	34,1	32,2	33,1	34,0	34,4	33,1	32,2	33,3	35,8	36,4	birds	31,2	0,46 – 0,83	723	NE
LA(min) Fast 30,0 – LA(max) Fast 32,0																		
46	09^{40}	09^{55}	33,4	34,1	32,3	33,1	34,0	34,6	33,1	32,2	33,5	36,5	39,8	birds	31,7	0,55 – 0,78	723	NE
LA(min) Fast 30,0 – LA(max) Fast 32,7																		
47	10^{00}	10^{15}	33,5	34,1	32,2	33,6	34,0	34,4	33,1	32,2	33,4	35,6	44,0	birds	32,1	0,56 – 0,98	723	NE
LA(min) Fast 28,0 – LA(max) Fast 30,1																		
48	10^{30}	10^{45}	33,5	34,1	32,4	33,6	34,0	34,8	33,1	32,2	33,1	35,2	40,0	birds	32,1	1,25 – 2,68	723	NE
LA(min) Fast 28,0 – LA(max) Fast 31,0																		

Table 0-12 NM 5 (weekend)

NM 5 – 27.06.2020 (weekend). Coordinates: 40°14'40.63"N 69° 7'33.91" E; h = 1,2 m.																		
49	7^{10}	7^{25}	No measurement due to wind speed > 5 m/s											wind, birds	22,4	**3,39 – 5,28**	727	SE
50	7^{35}	7^{50}	52,2	53,4	54,3	54,1	52,4	53,2	55,3	53,2	54,1	53,3	61,2	wind, birds	22,4	3,38 –4,25	727	SE
LA(min) Fast 50,4 – LA(max) Fast 52,9																		
51	8^{00}	8^{15}	53,2	54,1	54,3	53,1	52,2	53,4	53,0	52,1	54,3	41,3	54,0	wind, birds	24,1	2,86 – 4,42	727	SE
LA(min) Fast 38,4 – LA(max) Fast 42,9																		
52	8^{30}	8^{45}	44,2	43,3	42,1	41,3	41,1	41,3	42,1	41,2	40,4	44,3	50,0	wind, birds	24,0	2,45 – 4,58	727	SE
LA(min) Fast 37,8 – LA(max) Fast 42,1																		
53	9^{10}	9^{25}	56,2	57,1	54,3	56,1	54,2	56,4	57,1	56,3	54,1	54,3	62,0	wind, birds	25,6	2,94 – 4,95	729	SE
LA(min) Fast 45,8 – LA(max) Fast 48,1																		
54	9^{40}	9^{55}	No measurement due to wind speed > 5 m/s											wind, birds	25,2	**3,46 – 5,9**	729	SE
55	10^{00}	10^{15}	No measurement due to wind speed > 5 m/s											wind, birds	26,2	**4,41 – 6,79**	729	SE
56	10^{40}	10^{55}	No measurement due to wind speed > 5 m/s											wind, birds	26,4	**4,17 – 5,54**	729	SE

57	11^{10}	11^{25}	No measurement due to wind speed > 5 m/s											wind, birds	26,5	**3,39 – 6,71**	729	SE
58	11^{40}	11^{55}	No measurement due to wind speed > 5 m/s											wind, birds	26,4	**3,04 – 6,75**	729	SE
59	12^{00}	12^{15}	No measurement due to wind speed > 5 m/s											wind, birds	26,7	**4,53 – 6,27**	730	SE
60	12^{35}	12^{50}	No measurement due to wind speed > 5 m/s											wind, birds	26,1	**4,34 – 6,34**	730	SE
61	13^{14}	13^{29}	52,1	52,4	53,3	54,2	55,1	53,4	52,2	56,1	54,3	43,4	55,6	cars, birds	27,4	3,61 – 4,58	730	SE
LA(min) Fast 31,9 – LA(max) Fast 36,6																		
62	13^{40}	13^{55}	52,0	52,4	53,3	54,2	55,8	53,4	52,2	56,1	54,3	53,6	64,2	cars, birds	27,4	3,71 – 4,28	730	SE
LA(min) Fast 32,0 – LA(max) Fast 35,6																		
63	14^{00}	14^{15}	43,2	44,1	44,3	46,1	42,2	45,1	44,2	46,1	44,2	41,2	61,7	cars, birds	30,2	1,63 – 3,12	730	SE
LA(min) Fast 38,0 – LA(max) Fast 42,0																		
64	14^{40}	14^{55}	42,9	44,1	44,3	46,1	42,2	45,1	44,2	46,1	44,2	41,6	61,0	cars, birds	30,4	1,4 – 3,75	730	SE
LA(min) Fast 38,0 – LA(max) Fast 45,6																		
65	15^{00}	15^{15}	42,4	43,1	43,4	43,0	44,2	45,1	47,2	43,3	46,1	42,6	46,0	birds	27,6	2,66 – 4,91	730	SE
LA(min) Fast 30,0 – LA(max) Fast 34,6																		
66	15^{40}	15^{55}	34,6	34,3	34,1	33,0	32,8	32,7	32,0	31,8	31,7	34,6	54,5	birds	27,6	2,46 – 5,02	730	SE
LA(min) Fast 30,4 – LA(max) Fast 34,9																		
67	16^{05}	16^{20}	46,4	47,1	47,3	48,4	45,3	49,1	47,2	46,4	49,3	46,0	48,0	wind, birds	26,7	2,17 – 4,58	730	SE
LA(min) Fast 36,0 – LA(max) Fast 39,9																		
68	16^{40}	16^{55}	46,4	47,8	47,6	48,4	45,3	49,8	47,2	46,4	49,3	44,6	48,0	wind, birds	26,9	2,78 – 4,25	730	SE
LA(min) Fast 36,4 – LA(max) Fast 40,1																		
69	17^{00}	17^{15}	53,0	52,2	53,0	52,1	52,4	53,1	53,3	53,4	52,4	53,5	54,8	cars, birds	25,3	1,75 – 3,12	730	SE
LA(min) Fast 42,4 – LA(max) Fast 44,1																		
70	17^{30}	17^{45}	No measurement due to wind speed > 5 m/s											cars, birds	25,4	**2,8 – 5,31**	730	SE

71	18^{00}	18^{15}	43,4	44,0	44,4	43,3	43,2	44,0	43,0	45,4	46,4	46,7	60,0	cars, birds	25,0	1,75 – 3,85	730	SE
LA(min) Fast 32,1 – LA(max) Fast 36,5																		
72	18^{30}	18^{45}	32,6	32,5	32,3	32,1	32,0	31,8	31,7	31,5	32,6	43,0	61,0	birds, cars	25,4	1,68 – 2,74	730	SE
LA(min) Fast 32,4 – LA(max) Fast 36,1																		
73	19^{00}	19^{15}	34,6	34,3	34,1	33,0	32,8	32,7	32,0	31,8	31,7	48,7	64,0	birds, cars, frogs	24,1	1,57 и-3,15	730	SE
LA(min) Fast 33,8 – LA(max) Fast 37,5																		
74	19^{30}	19^{45}	47,2	47,1	48,3	47,4	46,2	46,4	47,9	48,3	47,4	48,3	61,4	birds, cars, frogs	24,0	2,46 – 4,11	730	SE
LA(min) Fast 33,4 – LA(max) Fast 37,1																		
75	20^{00}	20^{15}	51,4	53,3	54,1	52,2	53,1	53,4	54,4	53,4	52,4	57,4	66,8	birds, cars, frogs	22,2	1,36 – 2,12	729	SE
LA(min) Fast 36,0 – LA(max) Fast 40,0																		
76	20^{30}	20^{45}	51,8	53,5	54,1	52,2	53,1	53,4	54,4	53,4	52,4	54,8	64,0	birds, cars, frogs	22,4	1,46 – 2,8	729	SE
LA(min) Fast 36,8 – LA(max) Fast 40,1																		
77	21^{10}	21^{25}	52,4	53,3	54,2	55,1	53,4	56,1	53,2	54,2	53,3	51,9	58,1	birds, frogs	21,0	1,54 – 2,75	730	SE
LA(min) Fast 39,0 – LA(max) Fast 43,0																		
78	21^{35}	21^{50}	41,0	41,2	44,0	44,3	44,0	44,4	44,2	44,3	45,1	49,0	54,0	birds, frogs	21,0	1,48 – 2,24	730	SE
LA(min) Fast 39,8 – LA(max) Fast 42,4																		
79	22^{00}	22^{15}	41,0	41,2	44,0	44,3	44,0	44,4	43,2	43,3	43,1	48,9	53,1	frogs	19,3	0,98 – 1,62	730	SE
LA(min) Fast 38,0 – LA(max) Fast 42,0																		
80	22^{40}	22^{55}	44,3	45,1	45,3	46,0	45,2	46,3	46,1	45,2	46,2	47,4	59,8	frogs	19,7	0,94 – 1,36	730	SE
LA(min) Fast 42,1 – LA(max) Fast 48,0																		
81	23^{00}	44,9	45,1	45,3	46,0	45,2	46,2	46,1	45,2	46,0	44,9	46,4	53,1	frogs	18,5	0,64 – 1,07	730	NE
LA(min) Fast 42,0 – LA(max) Fast 48,0																		
82	23^{40}	23^{55}	51,1	51,4	51,4	52,3	52,1	52,0	50,4	51,3	52,4	47,0	54,3	frogs	18,4	0,98 – 1,22	730	NE

LA(min) Fast 42,1 – LA(max) Fast 48,8																		
NM 5 – 28.06.2020 (weekend). Coordinates: 40°14'40.63"N 69° 7'33.91" E; h = 1,2 m.																		
83	00^{00}	00^{15}	41,2	44,0	44,3	44,0	44,4	45,2	45,3	45,1	41,2	48,4	57,0	frogs	18,3	0,57 – 1,14	730	NE
LA(min) Fast 42,0 – LA(max) Fast 46,0																		
84	00^{25}	00^{40}	43,8	43,3	43,0	42,4	43,1	42,5	43,2	42,5	43,1	43,3	59,0	frogs	18,7	0,38 – 1,77	730	NE
LA(min) Fast 42,0 – LA(max) Fast 46,1																		
85	01^{10}	01^{25}	42,1	42,3	43,2	43,4	43,2	44,0	43,1	43,3	43,2	46,4	51,0	frogs	16,1	0,41 – 1,23	731	NE
LA(min) Fast 40,0 – LA(max) Fast 42,2																		
86	01^{35}	01^{50}	42,9	42,3	43,2	43,4	43,2	43,4	43,1	43,3	43,2	48,2	51,8	frogs	16,4	0,82 – 1,88	731	NE
LA(min) Fast 40,0 – LA(max) Fast 43,0																		
87	02^{00}	02^{15}	48,1	48,2	49,4	47,2	48,1	45,4	46,3	47,2	48,3	44,2	48,2	frogs	16,6	0,63 – 0,98	731	NE
LA(min) Fast 40,0 – LA(max) Fast 42,0																		
88	02^{40}	02^{55}	48,4	48,2	48,4	47,2	48,1	45,9	46,3	47,8	48,3	44,4	48,4	frogs	16,6	0,66 – 1,32	731	NE
LA(min) Fast 40,0 – LA(max) Fast 43,2																		
89	03^{00}	03^{15}	46,4	47,2	48,3	49,1	48,4	47,2	46,1	46,3	45,2	46,1	49,2	frogs	16,9	0,65 – 1,31	731	NE
LA(min) Fast 40,0 – LA(max) Fast 42,0																		
90	03^{30}	03^{45}	46,8	47,2	48,3	49,4	48,2	47,2	46,1	46,3	45,2	45,8	56,0	frogs	16,5	0,69 – 1,74	731	NE
LA(min) Fast 40,0 – LA(max) Fast 42,7																		
91	04^{02}	04^{17}	45,3	46,2	46,4	47,3	48,2	47,1	46,3	45,2	44,1	47,4	54,8	frogs	17,1	0,73 – 1,17	731	NE
LA(min) Fast 38,0 – LA(max) Fast 42,0																		
92	04^{31}	04^{46}	45,3	46,0	46,4	47,3	48,2	47,0	46,3	45,8	44,1	47,2	53,0	frogs	17,0	0,28 – 1,94	731	NE
LA(min) Fast 38,0 – LA(max) Fast 42,0																		
93	05^{00}	05^{15}	46,3	47,2	48,1	48,3	47,1	46,4	45,2	44,3	45,2	47,1	51,0	frogs	17,6	0,69 – 1,25	731	SW
LA(min) Fast 34,0 – LA(max) Fast 37,0																		

94	05^{30}	05^{45}	46,4	47,2	48,1	48,3	47,4	46,8	45,2	44,5	45,2	45,8	50,4	birds, frogs	17,4	0,64 – 1,38	731	SW
LA(min) Fast 34,0 – LA(max) Fast 36,0																		
95	06^{10}	06^{25}	41,0	41,2	44,0	44,3	44,0	44,4	45,2	45,3	45,1	47,2	58,0	birds, cars, frogs	18,7	079 – 1,36	731	SW
LA(min) Fast 34,0 – LA(max) Fast 36,0																		
96	06^{40}	06^{55}	44,1	44,3	43,4	44,0	43,2	45,1	46,3	45,2	45,4	44,8	65,0	birds, cars, frogs	20,3	1,28 – 2,09	731	SE
LA(min) Fast 31,0 – LA(max) Fast 33,0																		

Table 0-13 NM 6 (weekend)

№	**Start time**	**End time**	**Sound pressure in octave bands with geometric mean frequencies, Hz**									**LAeq, dB**	**LAmax, dB**	**Additional noise sources**	**Meteo data**			
			31,5	**63**	**125**	**250**	**500**	**1000**	**2000**	**4000**	**8000**				**Temperature, ^{0}C**	**Wind speed, m/sec**	**Pressure, mm Hg**	**Wind direction**
NM 6 – 20.06.2020 (weekend). Coordinates: 40°14'14.77'' N, 69°7'16.60'' E; h = 1,2 m.																		
1	10^{10}	10^{25}	44,4	53,9	52,1	51,3	51,0	51,2	52,4	51,2	50,0	46,2	57,2	house. livestock, birds,	35,6	0,59 – 1,16	728	NE
LA(min) Fast 42,0 – LA(max) Fast 45,1																		
2	10^{10}	10^{25}	44,2	43,9	42,1	41,3	41,0	41,3	42,4	41,2	40,0	48,5	55,0	house. livestock, birds,	35,9	0,38 – 2,21	728	NE
LA(min) Fast 43,0 – LA(max) Fast 46,1																		
3	11^{10}	11^{25}	44,2	43,9	42,1	41,3	41,0	41,3	42,4	41,2	40,0	47,5	55,0	house. livestock, birds	36,8	1,28 – 2,34	728	SW

№	Start time	End time	Sound pressure in octave bands with geometric mean frequencies, Hz									LAeq, dB	LAmax, dB	Additional noise sources	Meteo data			
			31,5	63	125	250	500	1000	2000	4000	8000				Temperature, ^{0}C	Wind speed, m/sec	Pressure, mm Hg	Wind direction
LA(min) Fast 43,0 – LA(max) Fast 45,1																		
4	11^{40}	11^{55}	44,4	53,9	52,1	51,3	51,0	51,2	52,4	51,2	50,0	46,2	57,2	house. livestock, birds	36,7	1,64 – 2,81	728	SW
LA(min) Fast 43,0 – LA(max) Fast 45,0																		
5	12^{05}	12^{20}	44,1	44,0	42,3	42,3	43,0	42,2	42,0	42,2	42,3	45,3	57,8	house. livestock, birds	38,2	1,16 – 2,19	728	SW
LA(min) Fast 46,0 – LA(max) Fast 49,0																		
6	12^{35}	12^{50}	44,1	44,0	42,3	42,3	43,0	42,2	42,0	42,2	42,3	43,2	52,2	house. livestock, birds,	38,7	1,24 – 2,78	728	SW
LA(min) Fast 44,4 – LA(max) Fast 48,0																		
7	13^{15}	13^{30}	32,6	32,5	32,3	32,1	32,0	31,8	31,7	31,5	32,6	34,2	47,5	house. livestock,	36,9	1,29 – 2,56	728	SW
LA(min) Fast 32,4 – LA(max) Fast 34,0																		
8	13^{35}	13^{50}	32,6	32,5	32,3	32,1	32,0	31,8	31,7	31,5	32,6	36,8	49,5	house. livestock,	36,1	1,29 – 2,56	728	SW
LA(min) Fast 32,0 – LA(max) Fast 34,7																		
9	14^{00}	14^{15}	42,9	43,2	42,4	44,0	43,2	44,8	45,1	45,3	45,0	43,2	52,0	house. livestock, birds,	37,4	1,97 – 2,04	728	SW
LA(min) Fast 42,0 – LA(max) Fast 44,7																		

№	Start time	End time	Sound pressure in octave bands with geometric mean frequencies, Hz									LAeq, dB	LAmax, dB	Additional noise sources	Meteo data			
			31,5	63	125	250	500	1000	2000	4000	8000				Temperature, ^{0}C	Wind speed, m/sec	Pressure, mm Hg	Wind direction
10	14^{40}	14^{55}	42,9	43,2	42,4	44,0	43,2	44,8	45,1	45,3	45,0	41,0	48,0	house. livestock, birds,	37,4	1,97 – 2,04	728	SW
LA(min) Fast 42,0 – LA(max) Fast 44,1																		
11	15^{00}	15^{15}	35,1	35,1	41,0	42,0	42,0	42,0	43,1	43,0	43,2	39,4	49,8	birds, house. livestock,	37,9	2,92 – 4,15	728	SW
LA(min) Fast 37,0 – LA(max) Fast 39,0																		
12	15^{00}	15^{15}	35,0	35,1	41,0	42,5	42,3	42,0	42,0	43,0	43,0	43,2	49,8	birds, house. livestock,	37,9	2,92 – 4,15	728	SW
LA(min) Fast 37,0 – LA(max) Fast 39,4																		
13	16^{10}	16^{25}	38,0	39,1	39,1	40,0	41,0	42,0	42,2	42,0	43,0	44,2	49,0	birds, house. livestock, frogs	40,2	1,43 – 2,08	728	SW
LA(min) Fast 41,0 – LA(max) Fast 43,4																		
14	16^{44}	16^{59}	38,0	39,1	39,1	40,4	41,0	42,2	42,1	42,0	43,0	44,8	51,0	birds, house. livestock, frogs	40,4	1,45 – 2,26	728	SW
LA(min) Fast 41,0 – LA(max) Fast 44,0																		
15	17^{03}	17^{18}	38,0	42,0	42,0	42,0	42,0	43,0	43,0	44,0	44,0	44,9	49,8	birds, house. livestock, frogs	38,1	0,9 – 1,62	726	SW
LA(min) Fast 31,0 – LA(max) Fast 33,0																		

№	Start time	End time	Sound pressure in octave bands with geometric mean frequencies, Hz									LAeq, dB	LAmax, dB	Additional noise sources	Meteo data			
			31,5	63	125	250	500	1000	2000	4000	8000				Temperature, ^{0}C	Wind speed, m/sec	Pressure, mm Hg	Wind direction
16	17^{44}	17^{59}	38,0	42,1	42,0	42,3	42,3	43,0	4310	44,2	44,0	45,3	51,8	birds, house. livestock, frogs	38,0	0,8 – 1,34	726	SW
LA(min) Fast 31,2 – LA(max) Fast 34,0																		
17	18^{00}	18^{12}	36,0	37,0	37,0	38,0	38,0	38,0	38,0	39,0	40,0	38,6	47,2	birds, house. livestock, frogs	36,1	0,27 – 0,43	726	SW
LA(min) Fast 30,2 – LA(max) Fast 32,0																		
18	18^{35}	18^{50}	36,0	37,0	37,0	38,0	38,0	38,0	38,0	39,0	40,0	44,4	49,5	birds, house. livestock, frogs	36,0	0,22 – 0,54	726	SW
LA(min) Fast 30,0 – LA(max) Fast 32,8																		
19	19^{00}	19^{15}	45,0	46,0	46,0	46,0	46,0	44,0	44,0	44,0	45,0	44,5	51,0	birds, house. livestock, frogs	31,2	0,31 – 0,76	726	NW
LA(min) Fast 42,9 – LA(max) Fast 45,4																		
20	19^{44}	19^{59}	45,1	46,0	46,0	46,2	46,2	44,0	44,3	44,2	45,0	46,2	53,4	birds, house. livestock, frogs	32,0	0,29 – 0,84	726	NW
LA(min) Fast 42,9 – LA(max) Fast 47,4																		
21	20^{00}	20^{15}	21,0	23,0	23,0	24,0	25,0	34,0	36,0	38,0	33,0	43,6	48,1	birds, house. livestock, frogs	28,1	0,43 – 0,86	726	NW
LA(min) Fast 43,0 – LA(max) Fast 45,0																		

№	Start time	End time	Sound pressure in octave bands with geometric mean frequencies, Hz									LAeq, dB	LAmax, dB	Additional noise sources	Meteo data			
			31,5	63	125	250	500	1000	2000	4000	8000				Temperature, ^{0}C	Wind speed, m/sec	Pressure, mm Hg	Wind direction
22	20^{38}	20^{53}	21,5	23,4	23,0	24,3	25,1	34,5	36,2	38,0	33,0	45,8	53,2	birds, house. livestock, frogs	28,4	0,45 – 0,94	726	NW
LA(min) Fast 43,2 – LA(max) Fast 45,4																		
23	21^{10}	21^{25}	73,0	73,0	72,0	73,0	73,0	74,0	74,0	75,0	75,0	60,8	75,0	birds, house. livestock, frogs	27,8	0,49 – 0,93	726	NW
LA(min) Fast 61,0 – LA(max) Fast 62,0																		
24	21^{40}	21^{55}	73,0	73,1	72,0	73,0	73,1	74,2	74,2	76,4	75,1	61,9	76,0	birds, house. livestock, frogs	28,0	0,67 – 1,06	726	NW
LA(min) Fast 62,0 – LA(max) Fast 65,0																		
25	22^{00}	22^{15}	71,0	72,0	72,0	73,0	73,0	74,0	75,0	75,0	75,0	74,4	76,0	frogs, Crickets, house. livestock	25,3	0,56 – 1,08	726	NW
LA(min) Fast 72,2 – LA(max) Fast 75,0																		
26	22^{38}	22^{53}	71,5	72,8	72,8	73,0	73,4	74,1	75,0	75,5	75,0	74,8	76,2	frogs, Crickets, house. livestock	25,0	0,64 – 1,22	726	NW
LA(min) Fast 72,2 – LA(max) Fast 75,2																		

№	Start time	End time	Sound pressure in octave bands with geometric mean frequencies, Hz									LAeq, dB	LAmax, dB	Additional noise sources	Meteo data			
			31,5	63	125	250	500	1000	2000	4000	8000				Temperature, ^{0}C	Wind speed, m/sec	Pressure, mm Hg	Wind direction
27	23^{05}	23^{20}	71,0	70,0	71,0	72,0	72,3	73,0	73,6	73,0	74,0	74,9	76,0	frogs, Crickets, house. livestock	23,2	0,87 – 1,46	726	NE
LA(min) Fast 71,0 – LA(max) Fast 74,0																		
28	23^{38}	23^{53}	71,0	70,0	71,1	72,0	72,3	73,0	73,6	73,2	74,0	75,5	78,1	frogs, Crickets, house. livestock	23,0	0,92 – 1,34	726	NE
LA(min) Fast 71,0 – LA(max) Fast 73,4																		
NM 6 – 21.06.2020 (weekend). Coordinates: 40˚14'14.77'' N, 69˚7'16.60'' E; h = 1,2 m.																		
29	00^{07}	00^{22}	71,0	70,0	71,0	72,0	72,3	73,0	73,6	73,0	74,0	72,1	75,2	frogs, Crickets, house. livestock	21,6	0,88 – 1,32	726	NE
LA(min) Fast 71,0 – LA(max) Fast 74,0																		
30	00^{44}	00^{59}	71,1	72,1	72,0	73,0	73,1	74,0	75,0	75,0	75,1	74,4	79,7	frogs, Crickets, house. livestock	22,0	0,66 – 1,22	726	NE
LA(min) Fast 71,0 – LA(max) Fast 72,8																		

№	Start time	End time	Sound pressure in octave bands with geometric mean frequencies, Hz									LAeq, dB	LAmax, dB	Additional noise sources	Meteo data			
			31,5	63	125	250	500	1000	2000	4000	8000				Temperature, ^{0}C	Wind speed, m/sec	Pressure, mm Hg	Wind direction
31	01^{12}	01^{27}	61,0	61,3	61,0	61,0	61,0	62,0	62,0	63,0	64,0	74,1	78,0	frogs, Crickets, house. livestock	21,0	0,67 – 1,34	726	NE
LA(min) Fast 61,0 – LA(max) Fast 64,0																		
32	01^{32}	01^{47}	61,0	61,3	61,0	61,2	61,7	62,0	62,0	63,3	64,1	70,4	76,2	frogs, Crickets, house. livestock	21,4	0,74 – 1,29	726	NE
LA(min) Fast 61,0 – LA(max) Fast 62,0																		
33	02^{03}	02^{18}	34,0	34,0	34,5	35,0	35,0	35,0	36,0	36,0	35,0	44,8	54,0	frogs, Crickets, house. livestock	19,8	0,36 – 0,78	726	NW
LA(min) Fast 33,9 – LA(max) Fast 36,0																		
34	02^{32}	02^{47}	34,5	34,0	34,5	35,0	35,0	35,3	36,3	36,3	35,0	42,8	51,3	frogs, Crickets, house. livestock	19,5	0,74 – 0,95	726	NW
LA(min) Fast 34,0 – LA(max) Fast 36,0																		
35	03^{10}	03^{25}	32,0	33,0	33,	34,0	34,0	34,0	34,0	34,0	34,0	38,1	59,2	frogs, Crickets, house. livestock	20,4	0,46 – 0,91	726	NW

№	Start time	End time	Sound pressure in octave bands with geometric mean frequencies, Hz									LAeq, dB	LAmax, dB	Additional noise sources	Meteo data			
			31,5	63	125	250	500	1000	2000	4000	8000				Temperature, ^{0}C	Wind speed, m/sec	Pressure, mm Hg	Wind direction
LA(min) Fast 33,0 – LA(max) Fast 34,0																		
36	03^{36}	03^{51}	32,0	33,0	33,	34,1	34,1	34,0	34,2	34,3	34,0	40,4	55,9	frogs, Crickets, house. livestock	20,1	0,59 – 0,98	726	NW
LA(min) Fast 32,8 – LA(max) Fast 34,5																		
37	04^{00}	04^{15}	33,0	33,0	34,0	34,3	34,0	34,0	34,0	35,0	35,0	39,8	54,1	frogs, birds, house. livestock	21,3	0,27 – 0,79	726	NW
LA(min) Fast 32,0 – LA(max) Fast 34,0																		
38	04^{22}	04^{37}	33,0	33,0	34,0	34,3	34,0	34,0	34,0	35,0	35,0	40,1	52,8	frogs, birds, house. livestock	21,0	0,34 – 0,81	726	NW
LA(min) Fast 32,1 – LA(max) Fast 34,4																		
39	05^{17}	05^{32}	33,0	33,0	34,0	34,7	34,0	34,5	34,5	35,0	35,0	38,7	53,8	birds, house. livestock	21,7	0,54 – 1,28	726	NW
LA(min) Fast 31,0 – LA(max) Fast 32,0																		
40	05^{43}	05^{58}	32,0	33,0	33,	34,1	34,1	34,0	34,2	34,3	34,0	40,5	54,0	birds, house. livestock	22,3	0,63 – 1,31	726	NW
LA(min) Fast 33,0 – LA(max) Fast 34,0																		
41	06^{10}	06^{35}	34,0	34,0	34,2	35,0	35,0	35,0	35,2	35,0	35,3	47,1	53,4	birds, house. livestock	21,7	0,36 – 1,14	726	NW
LA(min) Fast 30,1 – LA(max) Fast 33,9																		

№	Start time	End time	Sound pressure in octave bands with geometric mean frequencies, Hz									LAeq, dB	LAmax, dB	Additional noise sources	Meteo data			
			31,5	63	125	250	500	1000	2000	4000	8000				Temperature, ^{0}C	Wind speed, m/sec	Pressure, mm Hg	Wind direction
42	06^{40}	06^{55}	34,0	34,0	34,2	35,0	35,2	35,5	35,2	35,0	35,1	44,9	55,8	birds, house. livestock	22,0	0,44 – 1,05	726	NW
LA(min) Fast 33,0 – LA(max) Fast 34,0																		
43	07^{12}	07^{27}	33,0	33,0	33,0	33,4	34,0	34,0	34,0	34,0	34,0	48,4	60,0	birds, house. livestock	24,6	0,81 – 1,32	726	NW
LA(min) Fast 33,0 – LA(max) Fast 36,0																		
44	07^{39}	07^{54}	33,0	33,3	33,2	33,4	34,8	34,8	34,6	34,1	34,0	43,5	57,9	birds, house. livestock	24,8	0,84 – 1,46	726	NW
LA(min) Fast 33,1 – LA(max) Fast 36,4																		
45	08^{00}	08^{15}	34,0	35,0	41,0	41,0	42,0	41,0	42,0	42,0	42,0	40,4	54,2	birds, house. livestock	26,5	1,31 – 2,43	726	NW
LA(min) Fast 35,8 – LA(max) Fast 38,0																		
46	08^{32}	08^{47}	34,2	35,2	41,0	41,0	42,3	41,4	42,1	42,0	42,0	42,4	56,8	birds, house. livestock	27,0	1,38 – 2,44	726	NW
LA(min) Fast 36,0 – LA(max) Fast 38,4																		
47	09^{10}	09^{25}	56,0	56,0	57,0	57,0	57,0	56,0	56,0	55,0	55,0	56,0	58,1	birds, house. livestock	28,0	1,28 – 1,73	725	NW
LA(min) Fast 51,0 – LA(max) Fast 53,4																		
48	09^{40}	09^{55}	56,4	56,2	57,0	57,0	57,1	56,0	56,0	55,3	55,0	54,8	59,2	birds, house. livestock	29,7	1,48 – 1,82	725	NW
LA(min) Fast 51,0 – LA(max) Fast 53,1																		

Table 0-14 NM 6 (weekday)

NM 6 – 22.06.2020 (weekday). Coordinates: 40°14'14.77'' N, 69°7'16.60'' E; h = 1,2 m.																		
49	10^{10}	10^{25}	64,3	64,1	62,1	64,2	64,2	61,3	58,0	58,3	58,0	66,3	69,8	house. livestock, birds, trees	35,9	2,69 – 4,52	720	NW
LA(min) Fast 63,0 – LA(max) Fast 67,1																		
50	10^{40}	11^{55}	64,0	64,1	62,4	64,2	64,2	61,3	58,0	58,5	58,0	65,3	67,2	birds	36,4	2,7 – 4,41	720	NW
LA(min) Fast 62,9 – LA(max) Fast 66,1																		
51	11^{10}	11^{25}	64,1	62,1	64,2	64,2	61,3	58,0	58,3	58,0	64,1	58,8	65,5	house. livestock	32,5	3,11 – 4,84	720	NW
LA(min) Fast 41,0 – LA(max) Fast 56,0																		
52	11^{40}	11^{55}	64,1	62,1	64,2	64,2	61,3	58,2	58,3	58,0	64,4	55,1	61,4	house. livestock, trees	37,3	2,17 – 3,68	720	NW
LA(min) Fast 41,6 – LA(max) Fast 55,4																		
53	12^{05}	12^{20}	64,4	62,1	64,2	64,2	61,3	58,2	58,2	58,0	64,4	51,3	57,8	house. livestock, birds, trees	35,8	3,27 – 4,94	720	NW
LA(min) Fast 40,9 – LA(max) Fast 54,1																		
54	12^{35}	12^{50}	51,7	51,5	51,4	51,1	51,5	51,4	51,4	51,0	58,1	53,2	61,2	house. livestock, birds, trees	35,7	2,24 – 3,78	720	NW
LA(min) Fast 54,4 – LA(max) Fast 58,8																		
55	13^{15}	13^{30}	51,7	51,5	51,4	51,1	51,5	51,4	51,4	51,0	58,1	57,3	64,8	house. livestock, birds, car	37,6	2,70 – 4,32	720	NW
LA(min) Fast 56,0 – LA(max) Fast 58,1																		
56	13^{40}	13^{55}	51,7	51,5	51,4	51,1	51,5	51,4	51,4	51,0	58,1	65,5	67,0	house. livestock, birds, trees	37,4	2,74 – 4,28	720	NW
LA(min) Fast 63,7 – LA(max) Fast 66,0																		

57	14^{10}	14^{25}	44,4	44,0	43,7	42,8	42,9	42,2	41,2	41,1	41,0	43,6	55,0	transport, birds, house. livestock	36,7	1,23 – 2,07	719	NW
LA(min) Fast 41,9 – LA(max) Fast 44,2																		
58	14^{35}	14^{50}	44,4	44,0	43,7	42,4	42,9	42,2	41,0	41,1	41,0	45,2	54,1	birds, house. livestock	36,1	0,94 – 1,24	719	NW
LA(min) Fast 42,4 – LA(max) Fast 45,9																		
59	15^{00}	15^{15}	42,0	42,0	42,0	42,3	41,2	43,0	43,0	43,2	43,3	43,8	49,8	birds, house. livestock, car	36,9	0,93 – 1,74	719	NW
LA(min) Fast 40,0 – LA(max) Fast 41,3																		
60	15^{40}	15^{55}	42,0	42,0	42,0	42,3	41,2	43,0	43,0	43,2	43,3	43,3	47,8	birds, house. livestock	36,9	1,12 – 1,46	719	NW
LA(min) Fast 40,0 – LA(max) Fast 44,0																		
61	16^{10}	16^{25}	42,3	42,0	42,2	42,3	43,0	42,2	42,4	45,1	43,1	43,8	46,4	birds, house. livestock	36,5	1,28 – 1,36	719	NW
LA(min) Fast 41,2 – LA(max) Fast 44,4																		
62	16^{44}	16^{59}	42,3	42,0	42,2	42,3	43,0	42,2	42,4	45,1	43,1	44,6	48,9	birds, house. livestock	36,5	1,23 – 1,73	719	NW
LA(min) Fast 42,2 – LA(max) Fast 45,1																		
63	17^{03}	17^{18}	42,5	42,2	42,2	42,3	43,0	42,1	42,4	45,1	43,1	43,2	48,0	birds, house. livestock	36,5	1,66 – 1,84	719	NW
LA(min) Fast 40,2 – LA(max) Fast 43,9																		
64	17^{44}	17^{59}	42,3	42,0	42,2	42,3	43,4	42,0	42,4	45,1	43,1	42,2	49,4	birds, house. livestock	36,5	1,34 – 1,85	719	NW
LA(min) Fast 40,9 – LA(max) Fast 44,4																		
65	18^{00}	18^{12}	42,3	42,0	42,2	42,3	43,4	42,0	42,4	45,1	43,1	42,6	52,8	birds, house. livestock, frogs	34,3	0,31 – 0,57	719	NW
LA(min) Fast 42,0 – LA(max) Fast 44,0																		
66	18^{35}	18^{50}	42,3	42,0	42,2	42,3	43,4	42,0	42,4	45,1	43,1	42,1	53,9	birds, house. livestock, frogs	34,0	0,44 – 0,98	719	NW
LA(min) Fast 40,1 – LA(max) Fast 45,1																		

67	19^{00}	19^{15}	42,4	43,1	42,4	42,3	43,0	42,3	42,2	42,2	42,3	42,9	55,0	birds, house. livestock, frogs,	32,5	0,46 – 0,67	719	NW
LA(min) Fast 41,9 – LA(max) Fast 44,6																		
68	19^{44}	19^{59}	42,4	43,1	42,4	42,3	43,0	42,3	42,2	42,2	42,3	43,1	52,1	birds, house. livestock, frogs,	32,2	0,31 – 0,89	719	NW
LA(min) Fast 40,2 – LA(max) Fast 46,9																		
69	20^{00}	20^{15}	42,3	43,2	43,3	52,3	51,0	51,0	50,4	51,3	50,4	41,3	50,2	birds, house. livestock, Crickets,	28,7	0,87 – 1,53	719	NW
LA(min) Fast 40,0 – LA(max) Fast 44,0																		
70	20^{38}	20^{53}	42,3	43,2	43,3	52,3	51,0	51,0	50,4	51,3	50,4	43,6	53,8	birds, house. livestock, Crickets	26,4	0,85 – 1,14	719	NW
LA(min) Fast 41,7 – LA(max) Fast 44,8																		
71	21^{10}	21^{25}	53,2	53,1	52,4	52,4	53,0	53,2	55,1	55,3	54,4	55,6	58,8	birds, house. livestock, Crickets, frogs	32,2	1,36 – 2,01	720	NW
LA(min) Fast 55,0 – LA(max) Fast 57,0																		
72	21^{40}	21^{55}	53,2	53,1	52,4	52,4	53,4	53,2	55,0	55,3	52,4	56,1	61,8	birds, house. livestock, Crickets, frogs	32,2	1,64 – 2,19	720	NW
LA(min) Fast 53,2 – LA(max) Fast 59,9																		
73	22^{00}	22^{15}	62,3	64,4	65,2	63,4	63,3	61,4	62,3	64,1	63,2	63,0	70,0	birds, house. livestock, Crickets, frogs,	29,8	1,76 – 2,51	719	NE
LA(min) Fast 62,2 – LA(max) Fast 66,0																		
74	22^{38}	22^{53}	62,3	64,4	65,2	63,4	63,3	61,4	62,3	64,1	63,2	62,6	68,4	birds, house. livestock, Crickets, frogs,	29,8	1,77 – 2,98	719	NE

LA(min) Fast 62,0 – LA(max) Fast 64,0																		
75	23^{05}	23^{20}	62,3	64,4	65,2	63,4	63,0	61,2	62,3	64,0	63,2	61,8	68,4	birds, house. livestock, Crickets, frogs,	28,2	4,2 – 5,9	719	NE
LA(min) Fast 61,0 – LA(max) Fast 64,2																		
76	23^{38}	23^{53}	63,2	64,0	62,3	66,3	63,4	63,3	64,4	61,2	62,2	61,9	69,2	birds, house. livestock, Crickets, frogs,	28,0	3,1 – 5,88	719	NE
LA(min) Fast 60,4 – LA(max) Fast 64,9																		
NM 6 – 23.06.2020 (weekday). Coordinates: 40°14'14.77'' N, 69°7'16.60'' E; h = 1,2 m.																		
77	00^{07}	00^{22}	No measurement due to wind speed>5m/s											Crickets, frogs, ветер	28,2	**4,41 – 5,81**	719	NE
78	00^{44}	00^{59}	No measurement due to wind speed>5m/s											Crickets, frogs, ветер	26,0	**2,88 – 5,85**	719	NE
79	01^{12}	01^{27}	No measurement due to wind speed>5m/s											Crickets, frogs,	25,8	**3,56 – 5,93**	719	NE
80	01^{32}	01^{47}	52,3	52,5	52,4	53,2	53,4	54,0	53,4	54,0	53,3	51,7	59,1	Crickets, frogs,	24,6	3,12 – 4,23	719	NE
LA(min) Fast 51,0 – LA(max) Fast 54,8																		
81	02^{03}	02^{18}	52,3	52,5	52,4	53,2	53,4	54,0	53,4	54,0	53,3	51,3	53,3	Crickets, frogs, house.livestoc k	24,6	3,43 – 4,26	719	NE
LA(min) Fast 50,9 – LA(max) Fast 53,0																		
82	02^{32}	02^{47}	53,3	52,5	52,4	53,0	53,2	54,0	53,4	54,0	52,3	51,8	59,0	Crickets, frogs, house.livestoc k	24,1	3,44 – 4,56	719	NE
LA(min) Fast 49,9 – LA(max) Fast 54,8																		

83	03^{10}	03^{25}	46,3	52,2	53,1	53,4	54,2	54,2	53,3	52,4	53,3	50,4	63,2	Crickets, frogs, house.livestock	26,2	2,71 – 4,49	719	NE
LA(min) Fast 45,0 – LA(max) Fast 55,2																		
84	03^{36}	03^{51}	46,3	52,2	53,1	53,4	54,2	54,2	53,0	52,4	52,3	50,0	59,1	Crickets, frogs, house.livestock	26,1	1,84 – 4,35	719	NE
LA(min) Fast 43,0 – LA(max) Fast 55,2																		
85	04^{00}	04^{15}	42,4	43,2	43,3	43,4	43,1	44,2	44,3	45,3	44,4	45,6	48,0	birds, house.livestock	26,4	1,82 – 2,43	722	NE
LA(min) Fast 42,0 – LA(max) Fast 47,0																		
86	04^{22}	04^{37}	42,4	43,2	43,3	43,4	43,1	44,2	44,1	45,3	44,0	43,8	48,2	birds, house.livestock, frogs	26,3	1,5 – 2,71	722	NE
LA(min) Fast 42,4 – LA(max) Fast 47,8																		
87	05^{17}	05^{32}	42,0	41,3	41,4	41,4	41,3	41,2	42,1	42,2	42,1	44,0	55,0	birds, house.livestock, frogs	25,8	1,13 – 3,76	722	NE
LA(min) Fast 42,0 – LA(max) Fast 47,0																		
88	05^{43}	05^{58}	42,0	41,3	41,4	41,4	41,3	41,1	42,1	42,2	42,0	44,3	52,8	birds, house.livestock, frogs	25,7	1,06 – 3,69	722	NE
LA(min) Fast 42,1 – LA(max) Fast 44,8																		
89	06^{10}	06^{35}	41,1	41,4	41,3	41,4	41,1	42,1	42,3	42,0	41,4	41,4	49,0	birds, house.livestock	29,0	1,14 – 2,26	722	NE
LA(min) Fast 40,1 – LA(max) Fast 43,9																		

90	06^{45}	07^{00}	41,1	41,4	41,3	41,4	41,1	42,0	42,3	42,0	41,4	43,8	47,1	birds, house.livestock	29,0	1,4 – 2,78	722	NE
LA(min) Fast 41,8 – LA(max) Fast 44,6																		
91	07^{12}	07^{27}	41,1	41,4	41,3	41,4	41,1	42,0	42,3	42,0	41,4	43,5	52,0	birds, house.livestock, trees	29,2	2,16 – 4,32	722	NE
LA(min) Fast 45,4 – LA(max) Fast 44,3																		
92	07^{39}	07^{54}	43,4	44,0	44,2	44,4	45,1	43,4	46,0	46,0	45,0	48,0	54,2	birds, house.livestock, trees	29,6	1,35 – 2,18	724	NE
LA(min) Fast 44,8 – LA(max) Fast 49,0																		
93	08^{00}	08^{15}	42,3	43,1	42,0	42,2	44,3	42,4	44,2	45,3	43,2	43,3	63,5	birds, house.livestock, tracktor	29,3	1,21 – 2,13	724	NE
LA(min) Fast 42,8 – LA(max) Fast 44,0																		
94	08^{32}	08^{47}	42,3	43,1	42,0	42,2	44,2	42,4	44,2	45,1	43,2	44,7	62,0	birds, house.livestock	27,4	3,38 – 4,74	724	NE
LA(min) Fast 42,1 – LA(max) Fast 45,7																		
95	09^{10}	09^{25}	41,3	42,0	42,1	45,4	43,3	44,2	51,1	51,3	51,0	43,6	66,0	birds, house.livestock, trees	33,4	2,63 – 3,74	724	SE
LA(min) Fast 43,0 – LA(max) Fast 45,0																		
96	09^{40}	09^{55}	31,0	33,2	33,3	34,0	34,1	33,0	33,3	33,4	33,0	32,2	47,2	birds, house.livestock, trees	35,1	1,48 – 2,64	725	SE
LA(min) Fast 30,0 – LA(max) Fast 35,7																		

Table 0-15 NM 7 (weekend)

№	Start time	End time	Sound pressure in octave bands with geometric mean frequencies, Hz									LAeq, dB	LAmax, dB	Additional noise sources	Meteo data			
			31,5	63	125	250	500	1000	2000	4000	8000				Temperature, ^{0}C	Wind speed, m/sec	Pressure, mmHg	Wind direction
NM 7 – 20.06.2020 (weekend). Coordinates: 40°13'53.39'' N, 69°7'16.14'' E; h = 1,2 m.																		
1	10^{00}	10^{15}	32,9	32,6	32,5	32,3	32,1	32,0	31,8	31,7	31,5	33,8	40,4	road, transformer	34,8	0,72 – 1,02	728	NE
LA(min) Fast 32,3– LA(max) Fast 34,5																		
2	10^{40}	11^{55}	34,6	34,3	34,1	33,0	32,8	32,7	32,0	31,8	31,7	36,3	42,1	road, transformer	35,0	0,81 – 1,90	728	NE
LA(min) Fast 32,9– LA(max) Fast 36,1																		
3	11^{05}	11^{20}	32,1	32,0	31,8	31,5	31,2	32,1	31,0	30,8	30,4	30,8	36,9	road, transformer	35,3	1,12 – 1,87	728	SW
LA(min) Fast 30,2– LA(max) Fast 33,1																		
4	11^{30}	11^{45}	32,1	32,3	32,6	32,3	33,2	33,8	33,6	33,3	33,1	32,4	38,4	road, transformer	36,7	1,96 – 3,50	728	SW
LA(min) Fast 32,5– LA(max) Fast 34,9																		
5	12^{00}	12^{15}	33,4	33,1	32,8	32,7	32,4	32,4	31,8	31,5	31,3	32,6	39,4	road, transformer	36,7	2,04 – 3,4	728	SW
LA(min) Fast 30,7– LA(max) Fast 33,9																		
6	12^{40}	12^{55}	33,5	33,1	32,9	32,7	32,4	32,4	31,9	31,5	31,4	33,8	41,4	road, transformer	36,7	1,43 – 2,56	728	SW
LA(min) Fast 30,7– LA(max) Fast 34,5																		
7	13^{10}	13^{25}	35,2	34,8	34,6	34,2	34,0	33,7	33,6	33,1	33,0	37,9	46,2	road, transformer, household noise	36,9	0,74 – 0,98	728	SW
LA(min) Fast 32,7– LA(max) Fast 35,7																		

№	Start time	End time	Sound pressure in octave bands with geometric mean frequencies, Hz									LAeq, dB	LAmax, dB	Additional noise sources	Meteo data			
			31,5	63	125	250	500	1000	2000	4000	8000				Temperature, ^{0}C	Wind speed, m/sec	Pressure, mmHg	Wind direction
8	13^{40}	13^{55}	35,2	34,8	34,6	36,2	36,0	33,7	33,6	33,1	33,0	38,1	44,2	road, transformer, household noise	36,9	0,79 – 1,06	728	SW
LA(min) Fast 32,7– LA(max) Fast 36,4																		
9	14^{00}	14^{15}	32,1	32,0	31,8	31,5	31,2	32,1	31,0	30,8	30,4	31,4	41,0	road, transformer	37,4	1,147 – 1,26	728	SW
LA(min) Fast 30,2– LA(max) Fast 32,1																		
10	14^{30}	14^{45}	32,1	32,0	31,8	31,5	31,2	32,1	31,0	30,8	30,4	38,8	47,6	road, transformer	37,4	1,12 – 1,75	728	SW
LA(min) Fast 30,2– LA(max) Fast 33,1																		
11	15^{00}	15^{15}	33,4	33,1	32,8	32,7	32,4	32,4	31,8	31,5	31,3	39,2	47,4	road, transformer, birds	37,9	3,15 – 3,85	728	SW
LA(min) Fast 31,7– LA(max) Fast 35,7																		
12	15^{40}	15^{55}	32,1	32,3	32,6	32,3	33,2	33,8	33,6	33,3	33,1	37,0	44,5	road, transformer, birds	37,4	3,46 – 3,68	728	SW
LA(min) Fast 32,7– LA(max) Fast 35,7																		
13	16^{00}	16^{15}	33,0	34,0	34,0	33,5	34,5	34,5	35,6	36,6	37,2	37,8	48,0	road, transformer, pedestrians`s conversations	40,2	1,43 – 2,08	728	SW
LA(min) Fast 35,7– LA(max) Fast 36,7																		
14	16^{40}	16^{55}	33,5	34,3	34,0	33,5	34,5	34,5	35,6	36,6	37,2	34,9	43,2	road, transformer, pedestrians`s conversations	40,4	1,45 – 2,26	728	SW
LA(min) Fast 34,7– LA(max) Fast 36,7																		

№	Start time	End time	Sound pressure in octave bands with geometric mean frequencies, Hz									LAeq, dB	LAmax, dB	Additional noise sources	Meteo data			
			31,5	63	125	250	500	1000	2000	4000	8000				Temperature, ^{0}C	Wind speed, m/sec	Pressure, mmHg	Wind direction
15	17^{00}	17^{15}	36,2	37,3	37,5	38,4	38,0	38,1	38,4	39,1	40,3	38,5	48,0	road, transformer	39,2	0,9 – 1,62	728	SW
LA(min) Fast 36,7– LA(max) Fast 38,7																		
16	17^{40}	17^{55}	36,2	37,3	37,2	38,4	38,0	38,4	38,4	39,1	39,3	41,0	46,0	road, transformer	38,1	0,81 – 1,05	728	SW
LA(min) Fast 34,7– LA(max) Fast 36,7																		
17	18^{00}	18^{15}	35,0	35,2	41,8	42,0	42,1	42,3	43,0	43,1	43,7	36,0	42,0	road, transformer	35,4	0,35 – 0,48	726	SW
LA(min) Fast 36,0 – LA(max) Fast 39,0																		
18	18^{40}	18^{55}	35,0	35,0	41,0	42,5	43,8	43,0	43,6	43,8	43,0	38,2	45,8	road, transformer	35,2	0,46 – 1,22	726	SW
LA(min) Fast 36,2 – LA(max) Fast 39,4																		
19	19^{00}	19^{15}	35,2	36,2	41,5	41,9	43,0	41,8	42,0	42,0	42,4	37,8	43,3	road, transformer	31,2	0,35 – 0,48	726	SW
LA(min) Fast 36,0 – LA(max) Fast 39,0																		
20	19^{40}	19^{55}	35,9	36,3	41,5	41,1	43,0	41,0	42,0	42,0	42,4	38,1	44,0	road, transformer	31,0	0,67 – 1,02	726	SW
LA(min) Fast 35,4 – LA(max) Fast 39,1																		
21	20^{00}	20^{15}	35,0	35,2	41,8	42,0	42,1	42,3	43,0	43,1	43,7	42,0	45,2	road, transformer	30,2	0,45 – 0,56	726	SW
LA(min) Fast 38,1 – LA(max) Fast 44,1																		
22	20^{40}	20^{55}	36,2	37,3	37,2	38,4	38,0	38,4	38,4	39,1	39,3	40,3	46,0	road, transformer	30,1	0,34 – 0,62	726	SW
LA(min) Fast 38,0 – LA(max) Fast 41,8																		
23	21^{00}	21^{15}	35,0	35,2	41,8	42,0	42,1	42,3	43,0	43,1	43,7	38,2	42,0	road, transformer	27,7	0,49 – 0,93	726	NW
LA(min) Fast 34,0 – LA(max) Fast 39,0																		

№	Start time	End time	Sound pressure in octave bands with geometric mean frequencies, Hz									LAeq, dB	LAmax, dB	Additional noise sources	Meteo data			
			31,5	63	125	250	500	1000	2000	4000	8000				Temperature, ^{0}C	Wind speed, m/sec	Pressure, mmHg	Wind direction
24	21^{40}	21^{55}	36,2	37,3	37,2	38,4	38,0	38,4	38,4	39,1	39,3	38,0	48,2	road, transformer	26,4	0,44 – 1,15	726	NW
LA(min) Fast 33,4 – LA(max) Fast 38,1																		
25	22^{00}	22^{15}	33,8	34,0	34,0	33,2	34,7	34,5	35,3	36,2	37,4	39,5	44,1	road, transformer	25,8	0,56 – 1,08	726	NW
LA(min) Fast 38,0 – LA(max) Fast 40,0																		
26	22^{40}	22^{55}	34,2	35,7	35,4	35,6	36,2	37,4	38,4	39,7	39,3	36,1	42,4	road, transformer	25,9	0,34 – 1,12	726	NW
LA(min) Fast 34,0 – LA(max) Fast 39,0																		
27	23^{10}	23^{45}	34,2	35,7	35,4	35,6	36,2	37,4	38,4	32,7	32,3	33,8	36,2	road, transformer	22,6	0,87 – 1,47	726	NE
LA(min) Fast 32,0 – LA(max) Fast 34,0																		
28	23^{40}	23^{55}	34,2	35,7	35,4	35,6	36,2	37,4	38,4	32,7	32,3	32,4	43,9	road, transformer	22,0	0,84 – 2,01	726	NE
LA(min) Fast 32,1 – LA(max) Fast 34,7																		
NM 7 – 21.06.2020 (weekend). Coordinates: 40°13'53.39'' N, 69°7'16.14'' E; h = 1,2 - 1,3 m.																		
29	00^{05}	00^{20}	34,2	35,7	35,4	34,6	36,2	34,4	35,4	32,7	32,3	34,1	39,2	road, transformer	21,6	0,67 – 1,34	726	NE
LA(min) Fast 31,1 – LA(max) Fast 35,7																		
30	00^{30}	00^{45}	34,9	35,7	35,4	34,6	36,2	34,4	35,4	32,7	32,3	33,9	40,1	road, transformer	21,0	0,32 – 1,28	726	NE
LA(min) Fast 33,1 – LA(max) Fast 35,9																		
31	01^{05}	01^{20}	34,2	35,7	35,4	34,6	36,2	34,4	35,1	32,7	32,0	34,2	39,1	road, transformer	19,8	0,36 – 0,78	726	NW
LA(min) Fast 31,1 – LA(max) Fast 34,7																		
32	01^{40}	01^{55}	34,2	35,7	35,4	34,6	36,2	34,4	35,4	32,7	32,3	32,0	36,0	road, transformer	19,7	0,59 – 0,72	726	NW

№	Start time	End time	Sound pressure in octave bands with geometric mean frequencies, Hz									LAeq, dB	LAmax, dB	Additional noise sources	Meteo data			
			31,5	63	125	250	500	1000	2000	4000	8000				Temperature, ^{0}C	Wind speed, m/sec	Pressure, mmHg	Wind direction
LA(min) Fast 31,1 – LA(max) Fast 34,0																		
33	02^{10}	02^{25}	34,2	35,7	35,4	34,6	36,2	34,4	35,4	32,7	32,3	34,1	37,2	road, transformer	19,8	0,74 – 1,05	726	NW
LA(min) Fast 31,1 – LA(max) Fast 35,0																		
34	02^{40}	02^{55}	34,9	35,7	35,4	34,6	36,2	34,4	35,4	32,7	32,3	33,0	36,9	road, transformer	20,4	0,99 – 1,1	726	NW
LA(min) Fast 31,0 – LA(max) Fast 34,4																		
35	03^{00}	03^{15}	34,2	34,7	34,4	33,6	34,2	34,4	35,4	32,7	31,3	33,5	36,1	road, transformer	20,0	0,46 – 0,91	726	NW
LA(min) Fast 30,1 – LA(max) Fast 34,0																		
36	03^{41}	03^{56}	34,2	34,7	33,4	34,6	34,2	34,4	32,4	32,7	31,3	32,8	37,0	road, transformer	20,4	0,72 – 0,98	726	NW
LA(min) Fast 30,0 – LA(max) Fast 34,0																		
37	04^{05}	04^{20}	41,0	41,2	44,0	44,3	44,0	44,4	44,2	44,3	45,1	44,1	46,9	road, transformer	21,8	0,27 – 0,79	728	NW
LA(min) Fast 40,1 – LA(max) Fast 45,0																		
38	04^{30}	04^{45}	41,0	41,2	44,0	44,3	44,0	44,4	43,2	43,3	43,1	43,5	47,0	road, transformer	22,0	0,22 – 0,74	728	NW
LA(min) Fast 40,1 – LA(max) Fast 44,0																		
39	05^{04}	05^{19}	41,0	41,2	44,0	44,3	44,0	44,4	44,2	44,3	45,1	45,7	52,4	road, transformer, birds	22,7	0,27 – 0,79	726	NW
LA(min) Fast 38,2 – LA(max) Fast 46,0																		
40	05^{40}	05^{55}	41,0	41,2	44,0	44,3	44,0	44,4	45,2	45,3	45,1	53,8	58,3	road, transformer, birds	22,4	0,22 – 0,44	726	NW
LA(min) Fast 39,1 – LA(max) Fast 47,0																		
41	06^{04}	06^{19}	32,2	32,7	33,4	33,6	33,2	33,4	32,4	32,7	31,3	29,0	33,6	road, transformer	22,7	0,59 – 1,16	726	NW

№	Start time	End time	Sound pressure in octave bands with geometric mean frequencies, Hz									LAeq, dB	LAmax, dB	Additional noise sources	Meteo data			
			31,5	63	125	250	500	1000	2000	4000	8000				Temperature, ^{0}C	Wind speed, m/sec	Pressure, mmHg	Wind direction
LA(min) Fast 26,1 – LA(max) Fast 30,0																		
42	06^{41}	06^{56}	32,2	34,7	33,4	32,6	32,2	33,4	32,4	32,7	31,3	30,8	32,6	road, transformer	23,0	0,53 – 1,28	726	NW
LA(min) Fast 29,1 – LA(max) Fast 32,0																		
43	07^{10}	07^{25}	34,2	34,7	33,4	34,6	34,2	34,4	32,4	32,7	31,3	35,9	38,4	road, transformer	24,0	0,84 – 1,32	726	NW
LA(min) Fast 30,0 – LA(max) Fast 34,0																		
44	07^{30}	07^{45}	34,2	34,7	33,4	34,6	34,2	34,4	32,4	32,7	31,3	34,0	37,0	road, transformer	24,6	0,35 – 1,81	726	NW
LA(min) Fast 30,8 – LA(max) Fast 34,2																		
45	08^{00}	08^{15}	41,0	41,2	43,0	43,3	43,0	42,4	43,2	44,3	42,1	42,8	48,6	road, transformer	26,0	1,31 – 2,43	726	NW
LA(min) Fast 38,8 – LA(max) Fast 43,0																		
46	08^{22}	08^{37}	41,0	41,2	43,0	43,3	44,0	43,4	43,2	44,3	43,1	40,9	51,0	road, transformer	26,5	1,38 – 2,16	726	NW
LA(min) Fast 37,8 – LA(max) Fast 43,2																		
47	09^{10}	09^{25}	41,0	41,2	44,0	44,3	44,0	44,4	44,2	44,3	45,1	44,3	58,0	road, transformer	29,0	1,28 – 1,73	725	NW
LA(min) Fast 41,0 – LA(max) Fast 45,2																		
48	09^{40}	09^{55}	41,0	41,2	45,0	44,3	44,0	44,4	43,2	44,3	44,1	43,2	56,7	road, transformer	29,7	1,24 – 1,76	725	NW
LA(min) Fast 40,8 – LA(max) Fast 45,2																		

Table 0-16 NM 7 (weekday)

NM 7 – 22.06.2020 (weekday). Coordinates: 40°13'53.39'' N, 69°7'16.14'' E; h = 1,2 m.

49	10^{00}	10^{15}	34,2	34,7	33,4	34,6	34,2	34,4	32,4	32,7	31,3	42,5	54,0	road, transformer	31,2	3,58 – 4,92	721	NW
LA(min) Fast 32,8 – LA(max) Fast 36,2																		
50	10^{30}	10^{45}	No measurement due to wind speed > 5 m/s												31,0	**3,69 – 5,62**	721	NW
51	11^{00}	11^{15}	34,2	34,7	33,4	34,6	34,2	34,4	32,4	32,7	31,3	42,0	52,9	road, transformer	35,9	2,69 – 4,52	720	NW
LA(min) Fast 32,8 – LA(max) Fast 37,0																		
52	11^{40}	11^{55}	43,8	43,4	44,0	43,3	44,0	43,4	44,0	43,1	44,0	42,4	53,7	road, transformer	36,0	2,61 – 4,28	720	NW
LA(min) Fast 32,8 – LA(max) Fast 37,0																		
53	12^{10}	12^{25}	43,8	43,4	44,0	43,3	44,0	43,4	44,0	43,1	44,0	51,4	55,4	road, transformer, wind	37,3	2,69 – 3,44	720	NW
LA(min) Fast 42,8 – LA(max) Fast 47,0																		
54	12^{40}	12^{55}	44,0	44,2	45,0	44,3	44,0	44,4	43,2	44,3	43,1	49,0	54,6	road, transformer, wind	37,5	2,17 – 3,68	720	NW
LA(min) Fast 46,8 – LA(max) Fast 50,0																		
55	13^{00}	13^{15}	43,1	42,4	42,2	43,3	43,0	42,2	43,2	43,3	43,1	45,0	52,7	road, transformer, wind	39,8	2,74 – 4,32	720	NW
LA(min) Fast 44,8 – LA(max) Fast 47,0																		
56	13^{40}	13^{55}	44,1	42,4	42,0	43,3	43,0	43,2	43,2	43,3	43,0	44,0	51,9	road, transformer, wind	40,0	2,68 – 4,55	720	NW
LA(min) Fast 42,9 – LA(max) Fast 46,0																		
57	14^{00}	14^{15}	44,1	42,4	42,0	43,3	43,0	43,2	43,2	43,3	41,9	47,5	58,0	road, transformer	38,7	1,23 – 2,07	719	NW
LA(min) Fast 42,9 – LA(max) Fast 46,3																		
58	14^{35}	14^{50}	43,2	43,4	44,0	43,3	44,0	43,2	43,0	43,1	44,2	45,7	54,7	road, transformer	38,9	1,48 – 2,69	719	NW
LA(min) Fast 42,0 – LA(max) Fast 46,0																		
59	15^{00}	15^{15}	43,8	43,4	44,0	43,3	44,0	43,4	44,0	43,1	44,0	44,7	52,9	road, transformer	39,8	2,74 – 4,32	720	NW
LA(min) Fast 44,0 – LA(max) Fast 46,0																		
60	15^{35}	15^{50}	43,2	43,4	44,0	43,3	44,0	43,2	43,0	43,1	44,2	47,5	58,0	road, transformer	40,0	2,81 – 4,36	720	NW
LA(min) Fast 42,0 – LA(max) Fast 46,0																		
61	16^{05}	16^{20}	44,1	42,4	42,0	43,3	43,0	43,2	43,2	43,3	43,0	42,1	51,9	road, transformer	38,7	1,23 – 2,07	719	NW

LA(min) Fast 40,0 – LA(max) Fast 42,0																		
62	16^{40}	16^{55}	43,2	43,4	44,0	43,3	44,0	43,2	43,0	43,1	44,2	44,8	54,8	road, transformer	38,8	1,44 – 2,09	719	NW
LA(min) Fast 41,5 – LA(max) Fast 46,0																		
63	17^{05}	17^{20}	43,8	43,4	44,0	43,3	44,0	43,4	44,0	43,1	44,0	40,5	50,7	road, transformer	36,5	1,26 – 1,73	719	NW
LA(min) Fast 37,5 – LA(max) Fast 40,0																		
64	17^{45}	18^{00}	43,1	43,2	44,0	43,4	43,0	43,1	43,3	43,4	44,4	43,8	54,8	road, transformer	36,4	1,09 – 1,24	719	NW
LA(min) Fast 38,0 – LA(max) Fast 41,0																		
65	18^{15}	18^{30}	51,1	51,4	51,4	52,3	52,1	52,0	50,4	51,3	52,4	45,0	59,0	road, transformer	34,3	0,31 – 0,57	719	NW
LA(min) Fast 48,0 – LA(max) Fast 51,0																		
66	18^{42}	18^{57}	52,7	51,4	51,4	52,3	52,1	52,0	50,4	51,3	52,2	48,7	53,9	road, transformer	34,0	0,71 – 0,94	719	NW
LA(min) Fast 48,0 – LA(max) Fast 50,0																		
67	19^{05}	19^{20}	44,2	43,9	42,1	41,3	41,0	41,3	42,4	41,2	40,0	46,0	58,0	road, transformer	32,5	0,46 – 0,62	719	NW
LA(min) Fast 34,0 – LA(max) Fast 40,0																		
68	19^{40}	19^{55}	43,1	42,4	42,2	43,3	43,0	42,2	43,2	43,3	43,1	44,2	55,4	road, transformer	32,0	0,44 – 0,78	719	NW
LA(min) Fast 36,0 – LA(max) Fast 41,0																		
69	20^{04}	20^{19}	44,1	42,4	42,0	43,3	43,0	43,2	43,2	43,3	43,0	42,0	52,8	road, transformer	32,2	0,87 – 1,57	719	NW
LA(min) Fast 38,0 – LA(max) Fast 40,0																		
70	20^{36}	20^{51}	43,2	43,4	44,0	43,3	44,0	43,2	43,0	43,1	44,2	43,2	54,0	road, transformer	32,5	0,94 – 1,33	719	NW
LA(min) Fast 38,0 – LA(max) Fast 41,0																		
71	21^{09}	21^{24}	43,8	43,4	44,0	43,3	44,0	43,4	44,0	43,1	44,0	39,4	50,9	road, transformer	32,1	1,64 – 2,04	720	NW
LA(min) Fast 32,0 – LA(max) Fast 34,0																		
72	21^{40}	21^{55}	43,8	43,4	44,0	43,3	44,0	43,4	44,0	43,1	44,0	39,9	51,4	road, transformer	32,0	1,48 – 2,46	720	NW
LA(min) Fast 31,8 – LA(max) Fast 34,0																		
73	22^{00}	22^{15}	34,2	34,7	33,4	34,6	34,2	34,4	32,4	32,7	31,3	45,4	57,0	road, transformer	29,8	1,73 – 2,56	719	NE
LA(min) Fast 31,7 – LA(max) Fast 36,0																		

74	22^{36}	22^{51}	43,7	42,1	41,3	41,0	41,3	42,2	41,2	40,2	43,7	47,4	59,4	road, transformer	29,4	1,88 – 2,22	719	NE
LA(min) Fast 32,0 – LA(max) Fast 36,0																		
75	23^{00}	23^{15}	No measurement due to wind speed > 5 m/s											road, transformer	28,2	**4,20 – 6,13**	719	NE
76	23^{40}	23^{55}	No measurement due to wind speed > 5 m/s											road, transformer	28,0	**4,88 – 6,44**	719	NE
NM 7 – 23.06.2020 г. (weekday). Coordinates: 40°13'53.39'' N, 69°7'16.14'' E; h = 1,2 m.																		
77	00^{08}	08^{23}	No measurement due to wind speed > 5 m/s											road, transformer	26,0	**2,85 – 5,85**	719	NE
78	00^{40}	00^{55}	43,9	42,1	41,3	41,0	41,3	42,4	41,2	40,0	43,9	44,5	54,0	road, transformer	26,0	2,34 – 4,89	719	NE
LA(min) Fast 40,0 – LA(max) Fast 46,0																		
79	01^{00}	01^{15}	43,7	42,1	41,3	41,0	41,3	42,2	41,2	40,2	43,7	45,2	55,7	road, transformer	24,6	3,12 – 4,23	719	NE
LA(min) Fast 40,0 – LA(max) Fast 44,0																		
80	01^{38}	01^{53}	44,1	44,0	42,3	42,3	43,0	42,2	42,0	42,2	42,3	44,6	54,9	road, transformer	24,4	3,16 – 4,76	719	NE
LA(min) Fast 40,0 – LA(max) Fast 45,2																		
81	02^{00}	02^{15}	44,1	44,0	42,3	42,3	43,0	42,2	42,0	42,2	42,3	44,5	55,0	road, transformer	23,1	3,41 – 4,52	719	NE
LA(min) Fast 40,0 – LA(max) Fast 43,0																		
82	02^{40}	02^{55}	42,3	43,2	42,4	44,0	43,2	44,2	45,1	45,3	45,4	43,9	58,1	road, transformer	22,8	3,98 – 4,66	719	NE
LA(min) Fast 42,0 – LA(max) Fast 43,2																		
83	03^{05}	03^{20}	42,9	43,2	42,4	44,0	43,2	44,8	45,1	45,3	45,0	44,8	52,0	road, transformer	26,2	2,17 – 4,49	719	NE
LA(min) Fast 44,0 – LA(max) Fast 47,2																		
84	03^{44}	03^{59}	42,3	43,2	42,4	44,0	43,2	44,2	45,1	45,3	45,4	47,8	53,1	road, transformer	26,0	2,15 – 4,45	719	NE
LA(min) Fast 42,0 – LA(max) Fast 48,2																		
85	04^{00}	04^{15}	43,8	43,4	44,0	43,3	44,0	43,4	44,0	43,1	44,0	41,2	52,0	road, transformer	26,4	1,82 – 2,43	722	NE
LA(min) Fast 37,0 – LA(max) Fast 39,0																		
86	04^{35}	04^{50}	42,9	42,3	43,2	43,4	43,2	43,4	43,1	43,3	43,2	43,7	55,1	road, transformer	26,0	1,84 – 2,65	722	NE
LA(min) Fast 37,0 – LA(max) Fast 38,2																		

87	05^{10}	05^{25}	43,8	43,4	44,0	43,3	44,0	43,4	44,0	43,1	44,0	41,4	53,4	road, transformer	26,4	1,82 – 2,43	722	NE
LA(min) Fast 32,0 – LA(max) Fast 34,0																		
88	05^{40}	05^{55}	34,2	34,7	33,4	34,6	34,2	34,4	32,4	32,7	31,3	41,0	53,0	road, transformer	26,2	1,34 – 2,35	722	NE
LA(min) Fast 31,9 – LA(max) Fast 33,2																		
89	06^{00}	06^{15}	44,9	43,7	42,1	41,3	41,0	41,3	42,2	41,2	40,2	46,0	58,0	road, transformer	25,8	1,06 – 3,69	722	NE
LA(min) Fast 31,9 – LA(max) Fast 34,5																		
90	06^{40}	06^{55}	44,2	43,9	42,1	41,3	41,0	41,3	42,4	41,2	40,0	45,5	57,7	road, transformer	25,6	1,12 – 3,74	722	NE
LA(min) Fast 31,0 – LA(max) Fast 34,0																		
91	07^{05}	07^{20}	44,1	42,4	42,0	43,3	43,0	43,2	43,2	43,3	43,0	40,9	52,4	road, transformer	29,0	1,14 – 2,26	722	NE
LA(min) Fast 33,0 – LA(max) Fast 36,0																		
92	07^{40}	07^{55}	43,8	43,4	44,0	43,3	44,0	43,4	44,0	43,1	44,0	42,3	54,0	road, transformer	29,0	1,47 – 1,8	722	NE
LA(min) Fast 32,0 – LA(max) Fast 36,0																		
93	08^{14}	08^{29}	43,8	43,4	44,0	43,3	44,0	43,4	44,0	43,1	44,0	41,4	53,0	road, transformer	29,6	1,35 – 2,18	724	NE
LA(min) Fast 32,0 – LA(max) Fast 34,0																		
94	08^{40}	08^{55}	43,2	43,4	44,0	43,3	44,0	43,2	43,0	43,1	44,2	43,0	55,0	road, transformer	29,4	1,76 – 2,14	724	NE
LA(min) Fast 33,0 – LA(max) Fast 34,0																		
95	09^{05}	09^{20}	44,3	45,1	45,3	46,0	45,2	46,3	46,1	45,2	46,2	46,4	58,7	road, transformer, pets	33,4	724	2,63 – 3,74	SE
LA(min) Fast 34,0 – LA(max) Fast 37,0																		
96	09^{41}	09^{56}	44,3	45,1	45,3	46,0	45,2	46,3	46,1	45,2	46,2	46,7	59,0	road, transformer, pets	33,9	724	2,22 – 3,78	SE
LA(min) Fast 34,4 – LA(max) Fast 37,2																		

Table 0-17 NM 8 (weekday)

№	Start time	End time	Sound pressure in octave bands with geometric mean frequencies, Hz									LAeq, dB	LAmax, dB	Additional noise sources	Meteo data			
			31,5	63	125	250	500	1000	2000	4000	8000				Temperature, ^{0}C	Wind speed, m/sec	Pressure, mmHg	Wind direction
NM 8 – 25.06.2020 (weekday). Coordinates: 40°13'43.82'' N, 69°6'14.18'' E; h = 1,2 m.																		
1	11^{10}	11^{25}	63,1	62,2	62,4	63,3	65,4	64,1	63,2	62,1	64,3	67,5	75,0	birds, car	33,1	2,94 – 5,00	725	NW
LA(min) Fast 59,9 – LA(max) Fast 68,1																		
2	11^{40}	11^{55}	63,8	62,2	62,4	63,3	65,5	64,1	63,2	62,1	64,3	67,9	74,2	birds, cars	33,7	3,64 – 4,81	725	NW
LA(min) Fast 60,4 – LA(max) Fast 68,5																		
3	12^{05}	12^{20}	63,2	64,1	65,0	65,2	64,1	66,2	63,1	63,4	62,2	63,5	69,8	birds, cars	35,4	3,39 – 4,9	725	NW
LA(min) Fast 61,9 – LA(max) Fast 67,1																		
4	12^{35}	12^{50}	63,4	64,1	65,0	65,2	64,2	66,2	63,1	63,7	62,2	64,3	69,2	birds, cars	35,7	3,24 – 4,78	725	NW
LA(min) Fast 63,4 – LA(max) Fast 67,8																		
5	13^{15}	13^{30}	61,2	62,1	62,4	62,0	62,4	63,1	61,1	62,2	61,3	62,6	67,5	birds, cars	36,7	2,19 – 4,71	725	SW
LA(min) Fast 62,0 – LA(max) Fast 65,1																		
6	13^{40}	13^{55}	61,6	62,1	62,4	62,1	62,4	63,1	61,1	62,2	61,4	65,5	72,0	birds, cars	36,4	2,97 – 4,04	725	SW
LA(min) Fast 63,7 – LA(max) Fast 66,0																		
7	14^{10}	14^{25}	52,1	53,0	53,3	52,0	53,1	54,2	53,4	54,2	52,4	57,1	61,8	birds, cars	36,8	2,95 – 4,35	725	NW
LA(min) Fast 54,9 – LA(max) Fast 57,7																		
8	14^{35}	14^{50}	52,4	53,0	53,3	52,0	53,6	54,2	53,4	54,2	52,4	55,2	60,1	birds, cars	36,1	2,94 – 4,24	725	NW
LA(min) Fast 52,4 – LA(max) Fast 55,9																		

9	15^{00}	15^{15}	61,0	61,3	62,2	63,1	63,2	65,1	62,2	64,3	63,1	63,8	69,8	birds, trees, cars	36,2	2,48 – 4,53	725	NW
LA(min) Fast 62,0 – LA(max) Fast 64,3																		
10	15^{40}	15^{55}	61,5	61,3	62,2	63,3	63,2	65,1	62,2	64,5	63,1	63,5	67,8	birds, trees, cars	36,4	2,12 – 4,46	725	NW
LA(min) Fast 62,0 – LA(max) Fast 64,0																		
11	16^{10}	16^{25}	61,1	61,3	62,4	62,1	65,3	65,0	65,1	65,4	64,1	62,1	68,4	birds, house. livestock	36,7	2,58 – 3,85	722	NW
LA(min) Fast 61,2 – LA(max) Fast 65,4																		
12	16^{44}	16^{59}	61,6	61,3	62,4	62,2	65,3	65,0	65,1	65,4	64,1	64,6	68,9	birds, house. livestock	36,2	2,13 – 3,01	722	NW
LA(min) Fast 62,2 – LA(max) Fast 65,1																		
13	17^{03}	17^{18}	42,3	43,1	42,2	44,3	45,2	43,1	44,2	43,0	43,4	41,4	49,0	birds, cars	35,6	2,7 – 3,75	722	SW
LA(min) Fast 40,2 – LA(max) Fast 45,9																		
14	17^{44}	17^{59}	42,5	43,1	42,2	44,3	45,2	43,6	44,2	43,0	43,4	46,0	52,4	birds, cars	35,5	2,89 – 3,01	722	SW
LA(min) Fast 43,9 – LA(max) Fast 46,4																		
15	18^{00}	18^{12}	52,3	51,3	51,0	50,4	55,4	56,0	53,3	53,4	55,0	51,4	58,8	birds, cars, frogs	34,6	1,64 – 2,91	722	SW
LA(min) Fast 51,0 – LA(max) Fast 53,0																		
16	18^{35}	18^{50}	52,3	51,3	51,5	50,4	55,4	56,0	53,3	53,4	55,0	43,7	49,9	birds, cars, frogs	34,0	1,44 – 2,98	722	SW
LA(min) Fast 43,1 – LA(max) Fast 46,1																		
17	19^{00}	19^{15}	53,1	52,3	55,0	53,1	51,4	53,4	53,1	53,4	55,0	52,8	60,0	birds, cars, frogs	33,1	1,15 – 2,43	722	NW
LA(min) Fast 51,9 – LA(max) Fast 56,4																		
18	19^{44}	19^{59}	53,5	52,3	55,3	53,1	51,4	53,4	53,1	53,4	55,0	52,4	62,1	birds, cars, frogs	33,2	1,31 – 2,89	722	NW
LA(min) Fast 51,2 – LA(max) Fast 56,9																		
19	20^{00}	20^{15}	52,4	51,3	51,2	51,1	51,2	54,0	53,8	54,4	55,0	51,3	60,2	birds, cars, frogs	30,8	1,21 – 1,98	722	NW
LA(min) Fast 51,0 – LA(max) Fast 54,0																		

20	20^{38}	20^{53}	52,4	51,3	51,2	51,4	51,2	54,1	53,8	54,4	55,0	56,8	63,8	birds, cars, frogs	30,4	1,55 – 2,14	722	NW
LA(min) Fast 50,7 – LA(max) Fast 54,8																		
21	21^{10}	21^{25}	52,4	55,3	54,1	54,3	55,2	53,2	52,1	54,2	52,4	53,6	59,8	birds, cars, frogs	29,1	1,47 – 2,04	722	SW
LA(min) Fast 53,0 – LA(max) Fast 56,0																		
22	21^{40}	21^{55}	52,2	55,3	54,1	54,3	55,4	53,3	52,1	54,2	52,4	52,2	61,8	birds, cars, frogs	29,1	1,64 – 2,19	722	SW
LA(min) Fast 51,0 – LA(max) Fast 56,9																		
23	22^{00}	22^{15}	46,4	45,1	46,2	44,3	45,2	46,1	47,2	48,3	47,2	47,4	60,0	birds, cars, crickets, frogs,	27,3	0,36 – 0,71	722	NW
LA(min) Fast 46,2 – LA(max) Fast 49,0																		
24	22^{38}	22^{53}	46,4	45,1	46,2	44,3	45,2	46,1	47,2	48,3	47,2	48,2	58,4	birds, cars, crickets, frogs,	27,2	0,77 – 0,98	722	NW
LA(min) Fast 47,0 – LA(max) Fast 49,0																		
25	23^{05}	23^{20}	42,3	43,1	46,2	44,0	45,1	43,3	44,2	46,4	45,8	44,6	49,4	birds, cars, crickets, frogs,	27,6	0,79 – 1,16	722	NW
LA(min) Fast 44,0 – LA(max) Fast 47,0																		
26	23^{38}	23^{53}	42,2	43,1	46,2	44,4	45,1	43,6	44,2	46,4	45,8	42,3	51,4	birds, cars, crickets, frogs,	27,0	0,55 – 1,68	722	NW
LA(min) Fast 40,4 – LA(max) Fast 47,9																		
NM 8 – 26.06.2020 (weekday). Coordinates: 40°13'43.82'' N, 69°6'14.18'' E; h = 1,2 m.																		
27	00^{07}	00^{22}	42,4	43,1	45,2	44,3	45,2	44,4	45,3	46,1	44,2	41,9	49,2	birds, cars, crickets, frogs,	25,9	1,1 – 2,06	722	NW
LA(min) Fast 41,0 – LA(max) Fast 45,0																		
28	00^{44}	00^{59}	42,4	43,1	45,2	44,3	45,2	44,4	45,3	46,1	44,2	42,0	44,9	birds, cars, crickets, frogs,	25,4	1,55 – 2,04	722	NW

LA(min) Fast 40,3 – LA(max) Fast 44,3																		
29	01^{12}	01^{27}	46,1	49,3	47,2	48,1	47,2	45,4	46,3	47,1	48,2	47,5	54,1	cars, frogs,	25,2	1,14 – 1,73	722	NW
LA(min) Fast 45,5 – LA(max) Fast 49,0																		
30	01^{32}	01^{47}	46,1	49,3	47,2	48,1	47,7	45,4	46,3	47,4	48,2	41,9	55,1	cars, frogs,	25,1	1,36 – 1,94	722	NW
LA(min) Fast 41,0 – LA(max) Fast 49,8																		
31	02^{03}	02^{18}	53,1	54,0	52,3	51,1	53,4	54,3	53,0	53,4	52,2	52,8	63,3	cars, frogs,	23,9	0,87 – 1,36	722	NW
LA(min) Fast 50,9 – LA(max) Fast 54,0																		
32	02^{32}	02^{47}	41,3	54,0	52,5	51,1	53,3	54,3	53,0	53,4	52,2	51,8	64,0	cars, frogs,	23,0	0,44 – 1,56	722	NW
LA(min) Fast 39,9 – LA(max) Fast 54,8																		
33	03^{10}	03^{25}	53,1	53,4	52,3	54,4	55,2	53,1	52,2	51,4	53,3	53,4	63,2	cars, frogs,	23,4	1,32 – 1,66	722	NW
LA(min) Fast 50,0 – LA(max) Fast 55,2																		
34	03^{36}	03^{51}	53,5	53,4	52,3	54,4	55,8	53,6	52,2	51,4	53,3	54,4	60,1	cars, frogs,	23,1	1,84 – 1,95	722	NW
LA(min) Fast 53,0 – LA(max) Fast 55,2																		
35	04^{00}	04^{15}	52,3	53,3	52,2	53,1	51,4	52,2	51,2	53,1	51,4	52,2	58,0	cars, frogs,	23,7	0,54 – 1,26	722	NW
LA(min) Fast 51,0 – LA(max) Fast 53,0																		
36	04^{22}	04^{37}	52,3	53,3	52,2	53,1	51,4	52,2	51,2	53,1	51,4	52,8	58,2	cars, frogs,	23,3	0,5 – 1,71	722	NW
LA(min) Fast 50,4 – LA(max) Fast 54,8																		
37	05^{17}	05^{32}	53,4	53,1	52,2	53,3	54,4	54,0	583,4	53,3	53,1	53,5	55,9	cars, frogs, birds	25,1	1,14 – 2,22	722	NE
LA(min) Fast 51,0 – LA(max) Fast 55,0																		
38	05^{43}	05^{58}	53,4	53,1	52,5	53,3	54,4	54,6	583,4	53,7	53,1	54,3	64,8	cars, frogs, birds	25,7	1,51 – 1,89	722	NE
LA(min) Fast 52,1 – LA(max) Fast 55,8																		
39	06^{10}	06^{35}	52,3	53,2	53,4	52,4	53,1	53,4	52,3	53,1	53,4	54,7	59,0	cars, frogs, birds	26,7	1,18 – 1,96	722	NE
LA(min) Fast 50,1 – LA(max) Fast 56,9																		

40	06^{45}	07^{00}	52,3	53,2	53,4	52,4	53,1	53,3	52,6	53,1	53,4	54,8	67,1	cars, frogs, birds	26,5	1,4 – 1,78	722	NE
LA(min) Fast 51,8 – LA(max) Fast 56,6																		
41	07^{12}	07^{27}	53,2	54,1	53,3	54,2	54,4	52,2	53,1	54,2	53,4	54,5	67,0	birds, cars, груз. car	28,3	1,67 – 2,19	722	NE
LA(min) Fast 53,4 – LA(max) Fast 55,3																		
42	07^{39}	07^{54}	53,2	54,5	53,3	54,2	54,2	52,2	53,1	54,2	53,4	54,8	78,2	birds, cars, груз. car	28,5	1,20 – 2,21	722	NE
LA(min) Fast 52,8 – LA(max) Fast 56,0																		
43	08^{00}	08^{15}	51,4	52,2	53,1	51,3	52,2	51,3	53,1	52,4	53,3	52,2	72,4	birds, cars (passenger car and truck)	29,7	1,36 – 2,19	723	NE
LA(min) Fast 50,8 – LA(max) Fast 53,0																		
44	08^{32}	08^{47}	51,4	52,6	53,1	51,3	52,6	51,3	53,5	52,4	53,3	52,0	62,0	birds, cars (passenger car and truck)	29,4	1,38 – 2,74	723	NE
LA(min) Fast 42,1 – LA(max) Fast 47,7																		
45	09^{10}	09^{25}	33,4	34,1	32,2	33,1	34,0	34,4	33,1	32,2	33,3	45,8	66,4	birds, cars (passenger car and truck)	31,2	0,46 – 0,83	723	NE
LA(min) Fast 55,0 – LA(max) Fast 64,0																		
46	09^{40}	09^{55}	33,4	34,1	32,3	33,1	34,0	34,6	33,1	32,2	33,5	46,5	69,8	birds, cars (passenger car and truck)	31,7	0,55 – 0,78	723	NE
LA(min) Fast 45,0 – LA(max) Fast 47,7																		
47	10^{00}	10^{15}	33,5	34,1	32,2	33,6	34,0	34,4	33,1	32,2	33,4	45,6	74,0	birds, cars (passenger car and truck)	32,1	0,56 – 0,98	723	NE
LA(min) Fast 43,0 – LA(max) Fast 47,1																		
48	10^{30}	10^{45}	33,5	34,1	32,4	33,6	34,0	34,8	33,1	32,2	33,1	45,2	70,0	birds, cars (passenger car and truck)	32,1	1,25 – 2,68	723	NE

LA(min) Fast 42,0 – LA(max) Fast 47,0

Table 0-18 NM 8 (weekend)

NM 8 – 27.06.2020 (weekend). Coordinates: 40°13'43.82'' N, 69°6'14.18'' E; h = 1,2 m.																		
49	7^{10}	7^{25}	52,2	53,4	54,3	54,1	52,4	53,2	55,3	53,2	54,1	54,7	84,0	47 cars, 3 trucks	22,4	3,39 – 5,00	727	SE
LA(min) Fast 52,8 – LA(max) Fast 55,9																		
50	7^{35}	7^{50}	52,2	53,4	54,3	54,1	52,4	53,2	55,3	53,2	54,1	53,3	81,2	43 cars, 4 грузовых	22,4	3,38 –4,25	727	SE
LA(min) Fast 51,4 – LA(max) Fast 54,9																		
51	8^{00}	8^{15}	53,2	54,1	54,3	53,1	52,2	53,4	53,0	52,1	54,3	51,3	64,0	birds, cars	24,1	2,86 – 4,42	727	SE
LA(min) Fast 50,4 – LA(max) Fast 54,9																		
52	8^{30}	8^{45}	53,2	54,1	54,3	53,1	52,2	53,8	53,0	52,1	54,1	54,3	70,0	birds, cars	24,0	2,45 – 4,58	727	SE
LA(min) Fast 52,8 – LA(max) Fast 55,1																		
53	9^{10}	9^{25}	56,2	57,1	54,3	56,1	54,2	56,4	57,1	56,3	54,1	57,3	64,0	birds, cars	25,6	2,94 – 4,95	729	SE
LA(min) Fast 55,8 – LA(max) Fast 58,1																		
54	9^{40}	9^{55}	No measurement due to wind speed>5m/s											birds, cars, wind	25,2	**3,46 – 5,9**	729	SE
55	10^{00}	10^{15}	No measurement due to wind speed>5m/s											birds, cars, wind	26,2	**4,41 – 6,79**	729	SE
56	10^{40}	10^{55}	No measurement due to wind speed>5m/s											birds, cars, wind	26,4	**4,17 – 5,54**	729	SE
57	11^{10}	11^{25}	No measurement due to wind speed>5m/s											birds, cars, wind	26,5	**3,39 – 6,71**	729	SE
57	11^{40}	11^{55}	No measurement due to wind speed>5m/s											birds, cars, wind	26,4	**3,04 – 6,78**	729	SE
58	12^{00}	12^{15}	No measurement due to wind speed>5m/s											birds, cars, wind	26,7	**4,53 – 6,27**	730	SE
59	12^{35}	12^{50}	No measurement due to wind speed>5m/s											birds, cars, wind	26,1	**4,34 – 6,67**	730	SE

60	13^{14}	13^{29}	52,1	52,4	53,3	54,2	55,1	53,4	52,2	56,1	54,3	53,4	65,6	cars, birds	27,4	3,61 – 4,58	730	SE
LA(min) Fast 51,9 – LA(max) Fast 54,6																		
61	13^{40}	13^{55}	52,0	52,4	53,3	54,2	55,8	53,4	52,2	56,1	54,3	53,6	64,2	cars, birds	27,4	3,71 – 4,28	730	SE
LA(min) Fast 52,0 – LA(max) Fast 58,6																		
63	14^{00}	14^{15}	43,2	44,1	44,3	46,1	42,2	45,1	44,2	46,1	44,2	41,2	61,7	cars, birds	30,2	1,63 – 3,12	730	SE
LA(min) Fast 40,0 – LA(max) Fast 45,0																		
64	14^{40}	14^{55}	42,9	44,1	44,3	46,1	42,2	45,1	44,2	46,1	44,2	41,6	61,0	cars, birds	30,4	1,4 – 3,75	730	SE
LA(min) Fast 40,0 – LA(max) Fast 46,6																		
65	15^{00}	15^{15}	42,4	43,1	43,4	43,0	44,2	45,1	47,2	43,3	46,1	42,6	66,0	cars, birds	27,6	2,66 – 4,91	730	SE
LA(min) Fast 40,0 – LA(max) Fast 46,6																		
66	15^{40}	15^{55}	42,9	43,1	43,4	43,0	44,6	45,1	47,2	43,3	46,0	44,6	64,5	cars, birds	27,6	2,46 – 5,02	730	SE
LA(min) Fast 40,4 – LA(max) Fast 45,9																		
67	16^{05}	16^{20}	46,4	47,1	47,3	48,4	45,3	49,1	47,2	46,4	49,3	46,0	58,0	cars, birds	26,7	2,17 – 4,58	730	SE
LA(min) Fast 40,0 – LA(max) Fast 48,9																		
68	16^{40}	16^{55}	46,4	47,8	47,6	48,4	45,3	49,8	47,2	46,4	49,3	44,6	58,0	cars, birds	26,9	2,78 – 4,25	730	SE
LA(min) Fast 40,4 – LA(max) Fast 47,1																		
69	17^{00}	17^{15}	53,0	52,2	53,0	52,1	52,4	53,1	53,3	53,4	52,4	53,5	54,8	cars, birds	25,3	1,75 – 3,12	730	SE
LA(min) Fast 52,4 – LA(max) Fast 54,1																		
70	17^{30}	17^{45}	No measurement due to wind speed>5m/s											cars, birds	25,4	**2,8 – 5,31**	730	SE
71	18^{00}	18^{15}	53,4	54,0	54,4	53,3	53,2	54,0	53,0	55,4	56,4	56,7	70,0	cars, birds	25,0	1,75 – 3,85	730	SE
LA(min) Fast 52,1 – LA(max) Fast 58,5																		
72	18^{30}	18^{45}	53,9	54,2	53,2	53,1	53,0	53,3	51,0	51,3	53,0	53,0	71,0	birds, cars, frogs	25,4	1,68 – 2,74	730	SE
LA(min) Fast 52,4 – LA(max) Fast 56,1																		

73	19^{00}	19^{15}	46,2	47,1	48,3	47,4	46,2	46,4	47,1	48,3	47,4	58,7	74,0	birds, cars, frogs	24,1	1,57 и-3,15	730	SE
LA(min) Fast 47,8 – LA(max) Fast 49,5																		
74	19^{30}	19^{45}	47,2	47,1	48,3	47,4	46,2	46,4	47,9	48,3	47,4	58,3	71,4	birds, cars, frogs	24,0	2,46 – 4,11	730	SE
LA(min) Fast 47,4 – LA(max) Fast 49,1																		
75	20^{00}	20^{15}	51,4	53,3	54,1	52,2	53,1	53,4	54,4	53,4	52,4	67,4	76,8	birds, cars, frogs	22,2	1,36 – 2,12	729	SE
LA(min) Fast 52,0 – LA(max) Fast 54,0																		
76	20^{30}	20^{45}	51,8	53,5	54,1	52,2	53,1	53,4	54,4	53,4	52,4	64,8	74,0	birds, cars, frogs	22,4	1,46 – 2,8	729	SE
LA(min) Fast 51,8 – LA(max) Fast 55,1																		
77	21^{10}	21^{25}	52,4	53,3	54,2	55,1	53,4	56,1	53,2	54,2	53,3	61,9	68,1	birds, cars, frogs	21,0	1,54 – 2,75	730	SE
LA(min) Fast 53,0 – LA(max) Fast 55,0																		
78	21^{35}	21^{50}	52,0	53,5	54,2	55,6	53,4	56,1	53,2	52,2	54,3	59,0	64,0	birds, cars, frogs	21,0	1,48 – 2,24	730	SE
LA(min) Fast 53,8 – LA(max) Fast 56,4																		
79	22^{00}	22^{15}	52,3	53,1	52,2	53,4	53,0	54,2	55,1	52,1	53,2	58,9	63,1	birds, cars, frogs	19,3	0,98 – 1,62	730	SE
LA(min) Fast 53,0 – LA(max) Fast 55,0																		
80	22^{40}	22^{55}	52,6	53,1	52,2	53,4	53,4	54,2	55,1	52,2	53,2	57,4	59,8	birds, cars, frogs	19,7	0,94 – 1,36	730	SE
LA(min) Fast 50,1 – LA(max) Fast 54,0																		
81	23^{00}	23^{15}	52,3	53,2	54,0	53,3	54,1	54,2	54,1	53,3	53,1	56,4	63,1	birds, cars, frogs	18,5	0,64 – 1,07	730	NE
LA(min) Fast 52,0 – LA(max) Fast 54,0																		
82	23^{40}	23^{55}	52,5	53,2	54,4	53,3	54,6	54,2	54,1	53,3	53,1	57,0	64,3	birds, cars, frogs	18,4	0,98 – 1,22	730	NE
LA(min) Fast 52,1 – LA(max) Fast 54,8																		
NM 8 – 28.06.2020 (weekend). Coordinates: 40°13'43.82" N, 69°6'14.18" E; h = 1,2m.																		

83	00^{00}	00^{15}	62,3	62,4	62,2	60,3	61,1	60,4	61,3	61,1	61,0	68,4	77,0	birds, cars, frogs	18,3	0,57 – 1,147	730	NE
LA(min) Fast 61,0 – LA(max) Fast 64,0																		
84	00^{25}	00^{40}	62,3	62,4	62,2	60,3	61,1	60,4	61,3	61,1	61,0	68,3	79,0	birds, cars, frogs	18,7	0,38 – 1,77	730	NE
LA(min) Fast 60,0 – LA(max) Fast 65,1																		
85	01^{10}	01^{25}	54,3	55,4	55,1	56,2	55,4	55,1	56,3	56,1	55,2	56,4	61,0	birds, cars, frogs	16,1	0,41 – 1,23	731	NW
LA(min) Fast 52,0 – LA(max) Fast 57,2																		
86	01^{35}	01^{50}	54,8	55,4	55,1	56,2	55,4	55,8	56,3	56,1	55,1	58,2	61,8	birds, cars, frogs	16,4	0,82 – 1,88	731	NW
LA(min) Fast 52,0 – LA(max) Fast 58,0																		
87	02^{00}	02^{15}	48,1	49,2	49,4	47,2	48,1	45,4	46,3	47,2	48,3	54,2	58,2	birds, cars, frogs	16,6	0,63 – 0,98	731	NW
LA(min) Fast 48,0 – LA(max) Fast 50,0																		
88	02^{40}	02^{55}	48,4	49,2	49,4	47,2	48,1	45,9	46,3	47,8	48,3	54,4	58,4	birds, cars, frogs	16,6	0,66 – 1,32	731	NW
LA(min) Fast 48,0 – LA(max) Fast 53,2																		
89	03^{00}	03^{15}	46,4	47,2	48,3	49,1	48,4	47,2	46,1	46,3	45,2	46,1	57,2	birds, cars, frogs	16,9	0,65 – 1,31	731	NW
LA(min) Fast 45,0 – LA(max) Fast 47,0																		
90	03^{30}	03^{45}	46,8	47,2	48,3	49,4	48,2	47,2	46,1	46,3	45,2	45,9	56,0	birds, cars, frogs	16,5	0,69 – 1,74	731	NW
LA(min) Fast 44,0 – LA(max) Fast 47,0																		
91	04^{02}	04^{17}	45,3	46,2	46,4	47,3	48,2	47,1	46,3	45,2	44,1	47,4	54,8	birds, cars, frogs	17,1	0,73 – 1,17	731	NW
LA(min) Fast 44,0 – LA(max) Fast 47,0																		
92	04^{31}	04^{46}	45,3	46,0	46,4	47,3	48,2	47,0	46,3	45,8	44,1	47,2	53,0	birds, cars, frogs	17,0	0,28 – 1,94	731	NW
LA(min) Fast 45,0 – LA(max) Fast 47,0																		
93	05^{00}	05^{15}	46,3	47,2	48,1	48,3	47,1	46,4	45,2	44,3	45,2	47,1	65,0	birds, cars, frogs	17,6	0,69 – 1,25	731	SW

LA(min) Fast 45,0 – LA(max) Fast 47,0																		
94	05^{30}	05^{45}	46,4	47,2	48,1	48,3	47,4	46,8	45,2	44,5	45,2	45,8	61,0	birds, cars, frogs	17,4	0,64 – 1,38	731	SW
LA(min) Fast 45,0 – LA(max) Fast 47,0																		
95	06^{10}	06^{25}	52,3	53,1	54,0	52,2	53,0	53,2	55,3	52,1	52,4	55,1	58,0	birds, cars, frogs	18,7	079 – 1,36	731	SW
LA(min) Fast 52,0 – LA(max) Fast 54,0																		
96	06^{40}	06^{55}	52,1	51,4	53,1	53,3	54,2	52,2	53,4	54,2	52,1	64,8	75,0	birds, cars, frogs	20,3	1,28 – 2,09	731	SE
LA(min) Fast 51,0 – LA(max) Fast 53,0																		

2. Photos

3. Certificates

Table 3-1 Laboratory certificate

УЗБЕКСКОЕ АГЕНТСТВО СТАНДАРТИЗАЦИИ, МЕТРОЛОГИИ И СЕРТИФИКАЦИИ
(АГЕНТСТВО "УЗСТАНДАРТ")

Национальная система Аккредитации
Республики Узбекистан

СВИДЕТЕЛЬСТВО
ОБ АККРЕДИТАЦИИ

Зарегистрировано в государственном Реестре органов по оценке соответствия
«08» августа 2017г.
№ UZ.AMT.07.MAI.429
действительно до «08» августа 2022г.

Государственное предприятие «Узбекаккредитация» удостоверяет, что комплекс испытательных лабораторий Центра специализированного аналитического контроля в области охраны окружающей среды при Государственном комитете Республики Узбекистан по экологии и охране окружающей среды (Юридический и фактический адрес: 100100, г.Ташкент, ул. Шота Руставели, дом 13а) соответствует требованиям стандарта O'z DSt ISO/IEC 17025:2007 и аккредитована на техническую компетентность и независимость в Национальной системе аккредитации Республики Узбекистан.

Область аккредитации прилагается к настоящему свидетельству.

Уполномоченное лицо Ш.Б. Алимов

М.П.

UZBEK AGENCY OF STANDARTIZATION, METEOROLOGY AND CETRIFICATION

(Uzstandard agency)

National accreditation system of the Republic of Uzbekistan

ACCREDITATION CERTIFICATE

Registered in state register of authorized organization

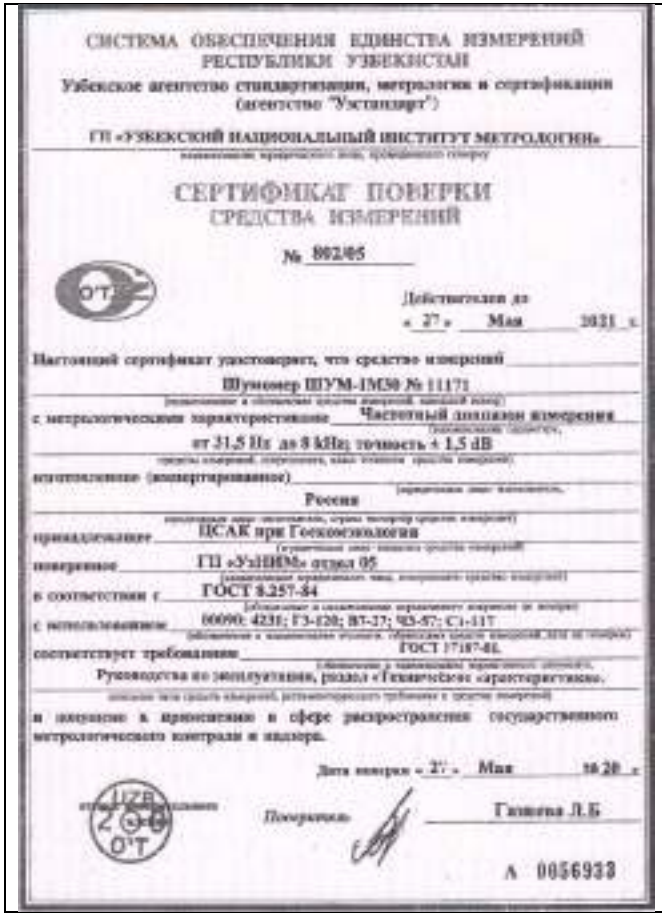
8th of August, 2017

№UZ.AMT.07.MAI.429

Valid until 8th of August, 2022

The state enterprise "Uzbekaccreditation" certifies that the complex of testing laboratories of the Center for Specialized Analytical Control in the Field of Environmental Protection under the State Committee of the Republic of Uzbekistan on Ecology and Environmental Protection (Legal and actual address: 100100, Tashkent, Shota Rustaveli Street, 13a) meets the requirements of standard O'z DSt ISO/IEC 17025:2007 and is accredited for technical competence and independence in the National Accreditation System of the Republic of Uzbekistan.

Signed by
Authorized person
Sh.B.Alimov



СИСТЕМА ОБЕСПЕЧЕНИЯ ЕДИНСТВА ИЗМЕРЕНИЙ
РЕСПУБЛИКИ УЗБЕКИСТАН

Узбекское агентство стандартизации, метрологии и сертификации
(агентство "Узстандарт")

ГП «УЗБЕКСКИЙ НАЦИОНАЛЬНЫЙ ИНСТИТУТ МЕТРОЛОГИИ»

СЕРТИФИКАТ ПОВЕРКИ
СРЕДСТВА ИЗМЕРЕНИЙ

№ 802/05

Действителен до
« 27 » Мая 2021 г.

Настоящий сертификат удостоверяет, что средство измерений
Шумомер ШУМ-1М30 № 11171
с метрологическими характеристиками Частотный диапазон измерения от 31,5 Hz до 8 kHz; точность ± 1,5 dB
изготовленное (импортированное) Россия
принадлежащее ЦСАК при Госкомэкологии
поверенное ГП «УзНИМ» отдел 05
в соответствии с ГОСТ 8.257-84
с использованием 6009: 4231; Г3-120; В7-27; Ф5-57; С1-117
соответствует требованиям ГОСТ 17187-81.
Руководства по эксплуатации, раздел «Технические характеристики».
и признано к применению в сфере распространения государственного метрологического контроля и надзора.

Дата поверки « 27 » Мая 2020 г.

Поверитель Газиева Л.Б.

А 0056933

<u>Unit Of Measurements System</u>
<u>Republic Of Uzbekistan</u>
<u>Uzbek Agency For Standardization, Metrology And Certification</u>
<u>(Agency "UzStandard")</u>
<u>SE « Uzbek National Institute Of Metrology »</u>

Verification Certificate

<u>Of Measurement Tool №» 802/05</u>

<u>Valid Until 27st May 2021</u>

This Certificate Certifies That Noise Meter Shum – 1m30 № 11171 With measurement range of 31.5 Hz – 8kHz; accuracy ± 1.5 dB
manufactured in Russia
belongs to Center for specialized analytical control (CSAC) inder State committee on ecology and environmental protection
verified by Uzbek National Institute Of Metrology
in accordance with GOST 8.257-84
the equipment corresponds to GOST 17187-81
approved for use in the field of dissemination of state metrological control and supervision

date of verification 27 May 2020
Executor *sign* Gazieva. L.B.

O'ZBEKISTON RESPUBLIKASINING O'LCHASHLAR BIRLIGINI TA'MINLASH TIZIMI

O'zbekiston standartlashtirish, metrologiya va sertifikatlashtirish agentligi ("O'zstandart" agentligi)

"O'zbekiston milliy metrologiya instituti" Davlat korxonasi

754/05 -sonli

O'LCHASH VOSITALARINI

QIYOSLASH SERTIFIKATI

Amal qilish muddati
« 20 » May 20 21 y.gacha

Ushbu sertifikat
00090; 4228; ГЗ-120; В7-27; Ч3-57; С1-117
dan foydalangan holda
ГОСТ 8.257-84, Pasport, « Qiyoslash » bo'limi
ga muvofiq
«O'zMMI» DK 05 bo'lim
tomonidan qiyoslangan
«MEXNAT AYDITLAB» XK
tegishli
ООО « Измеритель »
tayyorlangan (import qilingan)
Rossiya
Chastotaviy dianazoni (20 Hz-12.5 kHz). Aniqlik
metrologik tavsifli
Shovqin o'lchagich BШВ-003 № 3772
o'lchash vositasi
ГОСТ 17187, foydalanish bo'yicha qo'llanma, «Texnik xarakteristikalar» bo'limi
talablariga mosligini

tasdiqlaydi va davlat metrologik tekshiruvi va nazoratiga taalluqli doirada qo'llanishiga yo'l qo'yiladi.

Qiyoslash sanasi « 20 » May 20 20 y.

Qiyoslovchi Gazieva L.B.

A 0056888

UNIT OF MEASUREMENTS SYSTEM
REPUBLIC OF UZBEKISTAN
Uzbek Agency for Standardization, Metrology and Certification
(agency "Uzdavlatstandart")
SE « UZBEK NATIONAL INSTITUTE OF METROLOGY »

name of the legal entity that performed the verification

VERIFICATION CERTIFICATE

of MEASUREMENT TOOL №» 754/05

Valid till 21st May 2021

This certificate certifies that

Using 00090; 4231; Г3-120; В7-27; 43-57; Ci-I
(designation and name of standards, exemplary measuring instruments, date of their verification)

In accordance with **GOST 8.257-84**
Verified by **SE " UZNim " Department #5**
(name of the legal entity that has verified the measuring instrument)

Owned by PE **"MEXNAT AYDITLAB"**
Manufactured by **LLC "Измеритель" , Russia**
(legal entity-manufacturer, importing country of measuring instruments)
with metrological **characteristics 20 Hz to 12 kHz; accuracy ± 1.5 d**
(measurement limits, errors, accuracy class of measuring instruments)
Measuring instrument **Noise meter VSHV-003 No.3772**
(name and designation of the measuring instrument, serial number)
Meets the requirements **GOST 17187**
(designation and title of the regulatory document)
Operations manual «Technical characteristics» section
(description of the type of measuring instruments that regulate the requirements for the measuring instrument)
approved for use in the field permitted by state metrological control and supervision.

date of verification 20 May 2020

Executor *sign* Gazieva. L.B.

APPENDIX M– NOISE ASSESSMENT REPORT

ACWA Power Sydarya 1,500MW CCGT IPP

Noise Assessment

September 2020

ACWA Power Sydarya 1,500MW CCGT IPP

Noise Assessment

Revision	Date	Notes	Author	Checked	Approved
Ver 1.0	24-07-20	Noise Assessment	SB	SP	ND
Ver 1.1	30-07-20	Amendments Following Client Review	SB	SP	ND
Ver 1.2	04-08-20	Final Report	SB	SP	ND
Ver 1.3	25-09-20	Amended site, New Equipment, Directivity Corrections	SB	SP	ND

Entran Limited
12 Greenway Farm
Bath Road
Wick
Bristol
BS30 5RL

T: 0117 937 4077
www.entranltd.co.uk

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3	Noise Assessment	5
4	Summary	19

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1 INTRODUCTION

1.1 Entran Ltd has been commissioned by 5 Capitals Environmental & Management Consulting (5 Capitals) to undertake an assessment of the predicted noise impacts arising from the operation of the proposed ACWA Power Sydarya 1,500MW Combined Cycle Gas Turbine (CCGT) Power Plant IPP at Shirin, Uzbekistan (known from herein as the 'Project'). The Project is located on a plot of land that has been allocated for the development of two (2) CCGT Power Plant projects. The eastern plot, which is the subject of this assessment, has been granted to ACWA Power. The western plot has yet to be allocated but is understood to be under a tendering process with the IFC. It is anticipated that a similar sized plant will be operated in the future on this land (hereafter known as the 'IFC Project').

1.2 The Project is located near other existing power infrastructure near the settlement Shirin, a border town with Tajikistan. The Site is located in close proximity to the Sirdarya Thermal Power Plant (TPP) which currently operates 8 units of 300MW and 2 units of 325MW and a Combined Heat and Power Plant bringing the total capacity to 3065MW. It is understood there will be either a full or partial decommissioning of the Sirdarya TTP to coincide with the operation of the Project and adjacent IFC. The Project location is presented in Figure 1.

1.3 The purpose of this assessment is to establish the potential noise egress from the proposed Project (and the cumulative impact with the future IFC Project) and the potential effect on receptors. Applicable national and lender standards/guidelines for noise at receptors is presented in Section 2. The assessment of noise is presented in Section 3 together with Entran's recommendations for mitigation, to be considered as part of the on-going ESIA. The assessment is summarised in Section 4.

1.4 This report is necessarily technical in nature and contains terminology relating to acoustics and noise. Therefore, a glossary together with a brief introduction on the subject of noise has been provided in Appendix A.

Figure 1 Project Location

2 STANDARDS AND REGULATORY REQUIREMENTS

2.1 The applicable environmental standards for the Project as per the national regulations and lender requirements are outlined below.

National Standards

2.2 Given the proximity of the nearby communities, it is expected that the applicable residential standards will be applicable to the Project. SanPiN No. 0339-16 “Sanitary rules and norms of planning and development of settlements of Uzbekistan provides criteria for noise levels at residential areas.

2.3 The guideline criteria for residential areas are set out in Table 2.1 below.

Table 2.1 National Noise Standards

Receptor	Uzbekistan, SanPiN No. 0325-16.	
	Daytime (07:00 to 23:00)	Night-time (23:00 to 07:00)
Residential, institutional, educational	55	45
Industry, commercial	75	70

Lender Requirements

2.4 ACWA Power is seeking project finance from one or more Financial Institutions (FIs). Currently, this includes EBRD and DEG (part of KfW) who have their own internal Environmental & Social Policies, Safeguards and Performance Requirements.

DEG

2.5 DEG, as part of KfW is aligned with the requirements of the Equator Principles, and as such requires the implementation of the IFC Performance Standards and WBG EHS Guidelines.

Table 2.2 World Bank Group Noise Level Guideline (adopted from WHO guidance)

Receptor	$L_{Aeq,1hr}$ (dB)	
	Daytime 07:00 – 22:00	Night time 22:00 – 07:00
Residential, Institutional, Educational	55	45
Industrial, Commercial	70	70

2.6 Noise impacts should not exceed the levels presented above, or result in a maximum increase in background levels of 3 dB(A) at the nearest sensitive receptor location off-site

EBRD

2.7 As stated in EBRD Performance Requirement 3, 'The client will structure the project to meet relevant EU substantive environmental standards, where these can be applied at the project level.

2.8 It is noted that where national standards differ from the standards required by the lenders, borrowers/clients are normally required to achieve whichever is more stringent.

2.9 The European Commission Environmental Noise Directive (Directive 2002/49/EC) relating to the assessment and management of environmental noise is the main EU instrument to identify noise pollution levels and to trigger the necessary action both at Member State and at EU level.

2.10 The Directive applies to noise to which humans are exposed, particularly in built-up areas, in public parks or other quiet areas in an agglomeration, in quiet areas in open country, near schools, hospitals and other noise-sensitive buildings and areas.

2.11 It is important to note that the Directive does not set limit or target values, nor does it prescribe the measures to be included in the action plans, thus leaving those issues at the discretion of the competent Member State authorities.

3 NOISE ASSESSMENT

Ambient Noise Levels

3.1 For the purposes of calculating the potential noise impacts at nearby noise sensitive receptors, baseline noise survey data (undertaken as part of 5 Capitals' ESIA study in 2020) has been utilised for this assessment. Noise surveys were undertaken in June 2020 by the Centre of Specialized Analytical Control in the Field of Environmental Protection (CSAC), who were appointed by 5 Capitals to undertake measurements of the existing ambient environment. The CSAC was appointed separately to Entran, and the survey data adopted for the purpose of this assessment is understood to have been obtained by individuals competent in the collection of acoustic data. Further information of the noise survey can be obtained via 5 Capitals.

3.2 The noise monitoring locations are presented in Figure 2.

Figure 2 Noise Monitoring Locations

3.3 In order to derive a representative noise level for the purpose of assessment, daytime and night-time noise levels are calculated from the logarithmic average of all measurements obtained over a given period of time (i.e. 16-hour and 8-hour for day and night, respectively).

3.4 Accordingly, the provided monitoring data has been logarithmically averaged across the daytime and night-time periods to obtain a single ambient noise level for each location and assessment period. The results of the noise surveys are presented in Table 3.1

Table 3.1 Noise Survey Results

Monitoring Point	Measured Noise Levels $L_{Aeq,T}$ dB	
	Day (07:00 – 23:00)	Night (23:00 – 07:00)
NM1	42.0	44.6
NM2	54.3	54.2
NM3	49.5	47.9
NM4	39.0	46.1
NM5	48.3	45.7
NM6	57.6	54.2
NM7	43.1	43.5
NM8	59.1	58.4

Computer Noise Modelling

3.5 The Engineering, Procurement, Construction (EPC) Contractor has identified the major sources of noise generation both internally (i.e. within the gas turbine house and the steam turbine house) as well as externally located plant (i.e. the HRSG, ancillary equipment including ventilation units, water treatment plant, switchgear equipment etc). The noise source data of all plant are referenced in Appendix B. This report considers the following operational scenarios of the Project:

- Simple Cycle (without HRSG); and
- Combined Cycle (With HRSG)

3.6 Calculations have been undertaken for the above scenarios for the Project, adjacent IFC and the combined noise levels (Project & IFC) as well as the potential noise impact at discrete receptors.

3.7 In order to provide an indicative assessment of the potential cumulative impacts, the IFC Project has been assumed to be of identical design and technology of the proposed Project. The location of the IFC Project is in the centre of the available plot of land allocated for that Project. The predictive modelling results are provided only as a high-level indication of potential cumulative impacts and should therefore be taken as indicative for the IFC Project, on the basis that the design and location of plant may be subject to change.

3.8 By considering the source noise levels, the area of acoustic or non-acoustic enclosures (where available) and the intervening distance to the receptor, a noise model was constructed using proprietary software IMMI2020 using the methodology outlined in ISO9613 (ISO 9613-2 “Acoustics – Attenuation of sound during propagation outdoors – Part 2: General method of calculation”) which describes a detailed procedure to calculate sound levels from point/line/area sources. Please note that due to different sound propagation characteristics of area, line and point sources (including acoustical ‘far’ and ‘near’ field propagation), the noise level attributable to the sources should not be simply aggregated to compute noise levels at nearby receptors but instead calculations to follow the above-mentioned ISO 9613 methodology. Directivity corrections for the stacks and ventilation openings were added using the methodology of VDI3733 (Bypass Stacks with an exit velocity of 37m/s (gas temperature 655^{o}C); Main Stacks with an exit velocity of 15m/s (gas temperature 82^{o}C)).

3.9 ISO 9613-2 computes long-term average sound levels including downwind conditions (favourable propagation of sound with significant positive wind from source to receiver).

3.10 The guidance given by ISO 9613-2 on how to determine the meteorological correction term C0 is rather unsatisfactory and therefore the following global parameters are included in the noise model:

- Temperature 10^{o}C; relative Humidity 70% (worst-case for sound propagation);
- Light downwind propagation towards the receptor (standard ISO9613 application);
- Ground attenuation factor 0 (worst-case);
- Hard Reflection of all on-site buildings

3.11 Where information was available, noise attenuation from buildings/significant plant on/off-site, has been included in the noise model. The results of the noise modelling at representative receptors (NSRs) are presented below for the Project and Project + IFC Project impacts only (without baseline inclusion).

Calculated Noise Levels

3.12 Noise levels at discrete noise receptors have been predicted in accordance with the guidance outlined in ISO 9613. The receptor locations are presented in Figure 3, the calculated noise levels are presented in Table 3.2.

Figure 3 Closest Receptor Locations

Table 3.2 Predicted Noise Levels at Nearby Receptors (without baseline)

Receptor	Location (UTM 42T)	Calculated Noise Levels, $L_{Aeq,T}$ dB					
		Project		IFC		IFC & Project	
		Combined Cycle	Simple Cycle	Combined Cycle	Simple Cycle	Combined Cycle	Simple Cycle
1	510433.8, 4454506.5	44	42	39	37	45	43
2	510424.1, 4453643.5	40	37	36	34	41	39
3	510613.2, 4452751.4	34	33	32	30	36	35
4	510065.3, 4452765.9	36	34	34	32	38	36
5	509755, 4453187.8	40	38	36	35	41	40
6	509265.3, 4453488.3	38	37	40	38	42	41
7	508620.5, 4453939.2	40	39	38	36	42	41
8	507747.8, 4454336.8	36	35	38	37	40	39
9	509144.1, 4455262.8	41	40	**46**	45	**47**	**46**
10	510312.4, 4454121.9	45	43	39	38	**46**	44

3.13 As can be seen from the above, the predicted noise levels for the Project and adjacent IFC Project are predicted to be in compliance with the SanPiN No. 0325-16 optimal sound levels, as well as the WHO noise standards (as referenced by the World Bank's EHS Guidelines) for the majority of noise sensitive receptors during both simple and combined cycle operations. However, receptors 9 & 10, noise levels are just above the adopted criterion with the introduction of the IFC scheme. Accordingly, and depending on its ultimate design and location placement, the IFC project may require mitigation measures for the future noise impacts to achieve the criteria. These measures could potentially include attenuation to the IFC exhaust/diverter, higher sound insulation for the CT and ST buildings as well as quieter pumps/extract systems/air intake systems. The IFC Project will require the designers to address the potential noise impact at the identified receptors to enable full compliance

3.14 The predicted noise levels of Table 3.2 were combined with the measured ambient noise levels (of Table 3.1) to derive the overall predicted cumulative noise impacts at each receptor, for the Project, adjacent IFC Project and for the Project and IFC Projects combined.

It is noted that the measured baseline noise levels account for the existing Sydarya TPP to be fully operational with all 10 units active. It is understood that up to 4 of the existing TPP units may be decommissioned at the time of Project and IFC Project commissioning. Therefore, the cumulative impact assessment (i.e. with baseline) can be considered to portray a worst-case for noise impacts from the proposed plant and the future IFC Project.

3.15 The predicted cumulative noise levels for the Project are presented in Table 3.3.

Table 3.3 Cumulative Noise Levels, Project Scenario Only + Baseline

Period	Receptor	Ambient Noise Level, $L_{Aeq,T}$ dB	Calculated Noise Levels, Project & Ambient, $L_{Aeq,T}$ dB		Excess Over Existing Ambient Noise Level, dB	
			Combined Cycle	Simple Cycle	Combined Cycle	Simple Cycle
Day	1	57.6	57.8	57.7	0.2	0.1
	2	43.1	44.7	44.0	1.6	0.9
	3	59.1	59.1	59.1	0	0
	4	59.1	59.1	59.1	0	0
	5	59.1	59.1	59.1	0	0
	6	59.1	59.1	59.1	0	0
	7	42.0	44.2	43.8	2.2	1.8
	8	42.0	42.9	42.8	0.9	0.8
	9	49.5	50.0	49.9	0.5	0.4
	10	57.6	57.8	57.8	0.2	0.2
Night	1	54.2	54.6	54.5	0.4	0.3
	2	43.5	45.0	44.4	1.5	0.9
	3	58.4	58.4	58.4	0	0
	4	58.4	58.4	58.4	0	0
	5	58.4	58.5	58.4	0.1	0
	6	58.4	58.4	58.4	0	0
	7	44.6	46.0	45.7	1.4	1.1
	8	44.6	45.1	45.0	0.5	0.4
	9	47.9	48.6	48.5	0.7	0.6
	10	54.2	54.7	54.5	0.5	0.3

3.16 The cumulative Project and ambient noise levels do not increase the existing noise levels by more than 3 dB, which aligns with the WBG EHS Guidelines where existing baseline is in excess of the applicable standards.

3.17 The cumulative noise levels for the future adjacent IFC Project with baseline are presented in Table 3.4.

Table 3.4 Cumulative Noise Levels, IFC Project Scenario Only + Baseline

Period	Receptor	Ambient Noise Level, $L_{Aeq,T}$ dB	Calculated Noise Levels, IFC & Baseline, $L_{Aeq,T}$ dB		Excess Over Existing Ambient Noise Level, dB	
			Combined Cycle	Simple Cycle	Combined Cycle	Simple Cycle
Day	1	57.6	57.7	57.6	0.1	0
	2	43.1	43.9	43.6	0.8	0.5
	3	59.1	59.1	59.1	0	0
	4	59.1	59.1	59.1	0	0
	5	59.1	59.1	59.1	0	0
	6	59.1	59.1	59.1	0	0
	7	42.0	43.4	43.0	1.4	1
	8	42.0	43.4	43.2	1.4	1.2
	9	49.5	51.2	50.9	1.7	1.4
	10	57.6	57.7	57.6	0.1	0
Night	1	54.2	54.3	54.3	0.1	0.1
	2	43.5	44.2	44.0	0.7	0.5
	3	58.4	58.4	58.4	0	0
	4	58.4	58.4	58.4	0	0
	5	58.4	58.4	58.4	0	0
	6	58.4	58.5	58.4	0.1	0
	7	44.6	45.5	45.2	0.9	0.6
	8	44.6	45.4	45.3	0.8	0.7
	9	47.9	50.2	49.9	2.3	2
	10	54.2	54.3	54.3	0.1	0.1

3.18 The cumulative IFC Project and ambient noise levels do not increase the existing noise levels by more than 3 dB, which aligns with the WBG EHS Guidelines where existing baseline is in excess of the applicable standards.

3.19 The cumulative noise levels for the combined Project and IFC Project are presented in Table 3.5.

Table 3.5 Cumulative Noise Levels, Project and IFC Project + Baseline

Period	Receptor	Ambient Noise Level, $L_{Aeq,T}$ dB	Calculated Noise Levels, IFC, Project & Baseline, $L_{Aeq,T}$ dB		Excess Over Existing Ambient Noise Level, dB	
			Combined Cycle	Simple Cycle	Combined Cycle	Simple Cycle
Day	1	57.6	57.8	57.8	0.2	0.2
	2	43.1	45.3	44.4	2.2	1.3
	3	59.1	59.1	59.1	0	0
	4	59.1	59.1	59.1	0	0
	5	59.1	59.2	59.1	0.1	0
	6	59.1	59.2	59.2	0.1	0.1
	7	42.0	45.2	44.6	3.2	2.6
	8	42.0	44.0	43.7	2	1.7
	9	49.5	51.6	51.2	2.1	1.7
	10	57.6	57.6	57.8	0.3	0.2
Night	1	54.2	54.7	54.5	0.5	0.3
	2	43.5	45.5	44.7	2	1.2
	3	58.4	58.4	58.4	0	0
	4	58.4	58.4	58.4	0	0
	5	58.4	58.5	58.5	0.1	0.1
	6	58.4	58.5	58.5	0.1	0.1
	7	44.6	46.6	46.2	2	1.6
	8	44.6	45.8	45.6	1.2	1
	9	47.9	50.7	50.2	2.8	2.3
	10	54.2	54.8	54.6	0.6	0.4

3.20 The calculated cumulative noise levels from the combined Project and IFC Project are predicted to increase the existing noise level by more than 3 dB at calculation location 7.

3.21 Cumulative noise levels from the combined Project and IFC Project increase the baseline by up to 3.2 dB at calculation receptor 7 during the day. As has been outlined above and depending on the final IFC Project design and IFC Project location, mitigation measures may be required at the IFC Project to reduce the combined noise levels to meet the applicable standards/guidelines.

Noise Contours

3.22 Noise contours based on the above methodology have been computed for two key operational scenarios; namely ‘simple cycle’ and ‘combined cycle’. Calculated contours for each scenario are presented for the Project only, the adjacent IFC, and for the cumulative project and IFC. The calculated noise contours are presented in Figures 4 – 9.

Figure 4 Computed Noise Contours, Simple Cycle, Project Only

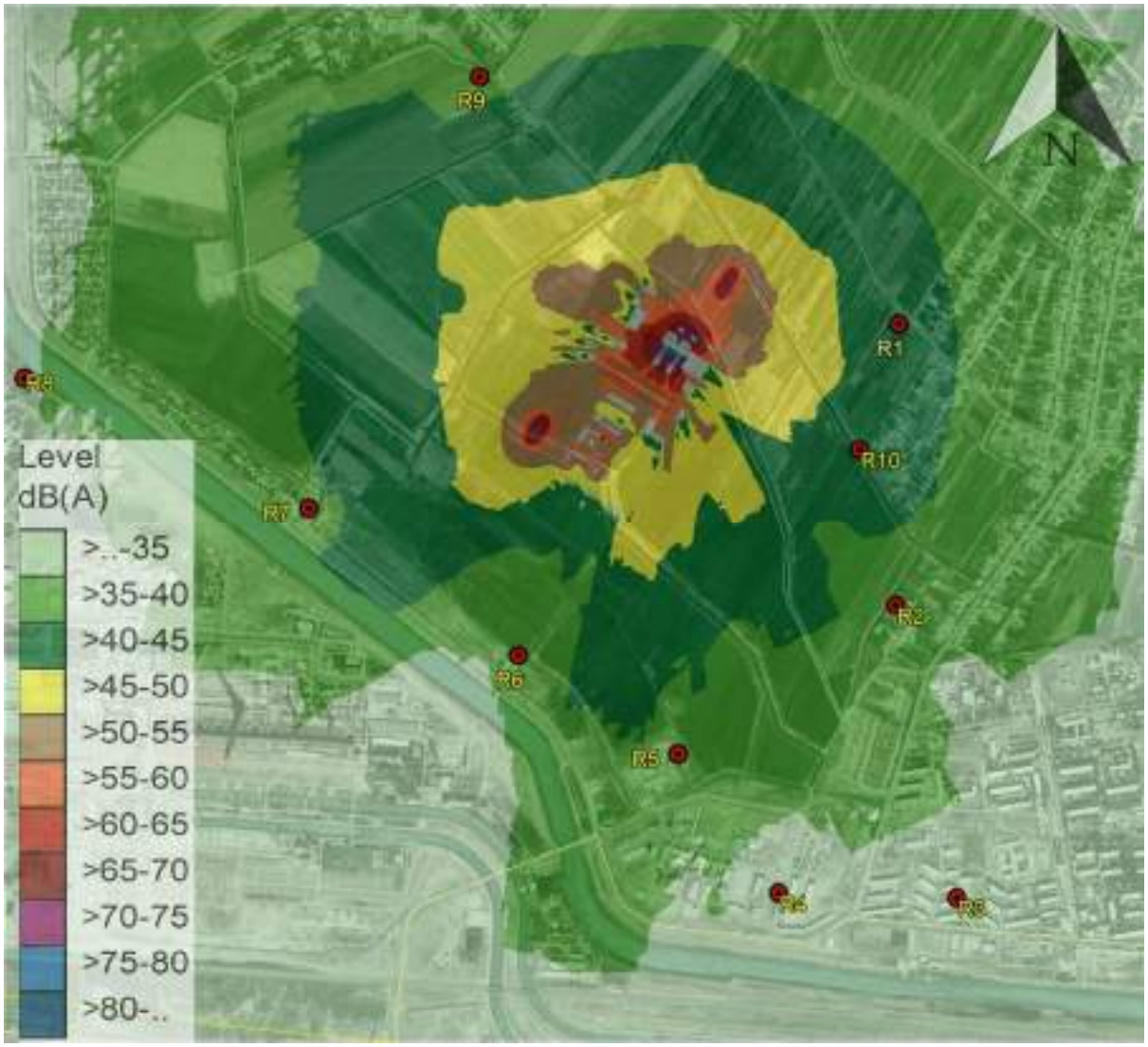


Figure 5 Computed Noise Contours, Combined Cycle, Project Only

Figure 6 Computed Noise Contours, Simple Cycle, IFC Only

Figure 7 Computed Noise Contours, Combined Cycle, IFC Only

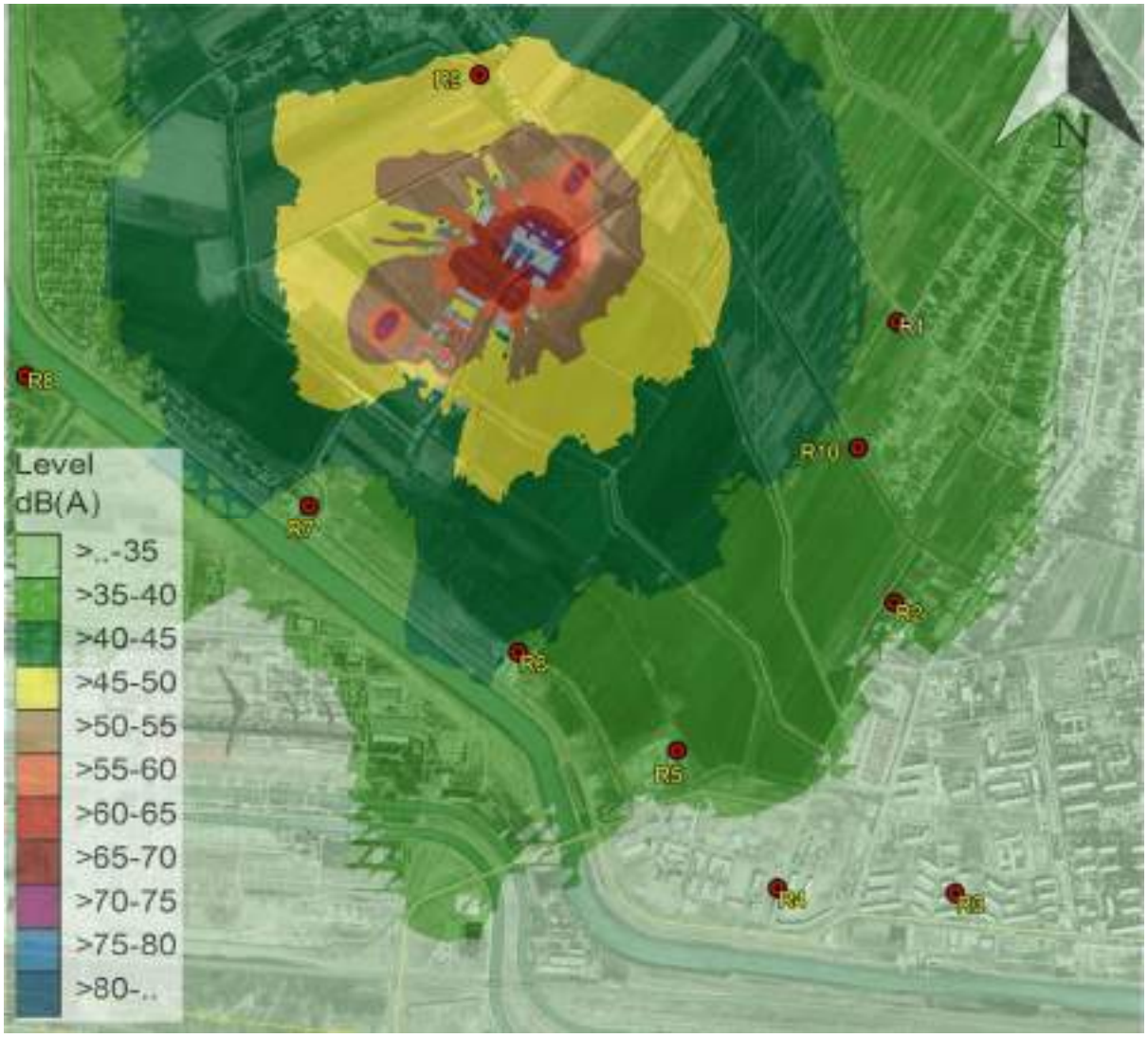


Figure 8 Computed Noise Contours, Simple Cycle, Project & IFC

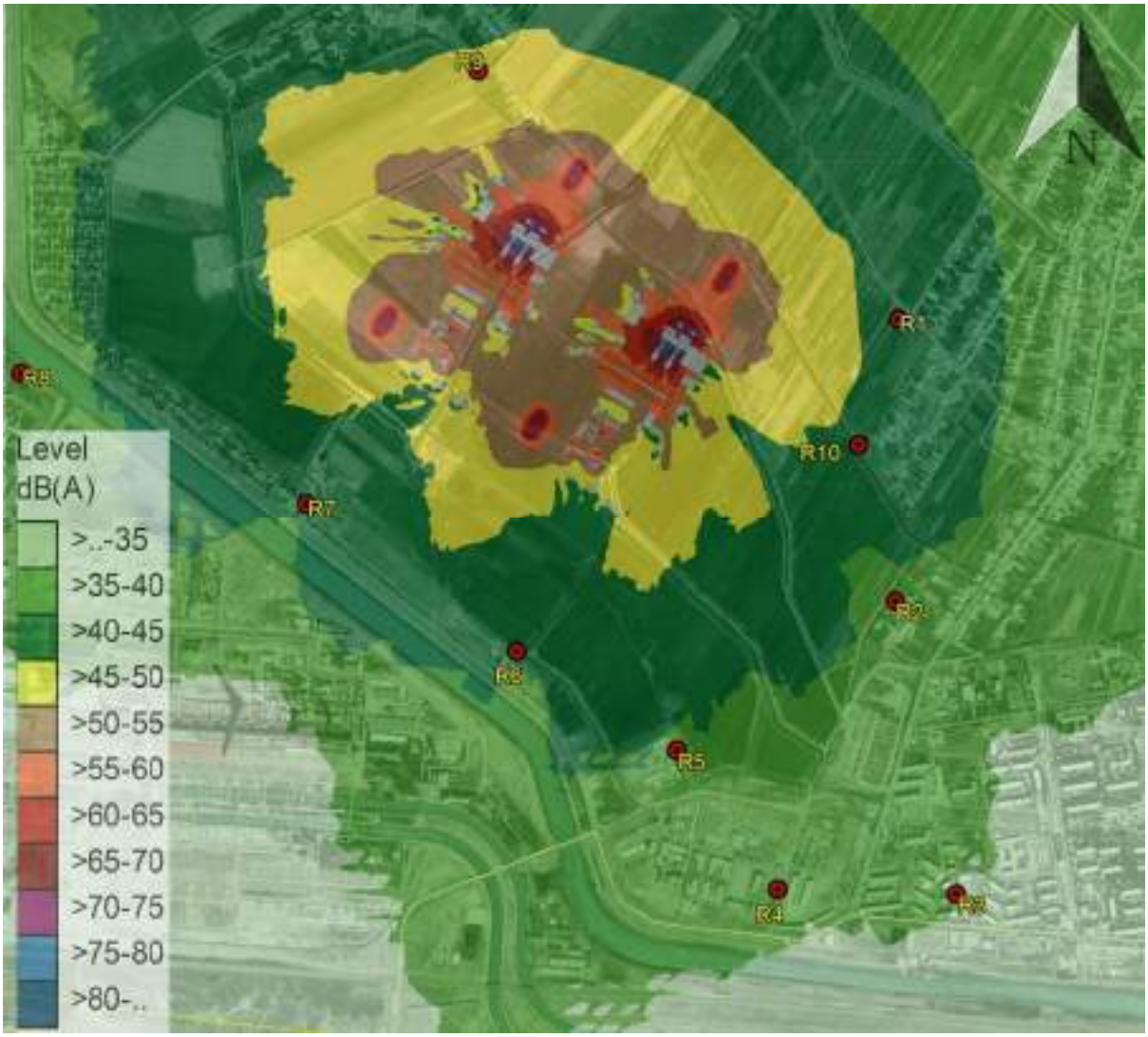
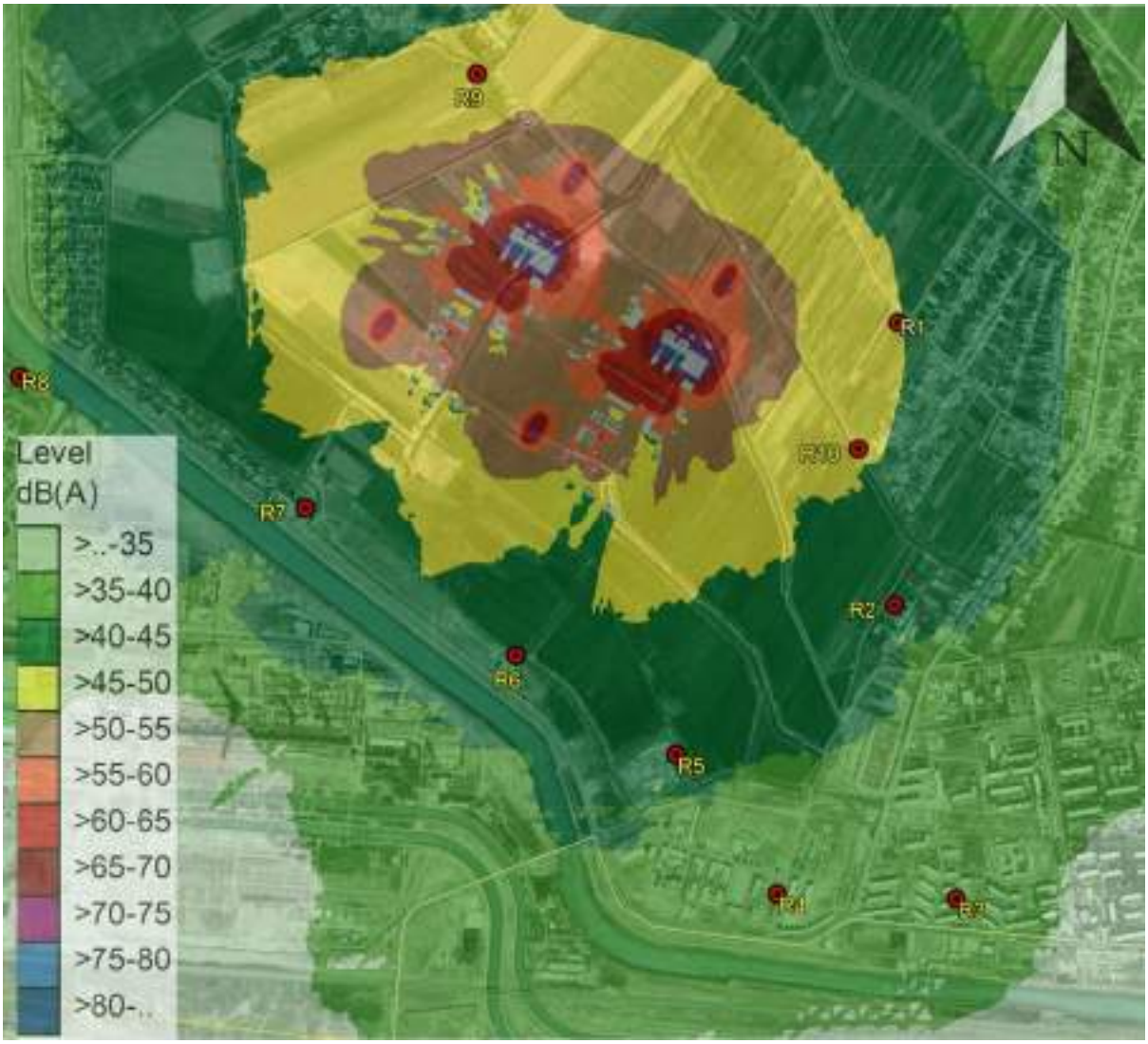


Figure 9 Computed Noise Contours, Combined Cycle, Project & IFC



4 SUMMARY

4.1 Entran Ltd have undertaken a noise assessment on behalf of 5 Capitals for the proposed ACWA Power 1,500MW Sydarya Combined Cycle Gas Turbine power plant located near Shirin, Uzbekistan.

4.2 This assessment has predicted the potential noise impacts of the proposed project at local receptors, during the operational phase. The assessment has been based on a series of environmental noise calculations using ISO9613 methodology, with input data provided by the EPC Contractor. Both simple and combined cycle operations have been considered. In addition, the expected future IFC Project (located on adjacent land to the Project) has also been included for a cumulative impact assessment.

4.3 Calculated noise levels associated with the Project operations (without incorporating the existing baseline noise levels) at the nearest residential receptors are within the applicable Uzbekistan noise standards, as well as the WHO Noise Standards as referenced by World Bank's EHS Guidelines for all receptor sites. However, for the future IFC Project, noise levels at Receptor 9 is slightly above the adopted criterion. Further, the IFC Project in combination with the Project is also slightly above the adopted criterion at Receptor 10.

4.4 When including existing baseline measurements in the predictions, noise levels from the proposed Project would not increase existing levels by more than 3 dB, and therefore the noise levels associated with the Project achieve WBG EHS Guideline criteria.

4.5 The predicted change in noise levels from the adjacent IFC Project in combination with the Project would increase the noise level at receptor location 7 by 3.2 dB (daytime) for combined cycle operations whilst other receptors remain less than a 3dB change.

4.6 Depending on the final IFC Project design and IFC Project location, mitigation measures may be required at the IFC Project to reduce the combined noise levels to meet the applicable standards/guidelines.

APPENDIX A: INTRODUCTION TO NOISE

In order to assist the understanding of acoustic terminology and the relative change in noise, the following background information is provided.

The human ear can detect a very wide range of pressure fluctuations, which are perceived as sound. In order to express these fluctuations in a manageable way, a logarithmic scale called the decibel, or dB scale is used. The decibel scale typically ranges from 0 dB (the threshold of hearing) to over 120 dB.

The ear is less sensitive to some frequencies than to others. The A-weighting scale is used to approximate the frequency response of the ear. Levels weighted using this scale are commonly identified by the notation dB(A).

A noise impact on a community is deemed to occur when a new noise is introduced that is out of character with the area, or when a significant increase above the pre-existing ambient noise level occurs. For levels of noise that vary with time, it is necessary to employ a statistical index that allows for this variation. These statistical indices are expressed as the sound level that is exceeded for a percentage of the time period of interest.

For instance, the 'A'-weighted sound pressure of the residual noise at the assessment position that is exceeded for 90 per cent of a given time interval, T, measured using the time weighting, F, and quoted to the nearest whole number of decibels. It is often referred to as the background noise level and is used in the assessment of disturbance from industrial noise.

An alternative way of assessing the time varying noise levels is to use the equivalent continuous sound level, L_{Aeq} - this is the value of the sound pressure level of a continuous steady noise that, a measurement interval of time (t), has the same mean square sound pressure as the sound under consideration whose level varies with time. It is a unit commonly used to describe construction noise, noise from industrial premises and is the most suitable unit for the description of other forms of environmental noise

To put these quantities into contact of perceptible noise:

- differences in noise levels of less than approximately 2 dB(A) are generally imperceptible in practice;
- differences in noise levels of around 5 dB(A) are considered to be significant; and
- differences in noise levels of around 10 dB(A) are generally perceived to be a doubling (or halving) of the perceived loudness of the noise.

Appendix A1: Glossary of Terms

Term	Definition
Decibel (dB)	A scale for comparing the ratios of two quantities, including sound pressure and sound power. The difference in level between two sounds s1 and s2 is given by 20 log10 (s1/s2). The decibel can also be used to measure absolute quantities by specifying a reference value that fixes one point on the scale. For sound pressure, the reference value is 20μPa.
A-weighting, dB(A)	The unit of sound level, weighted according to the A-scale, which takes into account the increased sensitivity of the human ear at some frequencies.
Noise Level Indices	Noise levels usually fluctuate over time, so it is often necessary to consider an average or statistical noise level. This can be done in several ways, so a number of different noise indices have been defined, according to how the averaging or statistics are carried out.
$L_{eq,\,T}$	A noise level index called the equivalent continuous noise level over the time period T. This is the level of a notional steady sound that would contain the same amount of sound energy as the actual, possibly fluctuating, sound that was recorded.
$L_{max,T}$	A noise level index defined as the maximum noise level during the period T. L_{max} is sometimes used for the assessment of occasional loud noises, which may have little effect on the overall L_{eq} noise level but will still affect the noise environment. Unless described otherwise, it is measured using the 'fast' sound level meter response.
$L_{90,T}$	A noise level index. The noise level exceeded for 90% of the time over the period T. L_{90} can be considered to be the "average minimum" noise level and is often used to describe the background noise.
Free-Field	Far from the presence of sound reflecting objects (except the ground), usually taken to mean at least 3.5m
Ambient Noise Level	The totally encompassing sound in a given situation at a given time, usually composed of a sound from many sources both distant and near ($L_{Aeq,T}$).
Residual Noise Level	The ambient noise remaining at a given position in a given situation when specified sources are suppressed to a degree such that they do not contribute to the ambient noise level ($L_{Aeq,T}$)
Specific Noise Level	The equivalent continuous A-weighted sound pressure level at the assessment position produced by the specific noise source (the noise source under investigation) over a given time interval ($L_{Aeq,T}$)
Rating Noise Level	The specific noise level plus any adjustment for the characteristic features of the noise ($L_{Ar,Tr}$).

APPENDIX B: NOISE SOURCE DATA

Appendix B1: EPC Contractor Source Noise Data

Equipment name	SPL	Sound source (1m from equipment) dB (SPL)								
	dB(A)	31.5 Hz	63 Hz	125 Hz	250 Hz	500 Hz	1000 Hz	2000 Hz	4000 Hz	8000 Hz
GT inlet air filter (Intake surface area, Front)	93	107.8	91.2	84.9	79.9	78.2	90.2	87.1	81.5	71.2
GT inlet air filter (Intake surface area, Left)	93	107.8	91.2	84.9	79.9	78.2	90.2	87.1	81.5	71.2
GT inlet air filter (Intake surface area, Right)	93	107.8	91.2	84.9	79.9	78.2	90.2	87.1	81.5	71.2
GT inlet air filter (wall area)	93	103.4	91.7	88.7	82.9	81	89.9	87.4	81.8	69.7
GT Inlet air silencer	93	98.1	87	83.8	80.7	82	90.5	86.9	80.3	68.3
GT inlet air duct A	93	100.2	88.9	91.1	83.4	86	90.3	86.4	79.7	67.1
GT inlet air duct B	93	100.2	88.9	91.1	83.4	86	90.3	86.4	79.7	67.1
GT enclosure	93	90.5	91.7	94.4	88.1	84.5	89.5	85.7	83.9	73.5
GT exhaust duct A	93	99	98.4	101.1	91.3	86.7	86.6	86.1	82.3	77
GT enclosure ventilation fan A	93	92.8	95.6	98.7	93.5	89.8	86.5	84.2	82.5	71
GT enclosure ventilation fan B	93	92.8	95.6	98.7	93.5	89.8	86.5	84.2	82.5	71
GT enclosure ventilation fan C	93	92.8	95.6	98.7	93.5	89.8	86.5	84.2	82.5	71
GT Enclosure Ventilation Duct	93	94.2	94	97.2	92.5	91.4	87.8	82.6	78.1	68
GT Enclosure Ventilation Duct Outlet	105	111.2	111.5	106.1	103.7	103	99.7	97.9	86.3	79.6
GT lube oil unit	93	84.3	93.5	98.1	90.4	90.3	88.2	85	79.5	70.5
GT control oil unit	93	82.9	95.8	92.6	88	88.7	89.4	85.7	79.6	71.3
GT Fuel Gas Unit	93	86.1	89.7	94.8	87.4	87	88.2	86.7	83.5	76.7
GT lube oil mist separator fan	93	97	90.7	88	84.6	88.8	89.8	85.6	79.5	72
GT lube oil mist separator outlet	95	99.9	98.1	93.1	88.7	86.7	93	85.8	82.6	77.7
4S cooler	93	96	93.2	90.4	86.5	80.6	79.9	86.1	89.7	75.8
Enhanced cooling air cooler	93	96	93.2	90.4	86.5	80.6	79.9	86.1	89.7	75.8
GT enhanced cooling air compressor	93		91.4	95.7	97.4	92	85.7	69.2	63.3	56.2
GT Evaporative Cooler Pump Skid	93		79.9	79.9	81.9	84.9	86.9	87.9	84.9	81.9
GT Inlet Air Cooling System (High Fogging)	93		79.9	79.9	81.9	84.9	86.9	87.9	84.9	81.9
GT generator and slip ring housing	93	104.2	105.7	108.3	80.5	79	81.7	68.5	67.9	57.7
GT Cooling Air Cooler with Fuel Gas Heater	93		100	99	94	91	87.9	80	76	72
Steam Turbine generator set w/o condenser	115	124	118	118	112	111	108	107	107	101
Steam Turbine SST-5000 series	113	123	115	116	111	110	105	106	106	100
Steam Condenser (offered as an option)	113	123	117	116	112	111	106	106	102	95
Steam Generator	111	121	119	117	111	108	104	105	96	89
Bypass Stack	93		97	97	95	88	86	86	84	71
Main Stack	86	105	101	100	88	77	72	65	69	56
Evaporators	85 dB(A), 1m (x7 units)									

AIS Transformer Area (switchyard)	85 dB(A), 1m (x6 units)
GSUTs (rear of GT/ST buildings)	85 dB(A), 1m (x3 units)
Water Treatment Plant Area	75 dB(A), 1m (radiating façade/roof of each building)
GT Building Vents	75 dB(A), 1m (x16 units)
ST Building Vents	75 dB(A), 1m (x10 units)
Central Control Building, rooftop AC/VRV units	70 dB(A), 1m (x8 units)
Social Building & Administration Building, rooftop VRV units	70 dB(A), 1m (x5 units for each building)

Green shading shows equipment not in use during simple cycle operations otherwise all equipment is operational for the combined cycle.

APPENDIX N– WATER SUPPLY ASSESSMENT REPORT

WATER SUPPLY ASSESSMENT REPORT

CLIENT: ACWA POWER

Juru Energy Ltd.
Suite 1, One George Yard, London
United Kingdom, EC3V 9DF
T: +44 207 859 4028,
F: +44 207 691 9406
E: b.gafurov@juruenergy.com

Project: Hydrological data and water supply for the CCGT project in the Syrdarya region

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ABBREVIATIONS AND ACCRONYMS

BWO “Sirdarya” – Basin Water Organization “Syrdarya”

YGC - Yuzhny-Golodnostepskiy canal

SIC ICWC - Scientific Information Center of Interstate Coordination Water Commission

CCGT – Combined Cycle Power Plant

IFAS - International Fund for Saving the Aral Sea

Uzhydromet - Uzbekistan Hydrometeorological Service

TPP - Thermal Power Plant (TPP)

MPL - Vaximum permissible limit

UzDSt – Uzbekistan state standard

TDS - Total dissolved solids

1. Introduction

This document summarizes the methodology used for hydraulics, hydrology, hydrochemistry and presents results of the involved estimations. The main aim of the analysis is to determine water availability and accessibility at the selected site.

The project site is located in Shirin town where Dustlik and Yuzhny-Golodnostepsky canals separate from Farhad derivation canal (Benjaminovich, E.M. Tersitsky 1975). The canals withdraw water from Syrdarya river several kilometers below from Bekabad hydrogauge.

Hydraulic, hydrological and hydrochemical investigation were carried out in order to study the water availability and accessibility at the planned project site. As a result of the preliminary work, initial data were obtained on the hydrological and hydrochemical regimes of water resources and primary data processing and analysis were conducted. As a result of investigation, hydrological and water quality data necessary for the design of the facility were obtained and analysed.

Location of the survey site: Syrdarya region, Bayaut district, Shirin town.

Specific objectives of the report are:

- collecting water resources data from related organizations for certain period;
- assessment different water sources and analysing water availability in the survey site;
- giving information on upstream and downstream status quo in the survey site;
- collecting physical and chemical parameters of the water sources and preliminary water quality assessment in base of government regulation documents
- Report is based on: review of publicly available information;
- hydraulic and hydrological assessment of collected water supply materials and data;
- Assess qualitatively of physical and chemical parameters of water;
- describing upstream and downstream status quo condition of the survey site.

The methodology of water supply assessment delivers application for the hydrologic and hydraulic, water quality analysis, as well as the results of the involved calculations. The aim of the methodology is to determine the quantitative and qualitative assessments of water resources in the survey site. Several hydraulic, hydrological methods i.e. probability analysis, hydraulic water discharge estimation, temporal variation of flow parameters with graphical illustrations were used in this report.

The main types of water resources were considered as surface water (Syrdarya river and main canals). Water resources at the survey site were assessed qualitatively as physical and chemical parameters of water is an important aspect of the analysis phase. The methodology of probability analysis, statistical application on hydrological calculation were used in this report. The water resources were assessed based on the information from previous publication, reports, periodically observed data and also

hydraulic and hydrological and advanced water quality assessment were evaluated based on the guidelines on water resources and hydrological investigations (Alley 2007; Chapman 1992; Rodda 2011).

River and canal flow patterns, water level, water temperature and flow velocity in the past 50 years. i.e. monthly mean water discharge of the canals 1975-2018 by Uzhydromet, physical and chemical parameters of the canals were collected analyzed for 2015-2019 years.

Hydrological measurements of Syrdarya river were carried out at the territory under consideration, using hydrometer and water gauging stations of Uzhydromet. Water regime studies of Dustlik and Yuzhny-Golodnostepsky (YG) canals were monitored by the Syrdarya Basin Water Organization.

2. Hydraulic data and primary hydraulic and hydrological data analyses on YG canal

The total length of the canal is 127 km. 2/3 length of the canal was built by cut and fill process, and the remaining part was excavated. The canal route passes under rather difficult hydrogeological conditions, mainly in the zone of natural high groundwater level (about 2-4 m from the surface). The nature of the interaction of groundwater and filtration water in different sections of the canal during the vegetation and non-vegetation periods is not same. Regarding to this occasion, the canal partially feeds groundwater, partially drains itself. All of this leads to insignificant filtration water from the canal bed - an average of about 65 liters per 1 km. This circumstance made it possible to abandon the expensive concrete cladding of such a large canal and lay it up to the 103rd canal in the earthen type lining. Only on the last 24 km the canal bed is covered with concrete lining.

The canal efficiency is generally high and at a flow rate of 300m^3/s is 0.97.

The cross section profile of the earthen part of the canal is almost the entire length of polygonal outline and only in the end part is trapezoidal. In the head, the channel has a width of 68 m along the top and 18 m along the bottom with a depth of 6.5 m. We used cross section data of between Alighment station 0 and 623 where the survey area is located. Obviously, central and downsteam areas of the canal cross section parameters are shortened due to canal branching.

The longitudinal slope of the canal between the Alighment station 0 and 923 are 0.00005-0.00007. The average slope i=0.00006 was used in our hydraulic calculations in the report. From Alighment station 923 to the end the slope of the canal is 0.0001.

Peak estimations for water measurement points were carried out based on YG canal design data (Benjaminovich, E.M. Tersitsky 1975).

Bed of the watercourse H=309.7m, water level H=316.9m, Max bank height H=318.4m

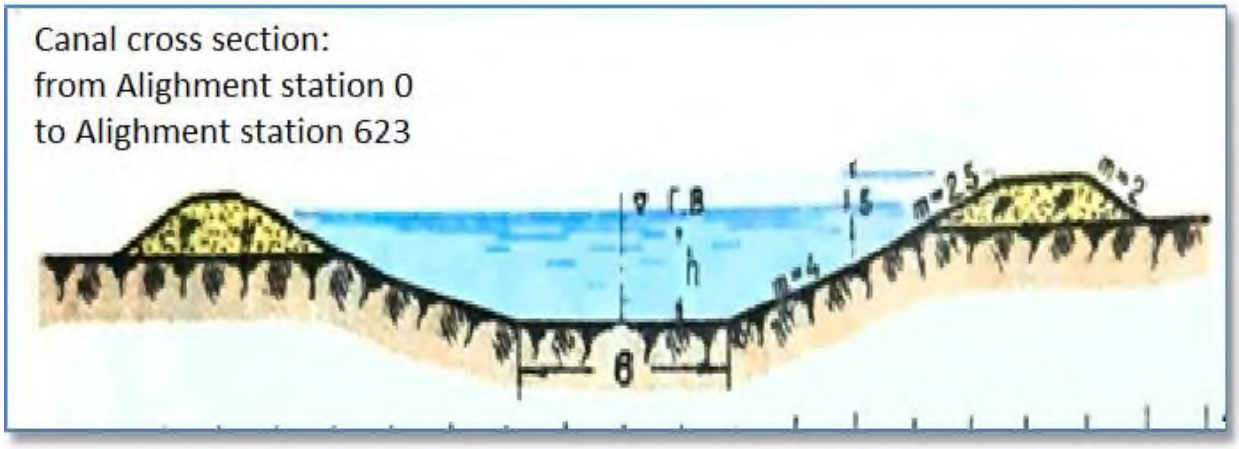

Figure 1 Cross section of YG canal between alignment station 0 and 623. Source: Benjaminovich, E.M. Tersitsky, D.K. 1975.

Due to limited availability of data, we use hydraulic parameters (Figure 1) of the canal (water level data) to estimate water flow.

b=18m, h=7.2m, m=4, n=0.02

Determine the slope for the bed of the watercourse:

$$i = \frac{\Delta h}{l} = \frac{309.7m - 309.4m}{5000m} = 0.00006$$

We measured the cross-section area using the depths corresponding to the water levels and calculated the stream flow velocity using Chézy formula (Sturm and Tuzson 2001), which allowed us to calculate water flow.

Following the above tasks, we determined water flow corresponding to the measured water levels (Figure 2). Based on the observed data and measurement results, we charted the water level measurement of possible discharge in the canal (Figure 3). The chart also depicts the maximum and catastrophic surface water discharges in the canal.

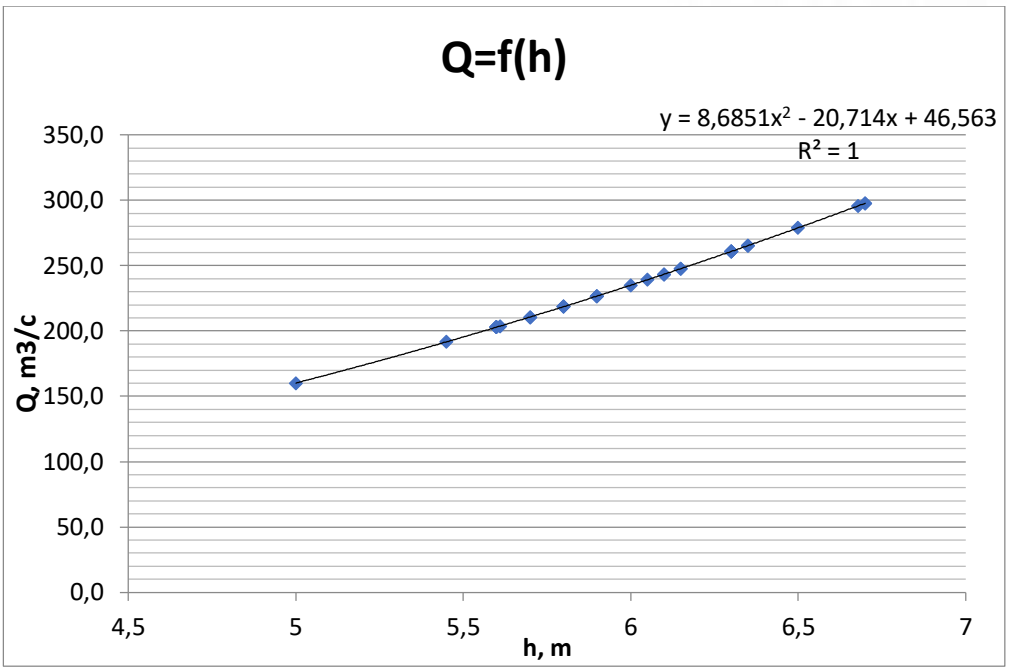

Figure 2 Estimated water discharge (Q) from water height (H) and other design hydraulic parameters of YG canal.
Source: illustrated by the data of YG canal administration and Uzhydromet

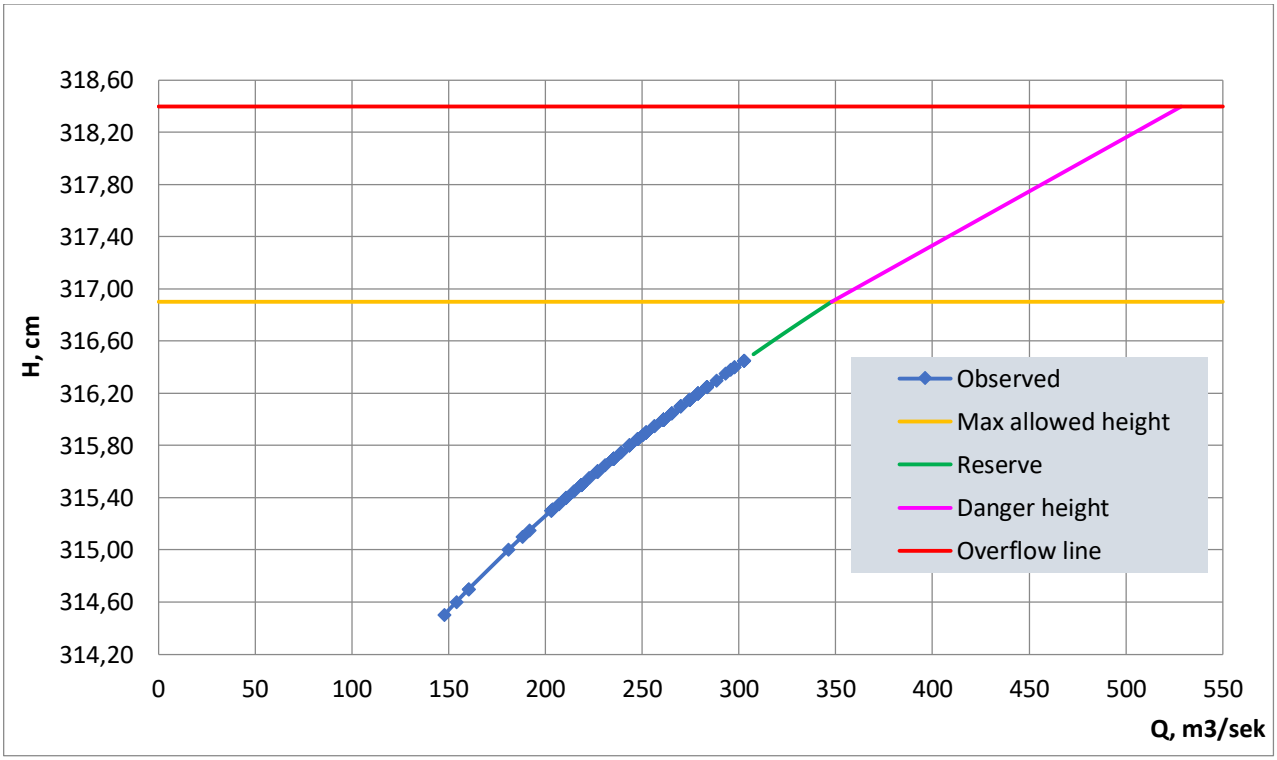

Figure 3 Estimated overflow discharge and observed water height and discharge in YG
Source: illustrated by the data of YG canal administration and hydraulic parameters from Benjaminovich, E.M. Tersitsky 1975

The Figure 5 shows monthly changing of mean, maximum and minimum water level values of YG from 2010 to 2019. The data obtained from YG canal administration.

The monthly mean water levels varied from 315.55 (2010) cm to 316.08 cm with average water level consisted 315.81 cm for observed period. Based on the Figure 3 the mean water levels indicated water discharge in the range of 222.8-268.4 m^3/sek.

Monthly maximum values observed in that period from 315.8 cm (2010) to 316.5 cm (2018) which were below from maximum allowed height (316.90 cm). The corresponding water discharges were in 243.4 – 302.5 m^3/sek.

The monthly minimum values of water level was observed almost same amount within 315.1-315.5 cm in first 5 year (2010-2014), but the second 5 year minimum water height more fluctuated in the range 314.5-315.5 cm. Minimum water height declined to 314.5 cm in 2019 which corresponded to water discharge values 147.1 m^3/sek.

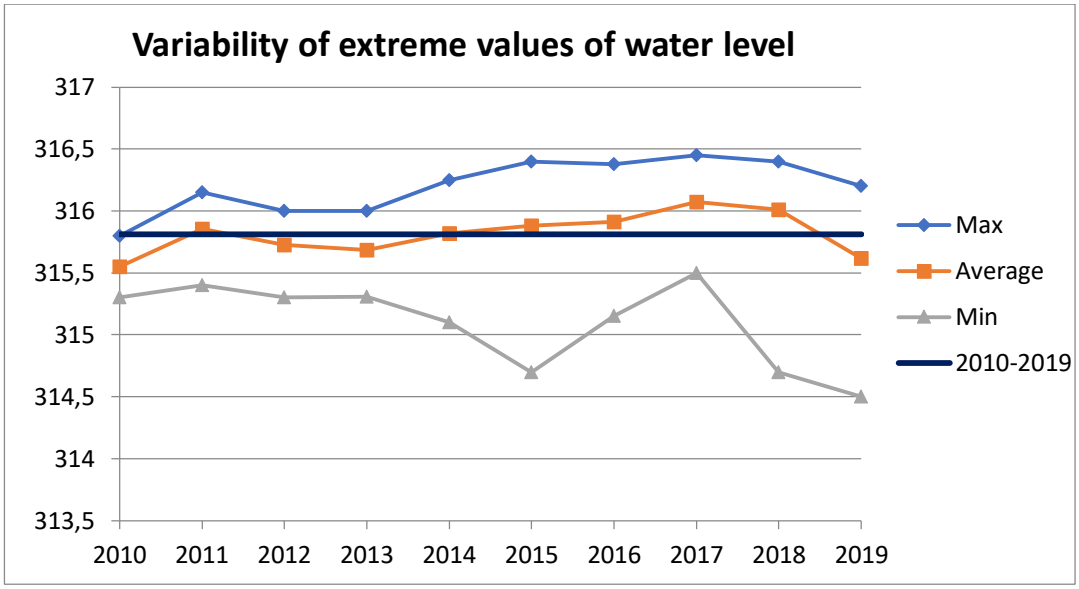

Figure 4 Variation of extreme values of water level of YG canal
Source: illustrated by the data of YG canal administration

The Figure 5. shows how water temperature changed in YG canal in the period of 2010-2019 years. The mean, maximum and minimum monthly water temperatures were illustrated. Overall these extreme values of water temperatures were significantly different from each other. That can be explained by seasonal climatic variation. However, mean, maximum and minimum water temperatures in the canal remained stable over the years. Mean water temperature was 19.2±0.5°C, while maximum water temperature 25.3±0.5°C observed in summer months. Only minimum water temperature observed in winter season relatively more fluctuated with amount 11.2±2°C due to rose in 2019.

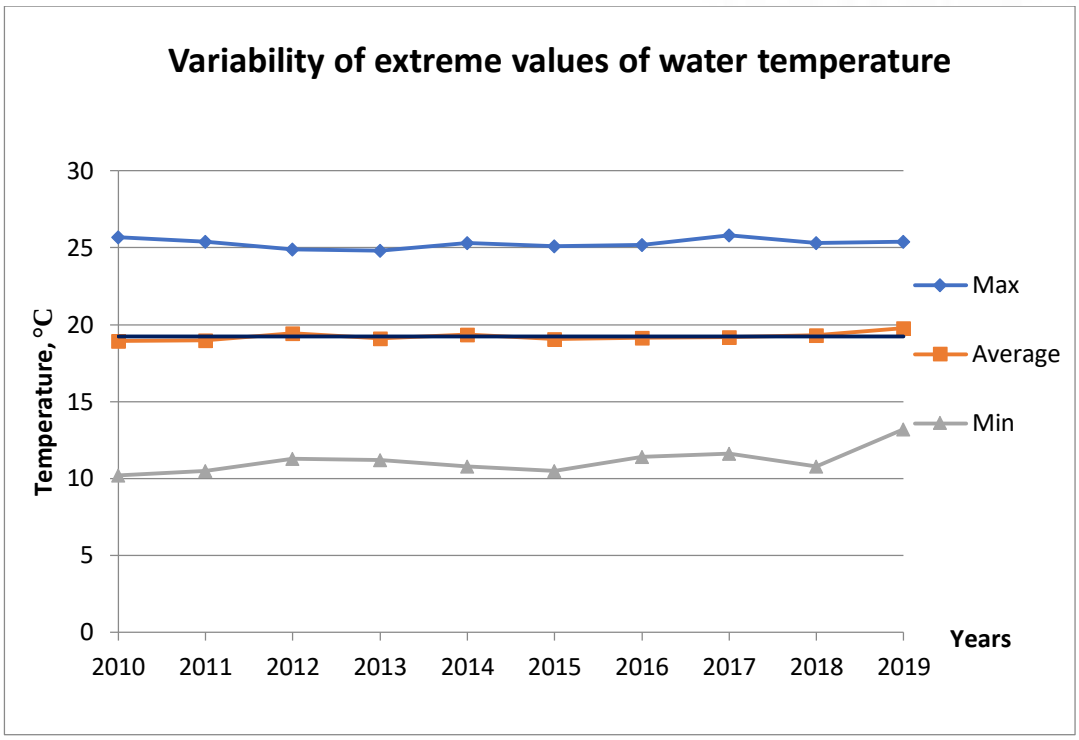

Figure 5 Variation of extreme values of water temperature of YG canal
Source: illustrated by the data of YG canal administration

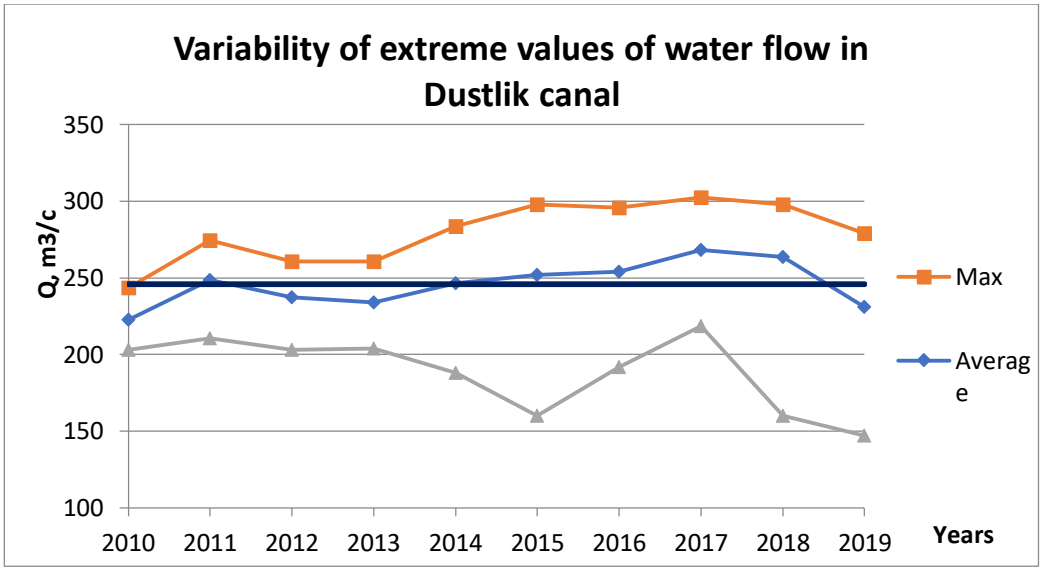

Figure 6 Variation of extreme values of water flow of Dustlik canal
Source: illustrated by the data of Dustlik canal administration

3. Upstream and downstream water status quo levels, including water facilities

3.1. Upstream status quo

Administratively, the survey area is located in the Syrdarya region, Bayavut district of Shirin town.

The site is located 14 km west of Bekabad and approx. 8 km north-west of the city of Bakht, with the center of these regions located approx. 45 km from the site.

Syrdarya river basin is located in the territories of four Central Asian countries: Kazakhstan, Kyrgyzstan, Tajikistan and Uzbekistan. The river originates in the Tian Shan mountains in Kyrgyzstan, fed by precipitation and glacier melt, and formed by the confluence of Naryn and Karadarya rivers, discharging to the Aral Sea flowing for 2790 km in total along with the Naryn river.

The average long-term flow of the Syrdarya river is 41 km^3/year (Chub 2007).

The population of the Syrdarya river basin is 22.1 million people (Libert and Lipponen 2012).

Five main reservoirs are located on the Syrdarya river and its tributaries, which include 3 upper and 2 channel reservoirs, with the following total volumes:

1. Toktogul - 19.5 km^3;
2. Andijan - 1.9 km^3;
3. Charvak - 2.05 km^3;
4. Bahri Tojik (Kayrokkum) - 3.4 km^3;
5. Shardara - 5.4 km^3.

3.2. Formation of legal status of Basin Water Organization “Syrdarya” (BWO Syrdarya)

In 1992, BWO Syrdarya becomes the executive body of ICWC (Interstate Coordination Water Commission of Central Asia) under the agreement signed by five countries. BWO Syrdarya in 1997 entered the structure of the International Fund for Saving the Aral Sea (IFAS). BWO Syrdarya acquired the status of an international organization by an agreement signed by the Presidents of Central Asia. The central administration of BWO Syrdarya is located in Tashkent and its structure includes four territorial divisions, including Tajik and Kazakh branches, i.e. Gulistan water network and Dustlik canal administration.

The main objectives of the water network administrations are i) to provide monitoring and water resources management of the canals which withdraw water from Syrdarya river; ii) maintenance and overhaul of the main hydrotechnical facilities and mechanized canal cleaning; iii) provision of water supply limits according to the applications of the states - water consumers, water supply to provide irrigated land for the middle reaches of the Syrdarya river and water supply to the Aral Sea.

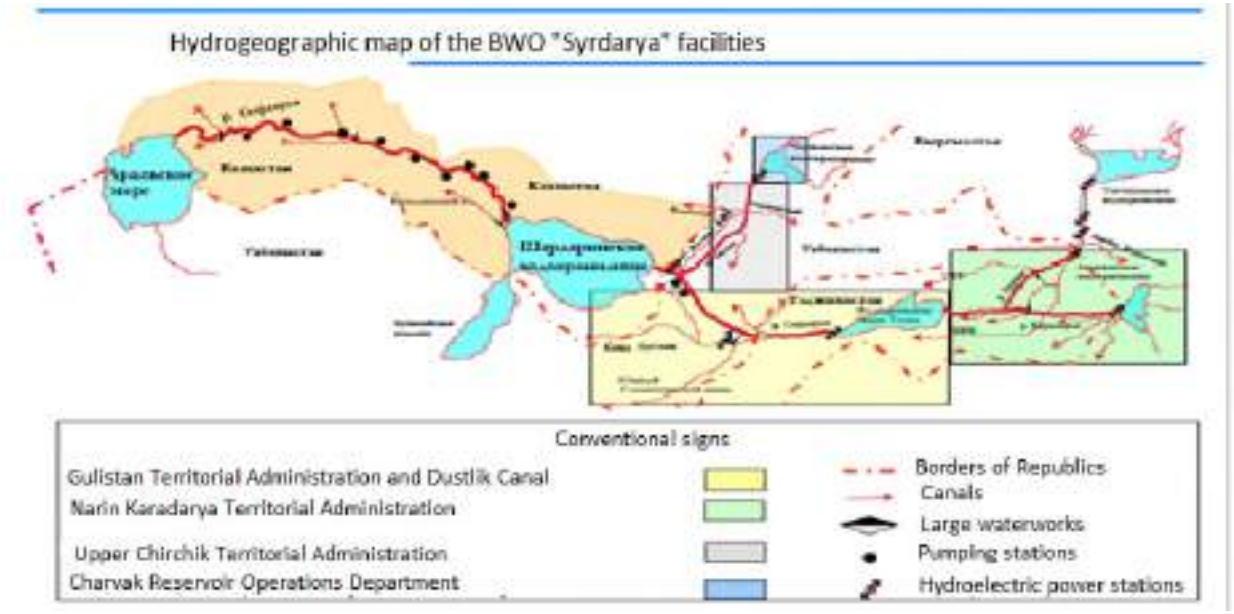

Figure 7 Hydrographic scheme of objects of BWO Syrdarya
Source: cawater-info.net

In order to ensure the implementation of the initiatives of the President of the Republic of Uzbekistan Sh. M. Mirziyoyev voiced at the Summit of the Heads of the IFAS (August 24, 2018) in the city of Turkmenbashi, BWO Syrdarya together with Scientific Information Center of Interstate Coordination Water Commission of Central Asia (SIC ICWC) and Uzbekistan Hydrometeorological Service (Uzhydromet) prepared the following two regional projects:

1. Modernization and implementation of an automated water resources management system and sustainable operation of hydraulic structures of interstate importance of the Syrdarya river basin;
2. Safety of dams and other hydrotechnical structures in Central Asia.

3.3. The Farhad hydroelectric facility

The Farhad hydroelectric facility is located in the alignment in the Farhad cliffs just above Bekabad city. A hydropower plant with a small reservoir is designed to provide a gravity intake and supply water free-flowing canals to the lands of the Golodnaya and Dalverzinsky steppes, as well as daily regulation of river flow for hydropower.

The reservoir capacity at maximum allowance level is 330 million m^3, its length is 28 km, its width is from 250 to 3000 m and its area is 46 km^2. The average water depth is 7.2 m, the maximum depth at dam is 23.6 m (Benjaminovich, E.M. Tersitsky 1975).

The Farhad hydroelectric complex includes: the spillway concrete dam, dead earth dam, the regulator of the Farhad derivation canal of the hydroelectric power station, and a regulator of the Dalverzin irrigation canal on the right bank of the Syrdarya river.

A spillway dam with a total length of 120 m, has 8 spans each 10 m wide in the light, each covered by dances with wheel locks. The height of the Dam is 25 m and it is designed to pass the maximum estimated flow rate of 4430 m^3/s and catastrophic flow rate of 5800 m^3/s(Benjaminovich, E.M. Tersitsky 1975).

The Farhad derivation canal regulator is located at the left end of the earthen dam. Designed for a pass of 470 m^3/s of water, it has 7 spans of 10 m in the light.

To protect the water intake from bottom sediments, flushing sluice are located in front of the thresholds of the regulator.

4. Downstream status quo

4.1. The site of structures at PK145 YG canal

From the 14.5th km, the YG canal is floe on the virgin soil. At the 32nd km, it crosses the Syrdarya-Havast railway, passes through the city of Yangiyer and at the 127th km it ends with the discharge into the Sangzar (Kly) river on the south western border of the Golodnaya Steppe, at the north of the city of Jizzakh.

The canal efficiency is generally high and at a flow rate of 300 m^3/s is 0.97 (Benjaminovich, E.M. Tersitsky 1975).

Numerous structures have also been built along the course of YG canal i.e. the head regulator, 9 blocking structures, 44 water outlets, 6 pipes and siphons, 12 mudflow outlets, 6 road and 1 railroad bridge, a spillway to Tokursai.

Land resources of the Golodnaya Steppe zone, irrigated mainly by YG canal and Dustlik, are shown in Table 1.

Table 1 Areas irrigated by Dustlik and YG canals

Administrative regions	**Irrigated area, ha**	**Irrigated area by canals, ha**	
		Dustlik	**YG canal**
Uzbekistan	523 033	130 000	400 133
Including: **Syrdarya** **Djizak**	292 900 230 133	130 000 0	170 000 230 133
Kazakhstan	145 000	145 000	0
Total	668 033	275 000	400 133

Source: BWO Syrdarya materials

5. Water availability analysis

The average long-term water discharge of the Syrdarya river in the downstream of the dam of the Kairakkum hydroelectric station for the period 1992 - 2018 is 678 m^3/s (Uzhydromet).

The average annual water discharge of the Syrdarya in the lower course of the Farhad dam was 165 m^3/s for the period 1992-2018, and varied from 52.2 m^3/s (2009) to 242 m^3/s (2010). The highest average monthly water discharge in the downstream of the dam for 1980-2018 period is observed in January-February - 361-407 m^3/s, the lowest in September - up to 8.4 m^3/s. In some years, from one to six months a year (2009), the river bed of Syrdarya below the Farhad dam was almost dry.

In the Syrdarya region, there are no natural watercourses of their own. The arrival of transboundary river waters in Syrdarya region is 240 m^3/s (Uzhydromet). YG and Dustlik are the main canals that supply water to the region.

Collector-drainage waters in volumes varying between 1.8 to 2.1 km^3 are formed in the area and are discharged into the Syrdarya river and Arnasay lowlands. The main collectors in the project area comprise Shuruzyak, the main collector in the bottomland area, and the Central Golodnostepsky collectors (Якубов, Якубов, and Якубов 2011).

The bulk of fresh groundwater is concentrated in the north and east parts of the Syrdarya region, in the Syrdarya river valley. The region is fed by 5 source deposits of fresh underground water: Syrdarya, Central Gulistan, Verkhnyaya Pliocene, Havast and Dustlik. The largest annual withdraws occur at the Syrdarya and Central Gulistan deposits and in 2007 amounted to more than $0.3*10^6$ m^3/day. Groundwater is mainly used for household water supply. In the region there are 13 municipal water supply facilities taking water from underground aquifers. Water for the remaining settlements is provided from local underground water withdrawal.

5.1. Flow pattern in the canals

We obtained data from BWO Sirdarya for Dustlik and YG canals with flow information containing 45-year data, and identified their monthly minimum, maximum and mean water discharges (Table 2) and analyzed graphically (Figure 8). We also obtained data from Syrdarya Thermal Power Plant (TPP) and performed primary assessment of information related to thermal and other physical and chemical parameters of the water. Sydrarya TPP is located in Shirin city along the YG canal – the water is withdrawn from the Farhad derivation canal with the water used for cooling eventually discharged to YG canal.

Table 2 Monthly mean, maximum and minimum water discharge of YG canal for 1976-2013 period. Cv - coefficient of variation indicates ratio of the standard deviation to the mean.

	J	F	M	A	M	J	J	A	S	O	N	D	Annual
Mean	95,4	67,8	79,2	107,4	126,7	214,8	278,6	237,7	74,7	67,1	56,2	49,1	121,1
Max	195	201	194	202	216	291	349	290	141	148	177	145	156
Min	18,0	12,0	0,4	9,5	8,8	123,0	157,5	136,0	28,7	9,5	0,2	4,9	92,1
Standard deviation	38,3	43,5	58,3	60,6	54,2	42,6	48,4	35,2	26,4	44,1	51,1	40,6	15,4

C_v (coefficient of variation	0,40	0,64	0,74	0,56	0,43	0,20	0,17	0,15	0,35	0,66	0,91	0,83	0,13

Source: Estimated by data of YG canal administration

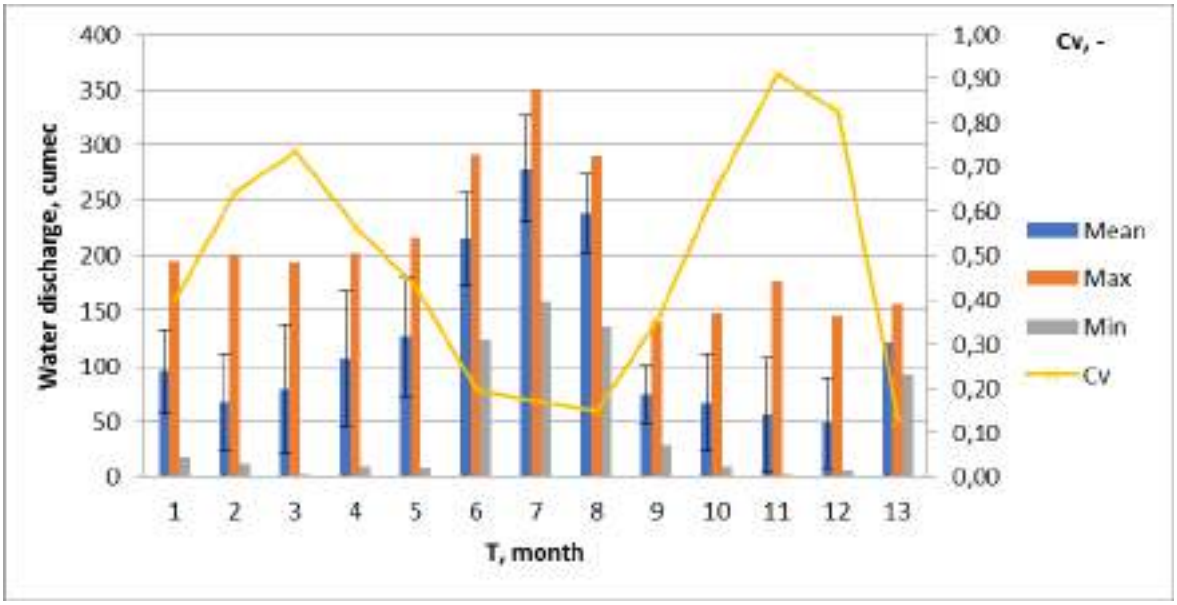

Figure 8 Monthly mean, maximum and minimum water discharge of YG canal for 1976-2013 period. Cv - coefficient of variation indicates ratio of the standard deviation to the mean.
Source: Estimated by data of YG canal administration

As mentioned above Table 2 shows extreme water discharge of YG canal and their statistical analysis values for 1976-2013 with graphically illustration (Figure 8). In general, high water discharge was observed in vegetation period as canal serves mainly for agriculture in the region and high demands for water in that season. The mean inter-annul water discharge was 121.1±15.4 m3/sek while coefficient of variation (CV) was 0.13 which indicates inter-annual flow stable. However, (inner) annual variation of flow in YG canal is considerable different within the months. Maximum monthly mean value – 278.6±48.4 m3/sek was observed in July, while minimum monthly mean value 49.1±40.6 m3/sek observed in December. There were high coefficient of variation in winter period, especially December (0.91), November (0.83) and March (0.74). There reason of high variation in this period can be explained with a) less water required in non vegetation period, but steady water demand increased due to agricultural reforms in independence years with increasing winter wheat producing instead of cotton by water consumers; b) relatively low water flowed in the canal in the early period (1973-1980) because of canal construction was still developing in that period; c) canal used occasionally for reducing flood risk in middle and downstream of Syrdarya River in winter and spring season.

Absolute minimum water discharges mainly observed in in non-vegetation period was observed in 1970-80s (Attachment 4). Based on the observed water discharges in YG canal, in the last 20 years monthly minimum water discharges was not below from 5 m^3/sek. According to conversation with the personnel of YG canal administration only

middle and downstream sections and branches of the canal be completely dried out during regularly maintaining of the canal once a year. However, Alignment section between 0 and 923 where the survey area is located still remains with water. Elsewhere, according to historic observed data canal has not been become dry after starting to in full operation.

5.2. Monthly minimum, maximum and mean water temperature

Monthly temperature fluctuations of Dustlik and YG canals were analyzed for the 2010-2019 period (Figures 9 and 10). Additionally, Figure 11 shows the impact of Syrdarya Thermal Power Plant (TPP) on water temperature of YG canal.

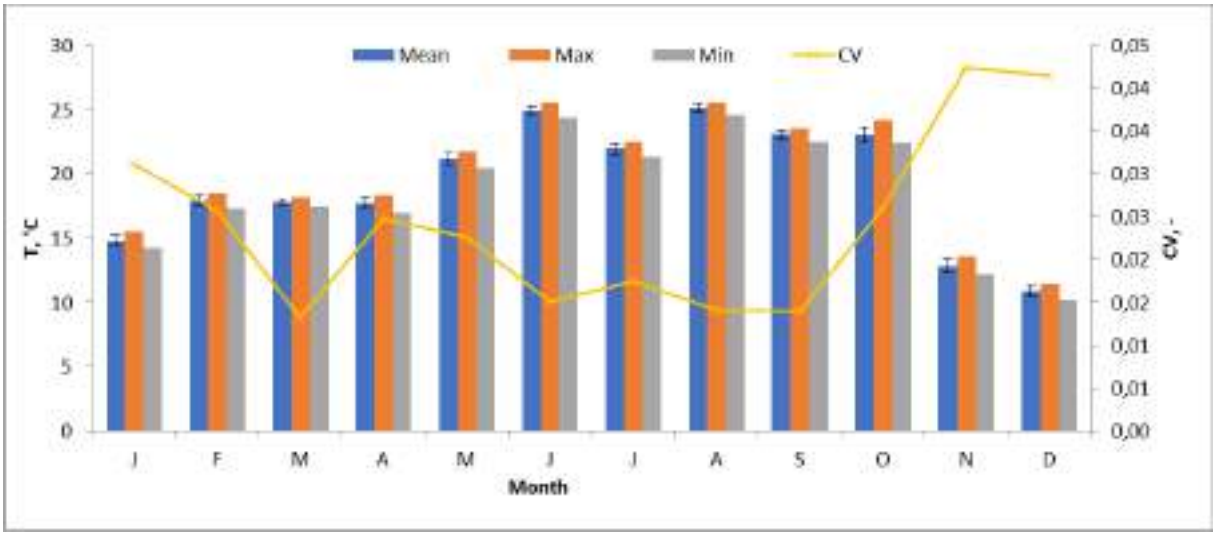

Figure 9 Monthly mean, maximum and minimum water temperature of Dustlik canal for 2010-2019 period. Cv - coefficient of variation indicates ratio of the standard deviation to the mean.
Source: Illustrated by data of Dustlik canal administration

The Figure 9. shows variation of monthly water temperature in Dsutlik canal in the period of 2010-2019 years. The extreme values of water temperatures in each month were not significantly different from each other, as only had 0.3-0.5°C difference between maximum and minimum values. However, monthly water temperature varied +9.8±0.4°C (in December) to 24.8±0.3°C (in June, August). The high values of coefficient of correlation belonged to winter months.

The Figure 10 illustrates monthly water temperature changes in YG canal in the period of 2010-2019 years. As abovementioned in Figure 5 the monthly values of water temperatures were significantly different from each other, that can be explained by seasonal climatic variation. However, extreme values of water temperatures in each month was similar. High water temperatures were also observed in summer months (about 23-25°C) while low water water temperatures referred to winter months (11-14°C). Monthly values of variation coefficients were relatively low (below 0.05). Only in

July CV coefficient was above 0.05, however it did not reflect significantly in water temperature value and its CV was higher due to minimum water temperature not maximum.

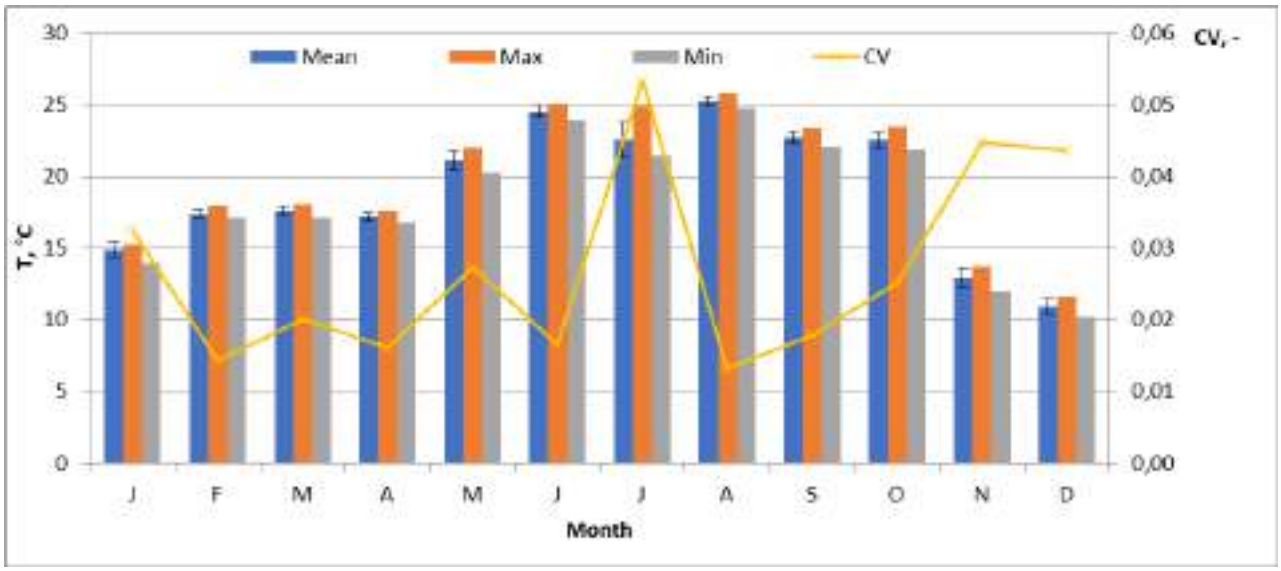

Figure 10 Monthly mean, maximum and minimum water temperature of YG canal for 2010-2019 period. Cv - coefficient of variation indicates ratio of the standard deviation to the mean.
Source: Illustrated by data of YG canal administration

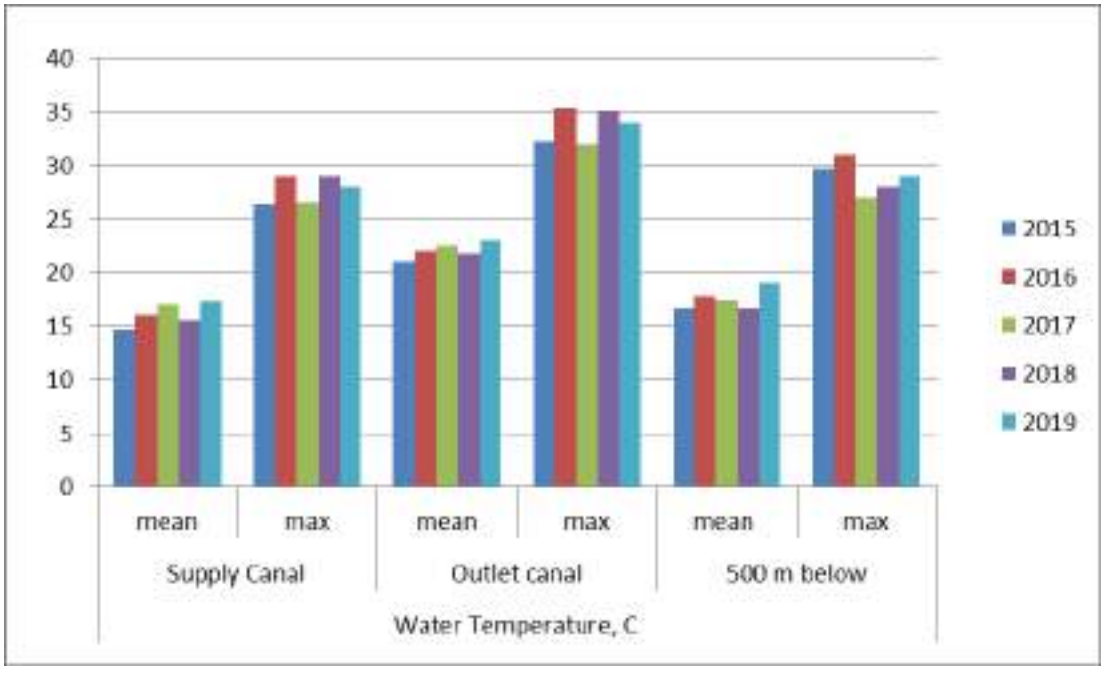

Figure 11 The impact of Syrdarya thermal power plant (TPP) on water temperature of YG canal

Source: Illustrated by data of Syrdarya TPP

The effect of Syrdarya TPP on water temperature of YG canal based on the data observed 2015-2016. Mean and maximum monthly values of water temperatures were analysed before (supply canal) and after (outlet canal) using of water in the plant. The water temperature measured 500 m below indicates that the values of water temperature after mixing again with YG canal water. Comparing of Outlet canal to Supply we observed that water temperatures increased in average +6.0°C and +5.9°C in mean and maximum values accordingly. After mixing with YG canal (comparing of Outlet canal and 500 m below) the water temperatures declined again in average -4.6°C and -4.8°C The net effects of Syrdarya TPP to YG canal was in average +1.4°C and 1.2°C in mean and maximum values accordingly.

6. Water quality and initial variability

Water quality analysis of the water resources in the selected site were investigated based on following scientific sources and data obtained from relevant organizations:

- Temporal and spatial changes of Syrdarya river (Mamatov 2008)
- 2019 water quality data for Dustlik and YG canals from local ecological pollution monitoring department of the State committee of the Republic of Uzbekistan on ecology and environmental protection
- monthly min, max and mean physical and chemical parameters of water before and after use at Syrdarya TPP during 2015-2019 period

Water quality analysis at Syrdarya river and Dustlik, and YG canals was carried out based on the following assessment methods:

- Temporal (spatial) changes in water quality parameters of Syrdarya river and Dustlik and YG canals;
- Water quality parameters with maximum permissible limit (MPL) for household and drinking water in accordance with the state standard of Uzbekistan (UzDSt951-2011 2011).

6.1. Water quality at the Syrdarya river

Hydrochemical regime of Syrdarya river, which determines the qualitative composition of its water, depends both on the hydrological regime, which itself depends on the natural and climatic conditions, and the influence of anthropogenic factors, associated primarily with discharges of sewage and drainage water into the river.

The discharge of contaminated drainage water into the river worsens the ecological condition and the domestic quality of the water used for drinking, fishery and irrigation. Certain contribution to the pollution of the Syrdarya and its tributaries is made by the discharges of sewage, insufficiently treated water from industrial enterprises and public utilities (Mamatov 2008).

The increase in anthropogenic pressures has led to a significant change in the quality of river flow. As a result of decreasing runoff discharge and increasing return water from

irrigated lands into the river in the second half of the 20th century, there was a deterioration of the river water quality, especially in its middle course, where Dustlik and YG canals withdraw water.

According to the Syrdarya river water quality analysis conducted by Mamatov (2008), water salinity in the Syrdarya river tends to increase towards downstream (from the Kal gauges to the Nadezhdinsk gauge). Its values in the upper Kal section were always lower than 1.0 g/l, and in the sections of the middle reaches of the river (Bekabad, Nadezhda), water mineralization increased, and its average annual values were usually higher than the maximum permissible concentration (MPC). Towards the Chinaz site, mineralization decreases (Figure 12).

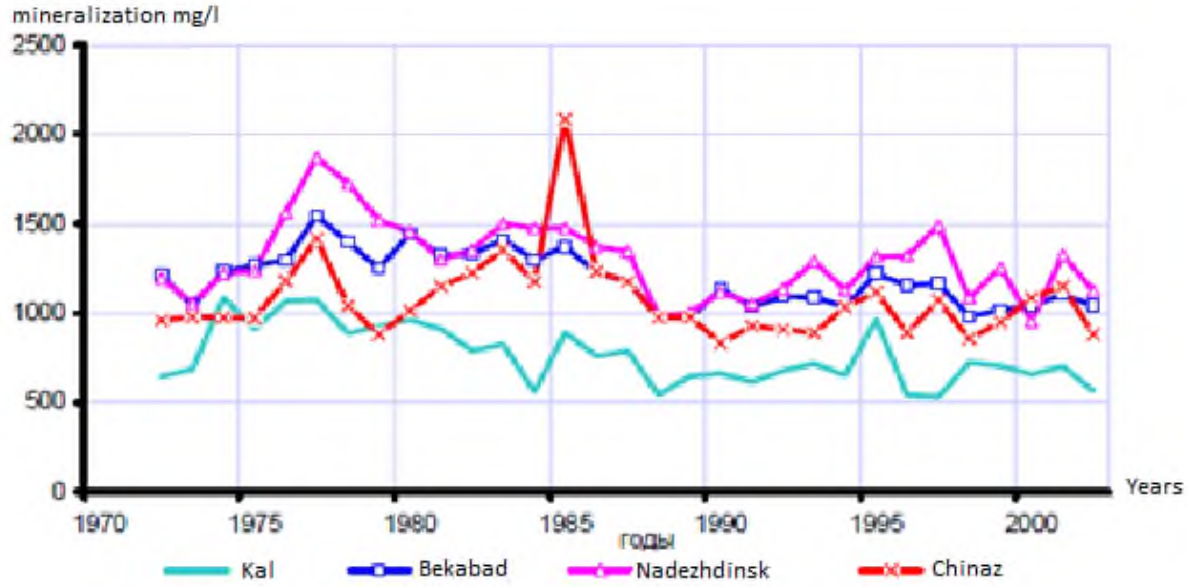

Figure 12 Water salinity changes in Syrdarya river

Source: Mamatov 2008

6.2. Water quality data of Dustlik and Yuzhny-Golodnostepsky canal for 2019

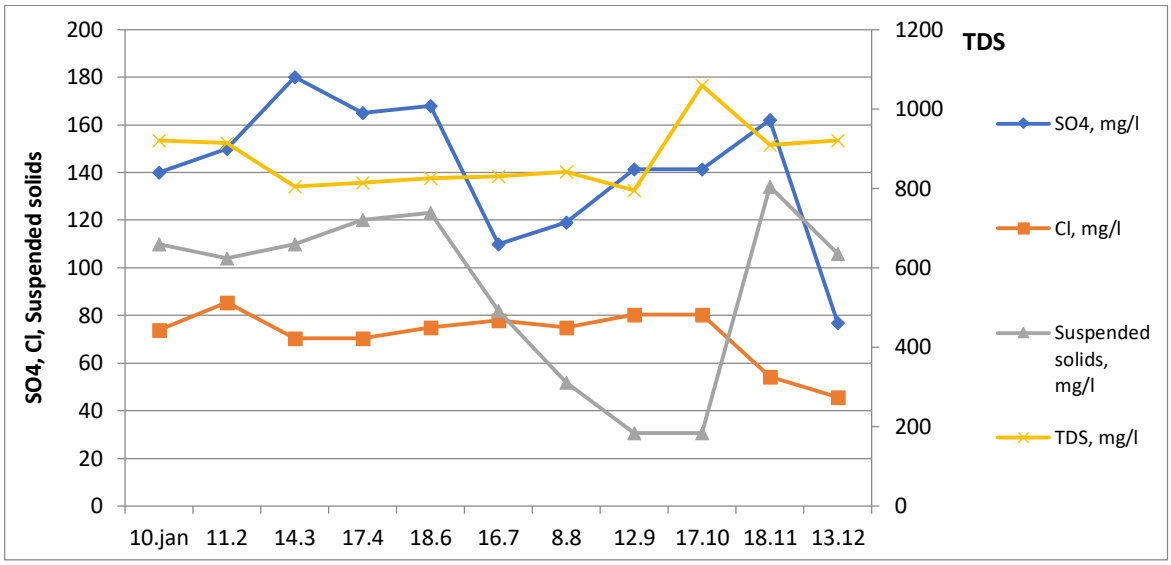

Figure 13 TDC, SO4, Cl and suspended solids at the beginning of Dustlik canal in 2019

Source: Illustrated by Syrdarya TPP data

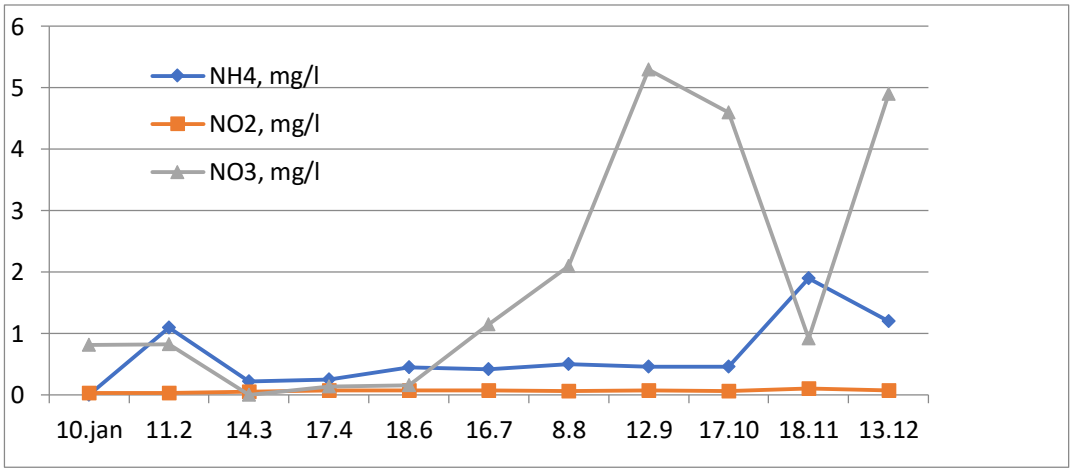

Figure 14 Nutrients in water at the beginning of Dustlik canal in 2019
Source: Illustrated by Syrdarya TPP data

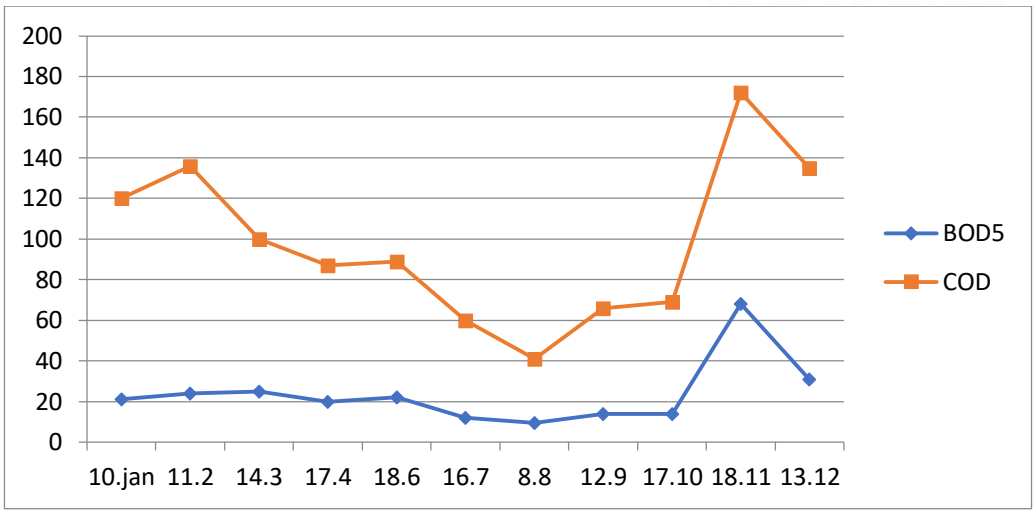

Figure 15 Biochemical Oxygen Demand and Chemical Oxygen demand at the beginning of Dustlik canal

Source: Illustrated by Syrdarya TPP data

6.3. Monthly min, max and mean physical and chemical parameters of the water before and after use at Syrdarya TPP for 2015-2019 period

Following parameters were used to assess change in water quality in the canals: water salinity (total dissolved solids), organic matters (NO_2, NO_3, NH_4) and other physical (pH, hardness, suspended solids) and chemical (Cl_2, Fe, BOD, COD) parameters, which characterize qualitative condition of the water sources. The dynamics of water quality parameters were analyzed for the period from 2015 to 2019.

Assessment of water quality change in used water of Syrdarya river by Syrdarya TPP was carried out on the basis of MPL comparison and correspondence of their MPL for drinking water (UzDSt951-2011 2011).

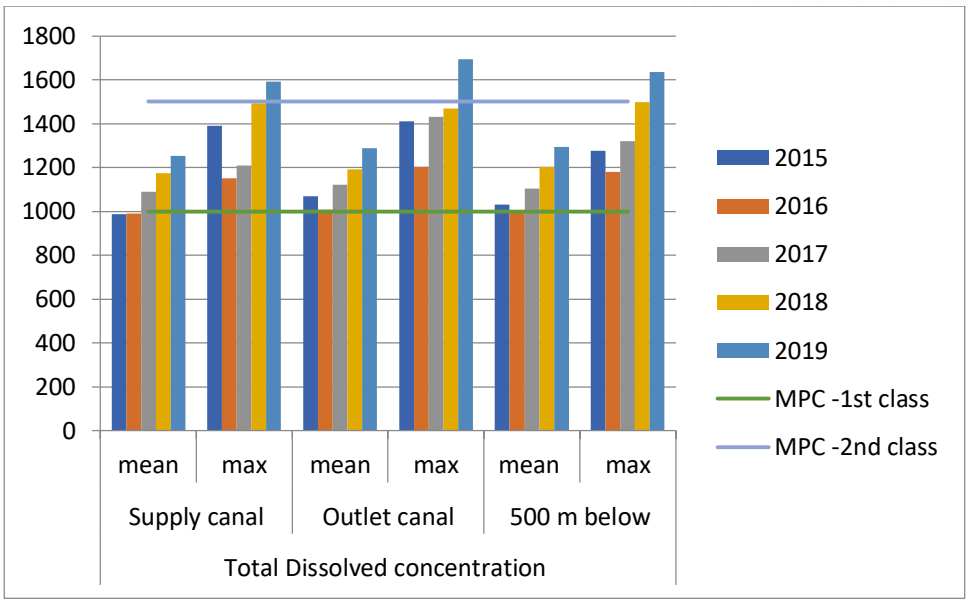

Figure 16 Total Dissolved concentration (TDC) of water used by Syrdarya TPP
Source: Illustrated by Syrdarya TPP data

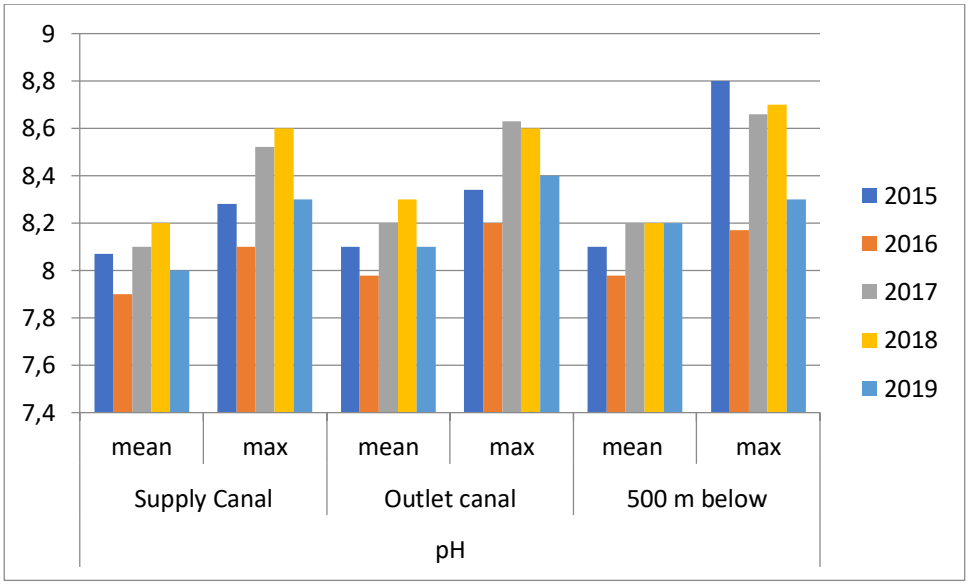

Figure 17 Changes in pH value of water after use by Syrdarya TPP
Source: Illustrated by Syrdarya TPP data

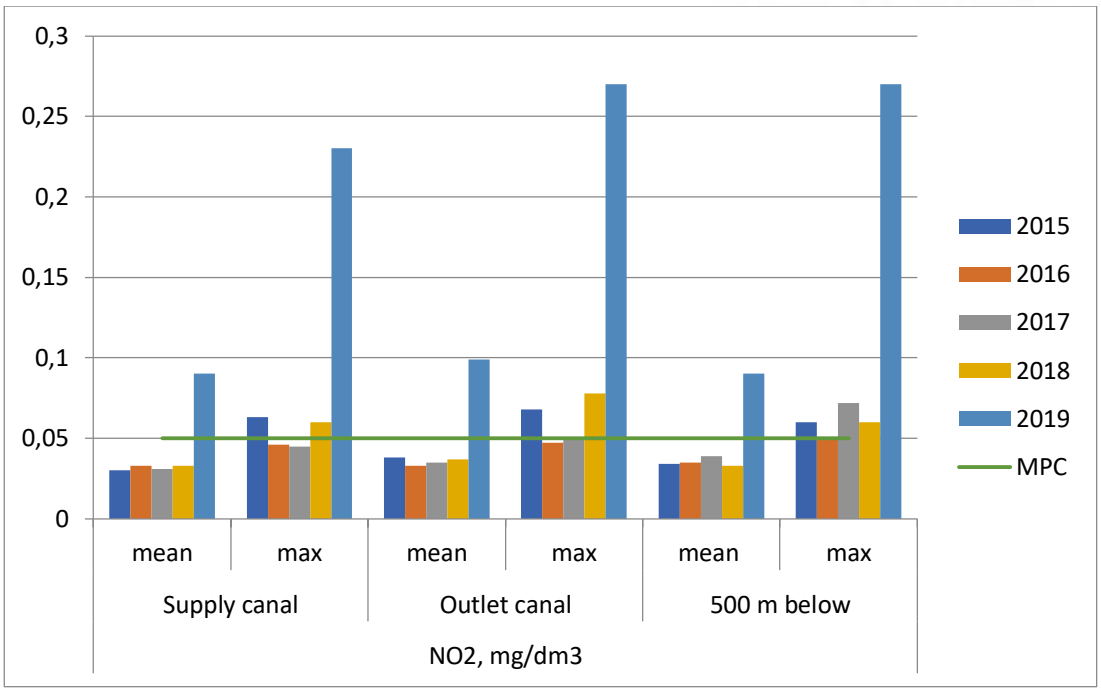

Figure 18 Nitrate (NO2) change in water used by Syrdarya TPP
Source: Illustrated by Syrdarya TPP data

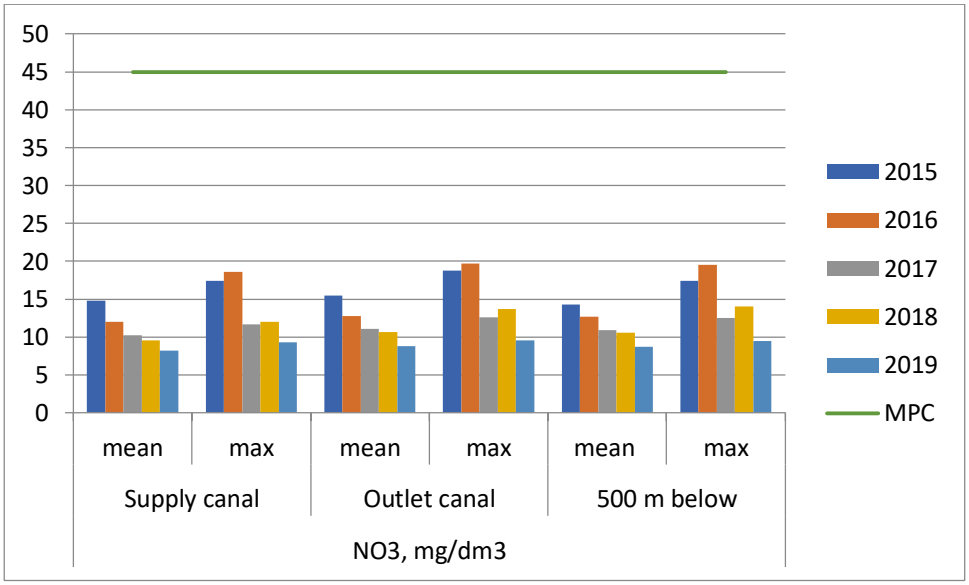

Figure 19 Nitrite (NO3) change in water used by Syrdarya TPP
Source: Illustrated by Syrdarya TPP data

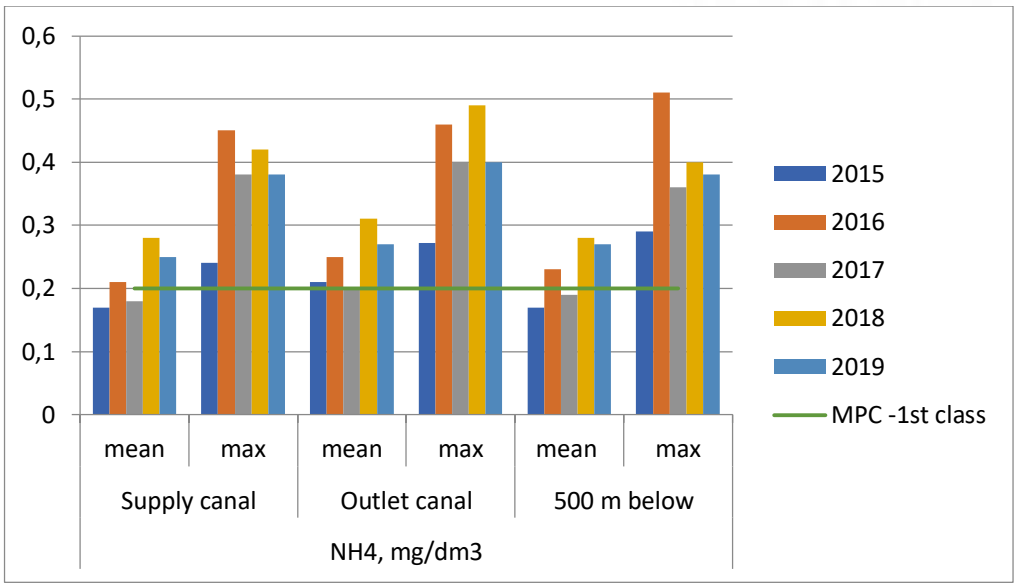

Figure 20 Ammonium (NH4) change in water used by Syrdarya TPP
Source: Illustrated by Syrdarya TPP data

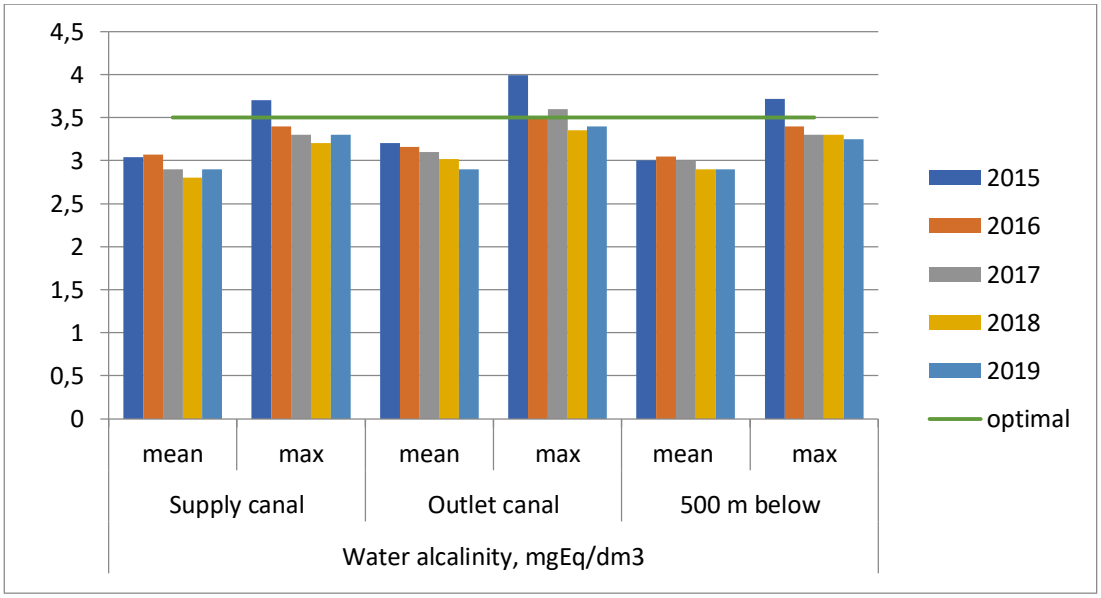

Figure 21 Alkalinity parameter of water used by Syrdarya TPP
Source: Illustrated by Syrdarya TPP data

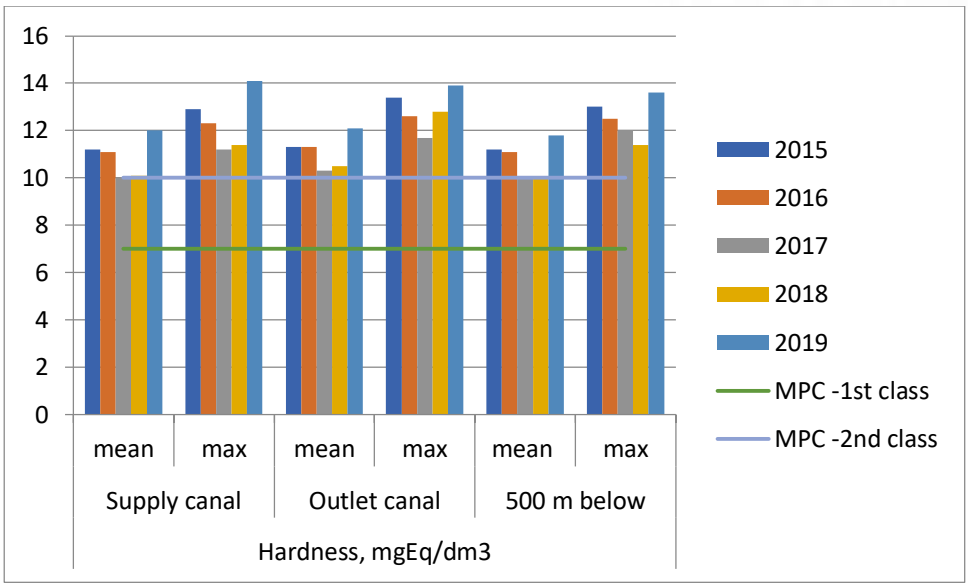

Figure 22 Hardness of water used by Syrdarya TPP
Source: Illustrated by Syrdarya TPP data

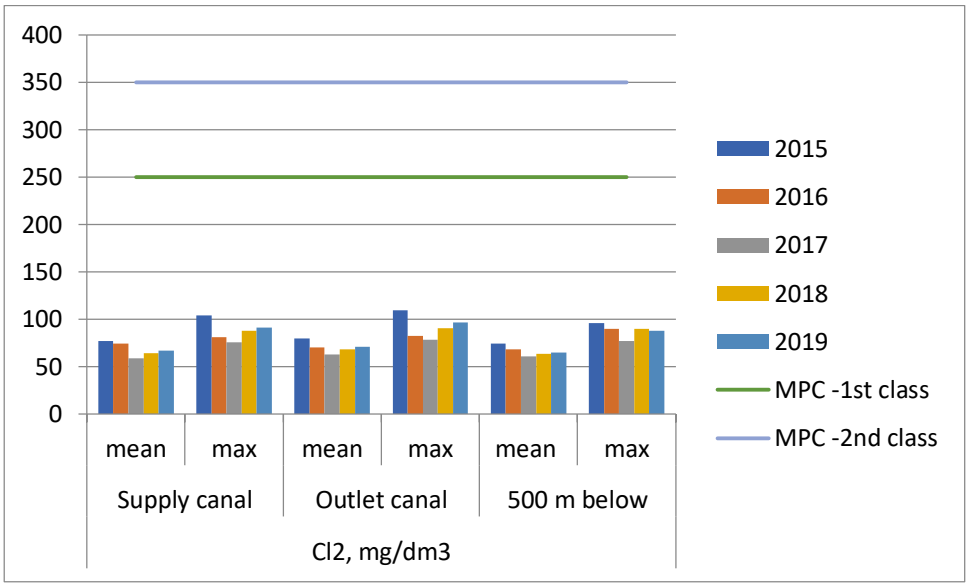

Figure 23 Change in chlorine concentration of water used by Syrdarya TPP
Source: Illustrated by Syrdarya TPP data

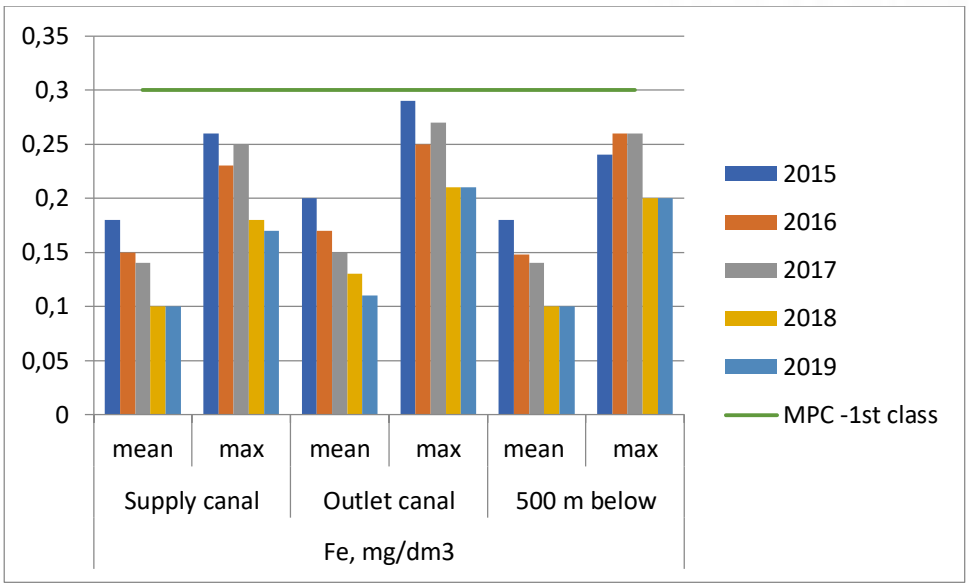

Figure 24 Change in iron (Fe) concentration of water used by Syrdarya TPP
Source: Illustrated by Syrdarya TPP data

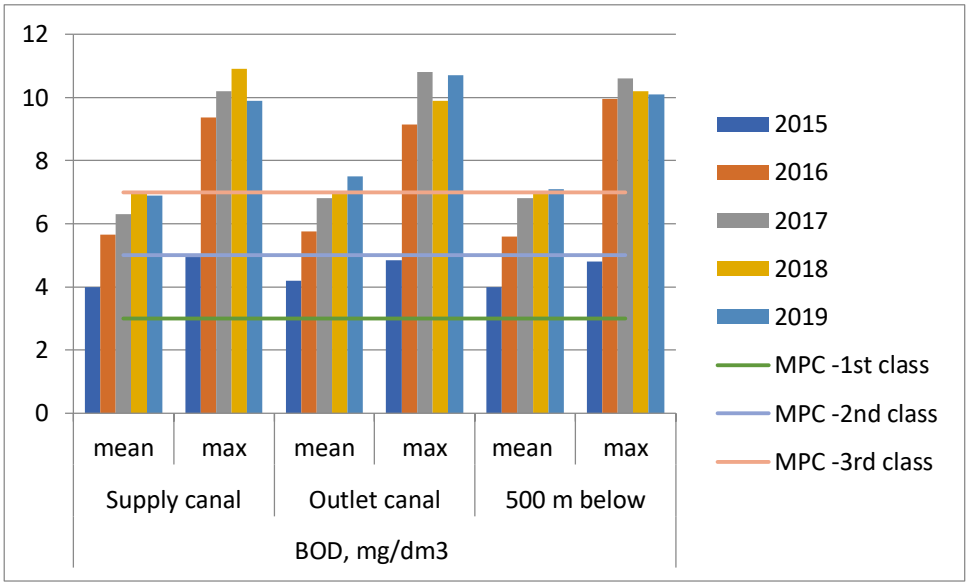

Figure 25 Change of Biochemical Oxygen Demand (BOD) of water used by Syrdarya TPP
Source: Illustrated by Syrdarya TPP data

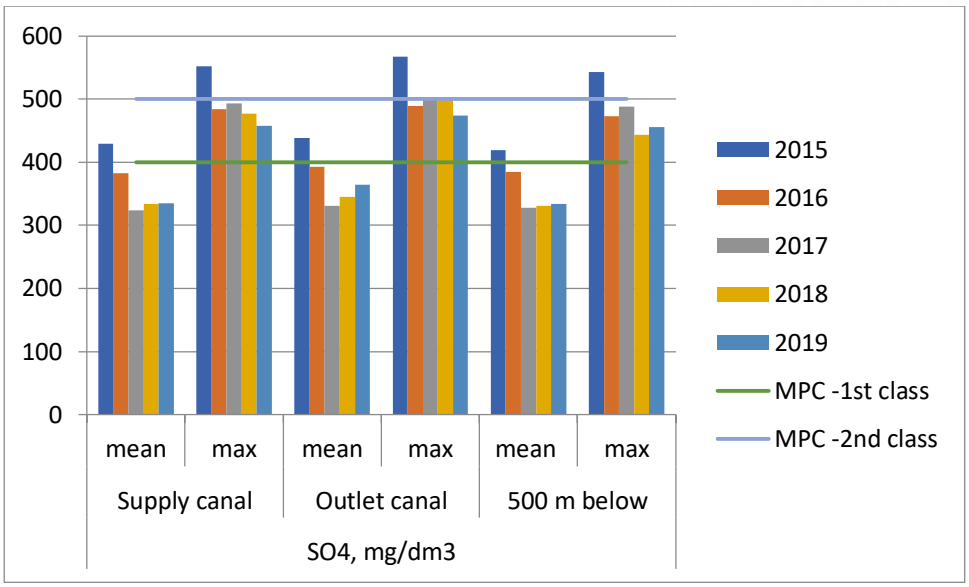

Figure 26 Change in sulphate (SO4) concentration of water used by Syrdarya TPP
Source: Illustrated by Syrdarya TPP data

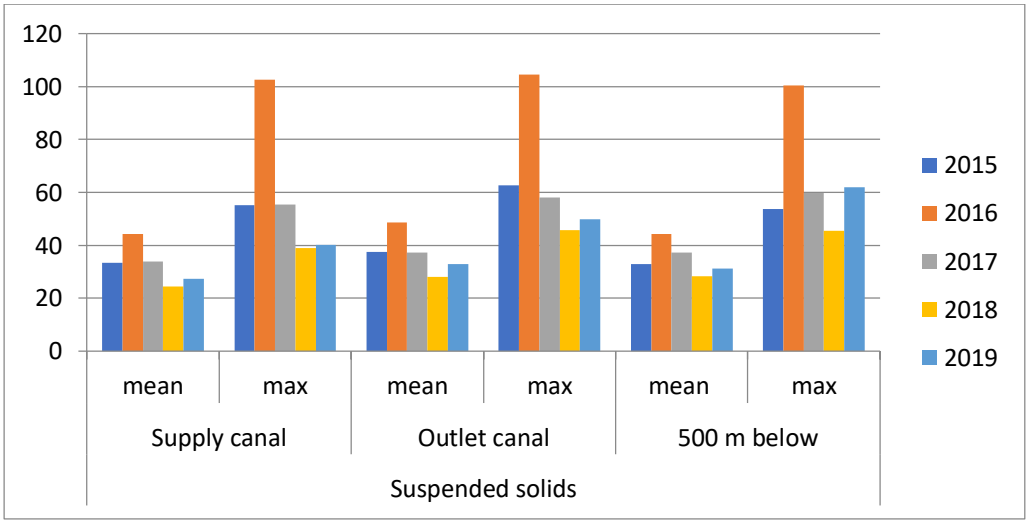

Figure 27 Suspended solids of water used by Syrdarya TPP
Source: Illustrated by Syrdarya TPP data

7. Conclusions

Main conclusions of the water availability and accessibility study can be summarized as follows:

- According to obtained water resources data water supply can be assessed, as the Syrdarya river is the prior water sources in the site of the project;
- Based on the hydraulic parameters of the YG canal, maximum (316.90 m) and catastrophic water levels (318.40 m) of the canal were estimated in selected section of the site. Obtained theoretical Q=f(H) curve estimation, water availability and flooding risk analyses can be performed;
- Annual water discharge at Yuzhny-Golodnostepsky canal was estimated at 121.1 m^3/s - mean, 156 m^3/s - max and 92.1 m^3/s – min.
- Upstream and downstream water status quo levels were studied;
- Water quality data was collected and analyzed graphically against national maximum permissible limits;
- Certain physical and chemical parameters of water i.e. hardness, TDC, SO_4, NH_4, Nitrate (2019) were observed above Maximum Permissible Concentration (MPC).

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Attachment 1 Monthly mean water level (H), water velocity (V) and water temperature (T) of Dustlik *canal for 2010-2019 period.* Month/Year		2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	Mean	Max	Min	SD	CV
January	H, cm	130	157	127	218	295	310	310	282	319	247	239,5	319,0	127	65,20	0,272
	V, m/sek	0,2	0,2	0,3	1	1,3	1,4	1,4	1,2	1,2	1,1	0,93	1,4	0,2	0,42	0,449
	T, °C	14,2	14,8	14,5	15,2	14,3	14,6	15,4	15,5	14,8	14,4	14,77	15,5	14,2	0,37	0,025
February	H, cm	220	242	92	255	117	156	235	228	276	267	208,8	276,0	92	52,28	0,250
	V, m/sek	0,8	1	0,1	1,3	0,1	0,3	0,9	0,9	0,9	1,2	0,75	1,3	0,1	0,35	0,467
	T, °C	17,6	17,5	18,5	17,5	18,2	17,8	18,2	18,5	18,4	17,3	17,95	18,5	17,3	0,41	0,023
March	H, cm	165	152	176	114	202	158	175	229	168	242	178,1	242,0	114	27,74	0,156

	V, m/sek	0,3	0,2	0,6	0,1	0,7	0,3	0,2	0,9	0,4	1,1	0,48	1,1	0,1	0,28	0,575
	T, °C	17,6	18	17,6	17,8	17,9	18	17,6	17,5	18,2	18	17,82	18,2	17,5	0,20	0,0111
April	H, cm	155	163	216	165	125	234	124	160	150	144	163,6	234,0	124	24,84	0,152
	V, m/sek	0,4	0,5	0,9	0,5	0,2	0,9	0,2	0,3	0,4	0,2	0,45	0,9	0,2	0,20	0,444
	T, °C	17	17,4	17,5	17,8	18	17,6	17,2	18,2	18,4	17,8	17,69	18,4	17	0,35	0,020
May	H, cm	193	222	188	190	192	239	180	229	220	142	199,5	239,0	142	22,40	0,112
	V, m/sek	0,6	0,8	0,6	0,7	0,5	0,7	0,3	0,9	0,4	0,3	0,58	0,9	0,3	0,16	0,283
	T, °C	20,8	21	20,5	20,9	21,2	21,6	21,8	20,8	21,7	21,8	21,21	21,8	20,5	0,41	0,019

June	H, cm	247	232	218	244	234	274	209	297	285	279	251,9	297,0	209	25,48	0,101
	V, m/sek	0,9	0,8	1	0,9	0,8	0,7	0,9	1,2	1,2	1,1	0,95	1,2	0,7	0,14	0,147
	T, °C	25	24,6	25,4	24,4	25,1	24,6	25,2	25,6	25	24,8	24,97	25,6	24,4	0,30	0,012
July	H, cm	264	254	228	194	237	228	248	346	322	322	264,3	346,0	194	39,42	0,149
	V, m/sek	1	1	0,9	0,7	0,7	1	0,9	1,4	1,4	1,3	1,03	1,4	0,7	0,20	0,196
	T, °C	22,4	22,2	21,8	21,6	22,4	22,5	22,2	21,8	21,4	21,7	22	22,5	21,4	0,34	0,015
August	H, cm	303	302	213	232	227	251	216	286	231	266	252,7	303,0	213	29,24	0,116
	V, m/sek	1,3	1,3	1	1	0,7	0,5	0,8	1,2	1,1	1,1	1	1,3	0,5	0,20	0,200

	T, °C	25,1	25,6	25,4	24,8	24,7	24,6	25,4	25,4	25,2	25,5	25,17	25,6	24,6	0,30	0,012
September	H, cm	187	192	132	136	160	122	173	171	155	118	154,6	192,0	118	22,08	0,143
	V, m/sek	0,3	0,4	0,3	0,2	0,2	0,1	0,2	0,3	0,3	0,2	0,25	0,4	0,1	0,07	0,280
	T, °C	22,5	22,8	22,9	23,2	23,4	23,1	23,2	23,4	23,6	23,1	23,12	23,6	22,5	0,24	0,010
October	H, cm	114	174	145	115	107	110	187	210	128	168	145,8	210,0	107	31,16	0,214
	V, m/sek	0,1	0,4	0,1	0,2	0,1	0,1	0,3	0,3	0,2	0,3	0,21	0,4	0,1	0,09	0,438
	T, °C	22,5	22,6	23,5	23,6	23,1	22,5	22,8	24,2	22,4	23,4	23,06	24,2	22,4	0,50	0,022
November	H, cm	145	121	125	144	120	74	223	225	141	200	151,8	225,0	74	38,52	0,254

	V, m/sek	0,5	0,1	0,2	0,5	0,2	0,05	0,8	0,4	0,3	0,3	0,34	0,8	0,05	0,17	0,513
	T, °C	12,4	12,2	12,4	12,6	13,6	13,5	13,2	12,6	12,4	13,5	12,84	13,6	12,2	0,49	0,038
December	H, cm	117	0	139	187	141	252	222	230	154		160,2	252,0	0	55,58	0,347
	V, m/sek	0,3	0	0,3	0,9	0,3	0,8	0,8	0,4	0,3		0,5	0,9	0	0,25	0,553
	T, °C	10,56	10,8	11	11,2	11,3	11,5	10,2	10,3	11,1		10,9	11,5	10,2	0,37	0,034
Mean	H, cm	186,67	184,25	166,58	182,83	179,75	200,67	208,50	241,08	212,42	217,73	198,05	241,1	166,6	18,03	0,09
	V, m/sek	0,56	0,56	0,53	0,67	0,48	0,57	0,64	0,78	0,68	0,75	0,62	0,8	0,48	0,08	0,13
	T, °C	18,97	19,13	19,25	19,22	19,43	19,33	19,37	19,48	19,38	20,12	19,37	20,1	19,0	0,19	0,01
Max	H, cm	303	302	228	255	295	310	310	346	322	322					

	V, m/sek	1,3	1,3	1	1,3	1,3	1,4	1,4	1,4	1,4	1,3					
	T, °C	25,1	25,6	25,4	24,8	25,1	24,6	25,4	25,6	25,2	25,5					
Min	H, cm	114	0	92	114	107	74	124	160	128	118					
	V, m/sek	0,1	0	0,1	0,1	0,1	0,05	0,2	0,3	0,2	0,2					
	T, °C	10,6	10,8	11,0	11,2	11,3	11,5	10,2	10,3	11,1	13,5					

Note: extreme values are highlighted

Attachment 2 Monthly mean water level (H), water velocity (V) and water temperature (T) of YG canal for 2010-2019 period.

Month/Year		2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	Mean	Max	Min	SD	CV
January	H, cm	130	157	127	218	295	310	310	282	319	247	239,5	319,0	127	65,20	0,272
	V, m/sek	0,2	0,2	0,3	1	1,3	1,4	1,4	1,2	1,2	1,1	0,93	1,4	0,2	0,42	0,449
	T, °C	14,2	14,8	14,5	15,2	14,3	14,6	15,4	15,5	14,8	14,4	14,77	15,5	14,2	0,37	0,025
February	H, cm	220	242	92	255	117	156	235	228	276	267	208,8	276,0	92	52,28	0,250
	V, m/sek	0,8	1	0,1	1,3	0,1	0,3	0,9	0,9	0,9	1,2	0,75	1,3	0,1	0,35	0,467
	T, °C	17,6	17,5	18,5	17,5	18,2	17,8	18,2	18,5	18,4	17,3	17,95	18,5	17,3	0,41	0,023
March	H, cm	165	152	176	114	202	158	175	229	168	242	178,1	242,0	114	27,74	0,156
	V, m/sek	0,3	0,2	0,6	0,1	0,7	0,3	0,2	0,9	0,4	1,1	0,48	1,1	0,1	0,28	0,575
	T, °C	17,6	18	17,6	17,8	17,9	18	17,6	17,5	18,2	18	17,82	18,2	17,5	0,20	0,011
April	H, cm	155	163	216	165	125	234	124	160	150	144	163,6	234,0	124	24,84	0,152
	V, m/sek	0,4	0,5	0,9	0,5	0,2	0,9	0,2	0,3	0,4	0,2	0,45	0,9	0,2	0,20	0,444
	T, °C	17	17,4	17,5	17,8	18	17,6	17,2	18,2	18,4	17,8	17,69	18,4	17	0,35	0,020
May	H, cm	193	222	188	190	192	239	180	229	220	142	199,5	239,0	142	22,40	0,112
	V, m/sek	0,6	0,8	0,6	0,7	0,5	0,7	0,3	0,9	0,4	0,3	0,58	0,9	0,3	0,16	0,283
	T, °C	20,8	21	20,5	20,9	21,2	21,6	21,8	20,8	21,7	21,8	21,21	21,8	20,5	0,41	0,019
June	H, cm	247	232	218	244	234	274	209	297	285	279	251,9	297,0	209	25,48	0,101
	V, m/sek	0,9	0,8	1	0,9	0,8	0,7	0,9	1,2	1,2	1,1	0,95	1,2	0,7	0,14	0,147
	T, °C	25	24,6	25,4	24,4	25,1	24,6	25,2	25,6	25	24,8	24,97	25,6	24,4	0,30	0,012
July	H, cm	264	254	228	194	237	228	248	346	322	322	264,3	346,0	194	39,42	0,149
	V, m/sek	1	1	0,9	0,7	0,7	1	0,9	1,4	1,4	1,3	1,03	1,4	0,7	0,20	0,196
	T, °C	22,4	22,2	21,8	21,6	22,4	22,5	22,2	21,8	21,4	21,7	22	22,5	21,4	0,34	0,015
August	H, cm	303	302	213	232	227	251	216	286	231	266	252,7	303,0	213	29,24	0,116
	V, m/sek	1,3	1,3	1	1	0,7	0,5	0,8	1,2	1,1	1,1	1	1,3	0,5	0,20	0,200
	T, °C	25,1	25,6	25,4	24,8	24,7	24,6	25,4	25,4	25,2	25,5	25,17	25,6	24,6	0,30	0,012

September	H, cm	187	192	132	136	160	122	173	171	155	118	154,6	192,0	118	22,08	0,143
	V, m/sek	0,3	0,4	0,3	0,2	0,2	0,1	0,2	0,3	0,3	0,2	0,25	0,4	0,1	0,07	0,280
	T, °C	22,5	22,8	22,9	23,2	23,4	23,1	23,2	23,4	23,6	23,1	23,12	23,6	22,5	0,24	0,010
October	H, cm	114	174	145	115	107	110	187	210	128	168	145,8	210,0	107	31,16	0,214
	V, m/sek	0,1	0,4	0,1	0,2	0,1	0,1	0,3	0,3	0,2	0,3	0,21	0,4	0,1	0,09	0,438
	T, °C	22,5	22,6	23,5	23,6	23,1	22,5	22,8	24,2	22,4	23,4	23,06	24,2	22,4	0,50	0,022
November	H, cm	145	121	125	144	120	74	223	225	141	200	151,8	225,0	74	38,52	0,254
	V, m/sek	0,5	0,1	0,2	0,5	0,2	0,05	0,8	0,4	0,3	0,3	0,34	0,8	0,05	0,17	0,513
	T, °C	12,4	12,2	12,4	12,6	13,6	13,5	13,2	12,6	12,4	13,5	12,84	13,6	12,2	0,49	0,038
December	H, cm	117	0	139	187	141	252	222	230	154		160,2	252,0	0	55,58	0,347
	V, m/sek	0,3	0	0,3	0,9	0,3	0,8	0,8	0,4	0,3		0,5	0,9	0	0,25	0,553
	T, °C	10,56	10,8	11	11,2	11,3	11,5	10,2	10,3	11,1		10,9	11,5	10,2	0,37	0,034
Mean	H, cm	186,67	184,25	166,58	182,83	179,75	200,67	208,50	241,08	212,42	217,73	198,05	241,1	166,6	18,03	0,09
	V, m/sek	0,56	0,56	0,53	0,67	0,48	0,57	0,64	0,78	0,68	0,75	0,62	0,8	0,48	0,08	0,13
	T, °C	18,97	19,13	19,25	19,22	19,43	19,33	19,37	19,48	19,38	20,12	19,37	20,1	19,0	0,19	0,01
Max	H, cm	303	302	228	255	295	310	310	346	322	322					
	V, m/sek	1,3	1,3	1	1,3	1,3	1,4	1,4	1,4	1,4	1,3					
	T, °C	25,1	25,6	25,4	24,8	25,1	24,6	25,4	25,6	25,2	25,5					
Min	H, cm	114	0	92	114	107	74	124	160	128	118					
	V, m/sek	0,1	0	0,1	0,1	0,1	0,05	0,2	0,3	0,2	0,2					
	T, °C	10,6	10,8	11,0	11,2	11,3	11,5	10,2	10,3	11,1	13,5					

Note: extreme values are highlighted

Attachment 3 Monthly mean water discharge of Dustlik canal for 1932-2006 years

Year	I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII	Mean
1932	11,7	11,5	1,85	18,9	35	59,8	80,6	72	42,8	32,2	20,6	8,11	32,9
1933	3,88	4,52	0	6,9	34,2	65,3	79,1	70,5	38,3	18,3	13,5	7,73	28,5
1934	4,2	3,23	0	3,7	16,1	55,7	81,2	71	33,7	15,2	13,5	8,15	25,5
1935	3,56	3,81	1,7	22,2	51,5	53,4	73,8	68,4	28,8	17,3	9,5	11,5	28,8
1936	3,86	13,6	0	8,33	33	61,4	79,8	64,8	31,2	17	22,9	8,89	28,7
1937	5,46	7,16	0	10,6	34,2	68	75,1	74,1	36,6	18,9	12,8	16	29,9
1938	21,9	4,65	0	29	63	69	79	77	36	29,7	18,8	14,2	36,9
1939	21,4	0,54	1,15	20,5	56,9	75,6	79,9	79,6	37,1	36,1	23,2	27,9	38,3
1940	24,1	11,9	4,4	44,4	71,3	91,1	104	99,6	50,4	38,6	24,3	4,23	47,4
1941	9,13	12,1	1,47	1,91	83,5	118	127	111	69,8	43,5	33,3	14,7	52,1
1942	13,7	5,93	2,31	59,7	109	128	151	134	54,1	23,3	18,2	18,5	59,8
1943	13,7	5,98	2,31	12,4	61,6	104	120	119	52	23	96	12,2	51,9
1944	14	5	1	7,5	64	104	123	122	53,5	15,7	9,2	20,6	45,0
1945	14,5	4	0	3,1	66,3	105	127	124	55,1	8,8	15,2	22,6	45,5
1946	15,6	0,64	1,8	59,2	96,7	106	124	114	55,3	9,45	21	20,9	52,1
1947	5,1	1,24	3,89	44,3	66,1	108	105	111	55,6	11,7	9,9	24,8	45,6
1948	25,1	0	2,9	10,7	79	115	132	127	52	13,2	16,9	16	49,2
1949	3,83	4,57	0	13,8	41,8	115	140	115	50,7	6,71	5,47	13,7	42,6
1950	16	0	7,4	63,9	108	117	134	118	41,3	19,2	17,3	16,1	54,9
1951	9,6	16,2	2,44	36,5	94,2	127	137	69,4	60,4	15,4	30,7	33,5	52,7
1952	17,1	0	1,41	13,5	75,3	141	130	140	51,4	12,9	18,1	25,6	52,2
1953	21,6	1,75	0	14,7	93,4	129	153	133	48,8	9,6	10	15,1	52,5
1954	4,54	0,98	1,3	2,85	89,1	139	152	134	42,3	15,9	11,3	10,9	50,4
1955	24,3	29	1,47	9,55	98,8	135	166	155	56,6	14,6	11,7	38,9	61,7
1956	18,2	3,41	0	11,8	83,9	164	126	161	62,3	17,7	17,4	40,7	58,9
1957	6,49	6,82	2,29	10,2	130	156	193	178	6,86	24,2	19	31,6	63,7
1958	62,4	1,3	0	184	34,8	160	188	176	83,2	21,7	18	28,4	79,8
1959	9	10	0	18,7	86,8	167	200	173	62,9	22,6	18,6	54,5	68,6
1960	23,5	0	0	6,7	69,2	123	213	200	68	33,9	37,8	66,2	70,1
1961	70,9	37,1	1,32	23,3	112	187	195	164	51,1	36,7	44,7	109	86,0
1962	79,5	5,61	14,1	83	83,2	177	220	195	71	28,6	30,5	37,9	85,5
1963	113	61,4	8,56	75,7	82,2	198	228	159	60,5	28,1	0,62	8,74	85,3
1964	87,9	106	11,9	7,79	59,3	18,2	218	195	55,2	26,6	20,9	56,8	72,0
1965	82,4	20,2	15,2	24,7	146	186	196	147	49,3	28,2	28,3	123	87,2
1966	86,8	15	15,9	61	104	189	223	150	44,3	36,8	39,1	176	95,1
1967	57,8	2	35,8	43	91,4	191	223	193	58	27,5	26,6	157	92,2
1968	128	0	0	31,7	106	183	220	187	70,7	35,6	37,6	123	93,6
1969	15,5	0	0	0	25,3	129	213	186	65,5	34,1	22,9	5,2	58,0
1970	106	27,1	4,02	51,6	125	208	220	152	59	35,8	45,1	182	101,3
1971													
1972													
1973	23,1	0	3,9	47,2	123	208	219	193	66,7	14	76,4		88,6
1974	47	0	3,55	60,4	109	154	147	113	48,3	51,1	93,1	165	82,6
1975	21,4	0	0	44,7	100	129	136	75,3	50	41,8	99,5	173	72,6

1976	69	0	0	3,6	90,8	151	180	136	56,4	39,1	48,3	146	76,7
1977	123	58,4	7,43	58,2	105	120	177	78,8	38,2	19,1	52,7	163	83,4
1978	89,7	11,7	0,18	41,7	78,7	148	219	151	53,2	37,9	27,8	72,6	77,6
1979	19	40,2	7,23	23,7	63,8	148	213	169	49,3	47,9	24,7	128	77,8
1980	190	5,7	2,9	54,7	102	172	217	163	64,4	51	53,1	155	102,6
1981	22,8	6	4,42	26,8	87,4	178	219	160	58,3	45,9	42,5	196	87,3
1982	128	0	16,1	39,6	123	159	158	135	31,7	12,3	0	29,8	69,4
1983	180	45,8	14,1	28,5	79,8	140	190	146	37,9	23,4	4,66	58,3	79,0
1984	168	13,2	1,55	14,9	83,5	155	205	149	27,7	9	28		71,2
1985	140	30,6	143	75	69,2	90,4	197	144	19,1	16,1	1,97	14,6	78,4
1986	120	8,05	3,5	42	84,9	139	213	169	28,3	13,4	6,8	108	78,0
1987	162	3,64		29,7	65	149	208	172	52	15,6		112	80,8
1988	128	0	3,55	44,4	82,5	142	210	169	28,3	14,4	4,8	109	78,0
1989	115		5,42	43	86,7	134	203	157	35,2	9,97	0,97	7,32	72,5
1990	144,7	2,7	7	27,7	66,8	149,2	200,5	164	18,2	7,8	0	108,9	75,1
1991	112,8	0	0	33,5	75,7	142,7	200,7	166,5	14,1	14	2,5	54,3	67,8
1992	145	17,7	4,8	47,6	44,9	135,3	190	190,7	35,8	9,9	13,4	7	70,2
1993	152,8	62	0	34,1	30,8	109,7	195,7	179,9	43,9	28,9	5,5	0	70,3
1994	0	46	63,7	83,3	82,6	148,3	196,5	144,8	97,8	43,8	26	44,5	81,4
1995	107,5	33	6,1	40	70,5	96,9	130,3	90,9	16,6	21,9	45,7	51,3	59,2
1996	98,4	43,1	0	36,9	76,3	116,5	171,1	169,1	44,9	40,3	58	44,2	74,9
1997	109,5	73,5	9,7	45,7	43	87,5	143,3	120,5	22	49,4	62,1	52	68,2
1998	95	73	4,8	49,1	47,9	66,3	160,7	163,9	34,7	46,6	59,9	13,2	67,9
1999	49,8	61,7	46,5	56,8	86,7	98,7	161,8	160,2	43,5	49,5	36,1	3,6	71,2
2000	57,8	69,1	109,9	40	59,6	81,6	99,5	135,1	62,9	58,1	25,3	0	66,6
2001	61	127,4	134	52,2	52,8	86,4	139,3	95,1	32,6	57,2	10	3,3	71,0
2002	48,6	72,3	91,8	23,4	37,2	81,9	127,6	157	41,3	39,1	44,6	7,2	64,3
2003	9,7	110,6	103,9	13,8	54,9	64,1	145,7	167,4	39,3	46,2	15,2	0	64,2
2004	57,6	106	108,8	43,9	63,5	107,6	190,7	174,8	38,1	38,4	24,7	6,7	80,1
2005	54,6	93,4	122,3	67,5	77	124,4	186,9	153,9	31,1	33,5	44,2	54,3	86,9
2006	76,6	65,5	111,4	56,2	85,7	125,2	155,9	155,5	73,6	62,4	47,6	52,1	89,0
	J	F	M	A	M	J	J	A	S	O	N	D	Annual
Mean	92,0	38,8	34,6	42,1	76,2	127,6	179,6	149,1	42,2	32,6	32,9	66,9	76,0
Max	190	127,4	143	83,3	123	208	219	193	97,8	62,4	99,5	196	102,6
Min	0	0	0	3,6	30,8	64,1	99,5	75,3	14,1	7,8	0	0	59,2
Standard deviation	52,7	37,6	48,9	17,0	22,5	33,2	32,0	29,4	17,9	17,0	27,1	61,4	8,7
C_V (coefficient of variation	0,57	0,97	1,41	0,40	0,30	0,26	0,18	0,20	0,42	0,52	0,82	0,92	0,1

Attachment 4 Monthly mean water discharge of YG canal for 1976 -2013 years

Year	I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII	Mean
1976	127	118	0,35	12,2	8,8	219	274	218	59,9	35	11,9	112	99,7
1977	104	36,1	33,9	99,2	200	205	262	143	65,6	33,5	9,9	73	105
1978	106	18,8	4,93	45	70,9	231	290	215	55,8	40,8	13,4	14	92,1
1979	110	16,8	19	10,6	62	244	292	290	59,7	30,6	22,2	72,7	102
1980	195	66,8	9,8	58,4	104	274	310	229	65,3	39,2	42,3	19	117
1981	115	42,3	1,5	35,3	101	277	304	202	55	46	54	115	118
1982	174	12	48	78	210	256	280	209	44,1	25,8	0,2	18,6	113
1983	132	110	46,3	71,5	122	236	310	250	43,8	17,8	30,5	51	134
1984	137	49,3	55,9	9,47	111	253	334	279	46,3	9,87	5	5	112
1985	108	39,3	131	38,9	119	243	315	240	41,1	20,8	18	119	110
1986	114	42,5	26,8	70,6	148	177	286	246	39,7	11	33,7	15,2	113
1987	132	61,1	16,6	40,2	96,3	269	325	285	58,2	21,5	7,95	36,4	112
1988	80	24,5	152	59,6	104	291	349	252	28,7	25,4	29,6	56,3	121
1989	56	16,9	114	177	114	236	330	272	49,4	34,2	5,11	13,9	118
1990	52	20,3	130	141	91,9	264	338	276	58,2	39,2	1,2	50,1	122
1991	57	38,6	114	128	88,3	242	329	266	53,3	41,7	9,1	7,4	114
1992	39	76,8	111	175	17,5	232	326	278	74,6	47,2	20,4	45,7	116
1993	18	36,7	23,7	180	49,4	188	338	269	85,5	64,2	24,9	37,5	106
1994	106	53,2	25,6	154	131	241	328	234	70	85,9	65	22,2	113
1995	66	65,3	37,1	202	190	220	268,7	262	75,4	80,1	115	19,6	133
1996	46	63	12,6	202	190	220	268,7	262	75,4	83,6	177	58,9	138
1997	123	91,6	76,1	166	85,1	194	272,7	232	73,9	122	142	75,8	138
1998	94	68,2	36,6	161	129	137	284	242	94,7	135	162	20,4	130
1999	102	56,2	112	136	216	200	275,8	256	102	145	65,6	31,6	141
2000	94	132	194	118	189	211	234,7	259	130	131	112	18,9	152
2001	111	140	171	152	154	167	204,9	216	98,8	101	73,1	15,7	134
2002	100	112	121	29	88,4	184	210,7	223	92,4	86,1	109	17,3	114
2003	59	137	119	91,2	159	147	213,6	221	116	9,5	4,5	8,8	107
2004	63	108	131	146	208	208	268,7	263	111	96,2	65,5	4,9	139
2005	69	54,8	139	193	200	236	289,4	238	118	85	40,3	73,1	138
2006	112	19,7	145	177	187	204	221,5	222	118	142	113	16,9	140
2007	117	201	186	56,5	143	190	253	235	110	148	114	113	156
2008	86	89,4	82,7	121	88,1	123	157,5	136	85,6	116	83,7	145	109
2009	105	66,2	41,5	79,6	132	134	175,8	199	87,9	96,6	47,7	93	105
2010	31	90	103	143	128	166	232	202	72,7	103	137	121	127
2011	**34,7**	**90,1**	**103,4**	**162,5**	**175,3**	**169,3**	**192,7**	**180,9**	**103,1**	**100,7**	**47,2**	**29,9**	116
2012	**104,5**	**64,4**	**130,8**	**149,2**	**178**	**171,5**	**207,7**	**189,4**	**118,9**	**114,4**	**126,6**	**84,5**	137
2013	**111,8**	**173,8**	**121,9**	**118,2**	**130,5**	**132**	**194,6**	**215,4**	**140,8**	**61**	**47,2**	**95,4**	129

	J	F	M	A	M	J	J	A	S	O	N	D	Annual
Mean	95,4	67,8	79,2	107,4	126,7	214,8	278,6	237,7	74,7	67,1	56,2	49,1	121,1
Max	195	201	194	202	216	291	349	290	141	148	177	145	156
Min	18,0	12,0	0,4	9,5	8,8	123,0	157,5	136,0	28,7	9,5	0,2	4,9	92,1
Standard deviation	38,3	43,5	58,3	60,6	54,2	42,6	48,4	35,2	26,4	44,1	51,1	40,6	15,4
C_V (coefficient of variation	0,40	0,64	0,74	0,56	0,43	0,20	0,17	0,15	0,35	0,66	0,91	0,83	0,13

Attachment 5 Estimated monthly mean water discharge of YG canal for 2010 -2019 years

Month	parameters	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	Сред	Max	Min
January	H, m	315,6	315,4	315,5	315,7	316,0	316,4	316,4	315,8	316,4	315,9	315,9	316,4	315,4
	h, m	5,9	5,7	5,8	6,0	6,3	6,7	6,7	6,1	6,7	6,2	6,2	6,7	5,7
	R, m	3,7	3,6	3,6	3,7	3,9	4,1	4,1	3,8	4,1	3,8	3,8	4,1	3,6
	v, m/sek	0,9	0,9	0,9	0,9	1,0	1,0	1,0	0,9	1,0	0,9	0,9	1,0	0,9
	W, m^2	245,4	232,6	239,0	252,0	272,2	300,2	298,7	255,3	300,2	262,0	265,7	300,2	232,6
	Q, m^3/sek	226,7	210,7	218,6	234,9	260,8	297,7	295,8	239,1	297,7	247,6	253,0	297,7	210,7
February	H, m	315,3	316,0	315,3	315,3	315,4	314,7	315,2	315,5	316,2	316,0	315,5	316,2	314,7
	h, m	5,6	6,3	5,6	5,6	5,7	5,0	5,4	5,8	6,5	6,3	5,8	6,5	5,0
	R, m	3,5	3,9	3,5	3,5	3,6	3,2	3,4	3,6	4,0	3,9	3,6	4,0	3,2
	v, m/sek	0,9	1,0	0,9	0,9	0,9	0,8	0,9	0,9	1,0	1,0	0,9	1,0	0,8
	W, m^2	226,2	272,2	226,2	226,9	232,6	190,0	216,9	239,0	286,0	272,2	238,8	286,0	190,0
	Q, m^3/sek	203,0	260,8	203,0	203,7	210,7	160,1	191,7	218,6	278,9	260,8	219,1	278,9	160,1
March	H, m	315,3	315,8	315,8	315,5	315,6	315,6	316,0	316,1	315,9	316,1	315,8	316,1	315,3
	h, m	5,6	6,1	6,1	5,8	5,9	5,9	6,3	6,4	6,2	6,4	6,1	6,4	5,6
	R, m	3,5	3,8	3,8	3,6	3,7	3,7	3,9	3,9	3,8	3,9	3,8	3,9	3,5
	v, m/sek	0,9	0,9	0,9	0,9	0,9	0,9	1,0	1,0	0,9	1,0	0,9	1,0	0,9
	W, m^2	226,2	258,6	258,6	239,0	245,4	245,4	272,2	275,6	262,0	275,6	255,9	275,6	226,2
	Q, m^3/sek	203,0	243,4	243,4	218,6	226,7	226,7	260,8	265,2	247,6	265,2	240,0	265,2	203,0
April	H, m	315,4	316,0	315,9	315,7	315,6	316,3	315,5	315,6	316,3	314,5	315,7	316,3	314,5
	h, m	5,7	6,3	6,2	6,0	5,9	6,6	5,8	5,9	6,6	4,8	6,0	6,6	4,8
	R, m	3,6	3,9	3,8	3,7	3,7	4,0	3,6	3,7	4,0	3,1	3,7	4,0	3,1
	v, m/sek	0,9	1,0	0,9	0,9	0,9	1,0	0,9	0,9	1,0	0,8	0,9	1,0	0,8
	W, m^2	229,4	272,2	265,4	252,0	245,4	293,0	239,0	242,2	289,5	178,6	250,7	293,0	178,6
	Q, m^3/sek	206,8	260,8	252,0	234,9	226,7	288,2	218,6	222,6	283,5	147,1	234,1	288,2	147,1
May	H, m	315,8	316,0	315,9	315,6	315,8	316,1	316,3	316,3	316,2	315,6	315,9	316,3	315,6
	h, m	6,1	6,3	6,2	5,9	6,1	6,4	6,6	6,6	6,4	5,9	6,2	6,6	5,9
	R, m	3,8	3,9	3,8	3,7	3,8	3,9	4,0	4,0	4,0	3,7	3,9	4,0	3,7
	v, m/sek	0,9	1,0	0,9	0,9	0,9	1,0	1,0	1,0	1,0	0,9	1,0	1,0	0,9
	W, m^2	258,6	272,2	262,0	245,4	258,6	279,0	289,5	289,5	282,5	245,4	268,3	289,5	245,4
	Q, m^3/sek	243,4	260,8	247,6	226,7	243,4	269,7	283,5	283,5	274,3	226,7	255,9	283,5	226,7
June	H, m	315,6	316,0	315,7	315,9	316,2	316,3	316,1	316,2	316,4	316,0	316,0	316,4	315,6
	h, m	5,9	6,3	6,0	6,2	6,5	6,6	6,4	6,5	6,7	6,3	6,3	6,7	5,9
	R, m	3,7	3,9	3,7	3,8	4,0	4,0	3,9	4,0	4,1	3,9	3,9	4,1	3,7
	v, m/sek	0,9	1,0	0,9	0,9	1,0	1,0	1,0	1,0	1,0	1,0	1,0	1,0	0,9
	W, m^2	245,4	272,2	252,0	265,4	286,0	289,5	279,0	286,0	296,6	272,2	274,4	296,6	245,4
	Q, m^3/sek	226,7	260,8	234,9	252,0	278,9	283,5	269,7	278,9	292,9	260,8	263,9	292,9	226,7
July	H, m	315,7	316,0	316,0	315,7	316,3	316,3	316,1	316,5	316,1	315,0	316,0	316,5	315,0

	h, m	5,9	6,3	6,3	6,0	6,6	6,6	6,4	6,8	6,4	5,3	6,3	6,8	5,3
	R, m	3,7	3,9	3,9	3,7	4,0	4,0	3,9	4,1	3,9	3,4	3,9	4,1	3,4
	v, m/sek	0,9	1,0	1,0	0,9	1,0	1,0	1,0	1,0	1,0	0,9	1,0	1,0	0,9
	W, m^2	248,7	272,2	272,2	252,0	289,5	289,5	279,0	303,8	279,0	207,8	269,4	303,8	207,8
	Q, m^3/sek	230,8	260,8	260,8	234,9	283,5	283,5	269,7	302,5	269,7	180,8	257,7	302,5	180,8
August	H, m	315,7	316,0	315,9	316,0	316,2	316,0	316,1	316,5	316,2	316,0	316,0	316,5	315,7
	h, m	6,0	6,3	6,2	6,3	6,4	6,3	6,4	6,8	6,4	6,3	6,3	6,8	6,0
	R, m	3,7	3,9	3,8	3,9	4,0	3,9	3,9	4,1	4,0	3,9	3,9	4,1	3,7
	v, m/sek	0,9	1,0	0,9	1,0	1,0	1,0	1,0	1,0	1,0	1,0	1,0	1,0	0,9
	W, m^2	252,0	272,2	265,4	272,2	282,5	272,2	279,0	303,8	282,5	272,2	275,4	303,8	252,0
	Q, m^3/sek	234,9	260,8	252,0	260,8	274,3	260,8	269,7	302,5	274,3	260,8	265,1	302,5	234,9
September	H, m	315,6	315,5	315,8	315,7	315,5	315,9	315,6	316,0	314,7	314,6	315,5	316,0	314,6
	h, m	5,9	5,8	6,1	6,0	5,8	6,2	5,9	6,3	5,0	4,9	5,8	6,3	4,9
	R, m	3,7	3,6	3,8	3,7	3,6	3,8	3,7	3,9	3,2	3,2	3,6	3,9	3,2
	v, m/sek	0,9	0,9	0,9	0,9	0,9	0,9	0,9	1,0	0,8	0,8	0,9	1,0	0,8
	W, m^2	245,4	239,0	258,6	252,0	239,0	264,0	245,4	268,8	190,0	184,2	238,6	268,8	184,2
	Q, m^3/sek	226,7	218,6	243,4	234,9	218,6	250,2	226,7	256,3	160,1	153,5	218,9	256,3	153,5
October	H, m	315,6	315,9	315,5	315,7	315,1	315,7	315,6	316,2	315,9	316,0	315,7	316,2	315,1
	h, m	5,9	6,2	5,8	6,0	5,4	6,0	5,9	6,4	6,2	6,3	6,0	6,4	5,4
	R, m	3,7	3,8	3,6	3,7	3,4	3,7	3,7	4,0	3,8	3,9	3,7	4,0	3,4
	v, m/sek	0,9	0,9	0,9	0,9	0,9	0,9	0,9	1,0	0,9	1,0	0,9	1,0	0,9
	W, m^2	245,4	265,4	235,8	252,0	213,8	252,0	245,4	282,5	265,4	272,2	253,0	282,5	213,8
	Q, m^3/sek	226,7	252,0	214,6	234,9	188,0	234,9	226,7	274,3	252,0	260,8	236,0	274,3	188,0
November	H, m	315,6	316,2	315,9	316,0	316,2	315,7	316,2	316,2	316,1	316,2	316,0	316,2	315,6
	h, m	5,9	6,4	6,2	6,3	6,5	6,0	6,5	6,4	6,4	6,5	6,3	6,5	5,9
	R, m	3,7	4,0	3,8	3,9	4,0	3,7	4,0	4,0	3,9	4,0	3,9	4,0	3,7
	v, m/sek	0,9	1,0	0,9	1,0	1,0	0,9	1,0	1,0	1,0	1,0	1,0	1,0	0,9
	W, m^2	245,4	282,5	265,4	272,2	286,0	252,0	286,0	282,5	279,0	286,0	273,7	286,0	245,4
	Q, m^3/sek	226,7	274,3	252,0	260,8	278,9	234,9	278,9	274,3	269,7	278,9	262,9	278,9	226,7
December	H, m	315,5	315,5	315,6	315,4	316,1	315,7	316,0	316,5	316,0		315,8	316,5	315,4
	h, m	5,8	5,8	5,9	5,7	6,4	6,0	6,3	6,8	6,3		6,1	6,8	5,7
	R, m	3,6	3,6	3,7	3,6	3,9	3,7	3,9	4,1	3,9		3,8	4,1	3,6
	v, m/sek	0,9	0,9	0,9	0,9	1,0	0,9	1,0	1,0	1,0		0,9	1,0	0,9
	W, m^2	239,0	239,0	245,4	232,6	275,6	252,0	268,8	303,8	272,2		258,7	303,8	232,6
	Q, m^3/sek	218,6	218,6	226,7	210,7	265,2	234,9	256,3	302,5	260,8		243,8	302,5	210,7
Mean	v, m/sek	315,6	315,9	315,7	315,7	315,8	315,9	315,9	316,1	316,0	315,6	315,8	316,1	315,6
	W, m^2	242,3	262,5	253,8	251,1	260,6	264,9	266,6	277,7	273,7	248,0	260,1	277,7	242,3
	Q, m^3/sek	222,8	248,5	237,4	234,0	246,3	252,1	254,0	268,4	263,4	231,2	245,8	268,4	222,8
Max	v, m/sek	315,8	316,2	316,0	316,0	316,3	316,4	316,4	316,5	316,4	316,2	316,2	316,5	315,8
	W, m^2	258,6	282,5	272,2	272,2	289,5	300,2	298,7	303,8	300,2	286,0	286,4	303,8	258,6

	Q, m^3/sek	243,4	274,3	260,8	260,8	283,5	297,7	295,8	302,5	297,7	278,9	279,5	302,5	243,4
Min	v, m/sek	315,3	315,4	315,3	315,3	315,1	314,7	315,2	315,5	314,7	314,5	315,1	315,5	314,5
	W, m^2	226,2	232,6	226,2	226,9	213,8	190,0	216,9	239,0	190,0	178,6	214,0	239,0	178,6
	Q, m^3/sek	203,0	210,7	203,0	203,7	188,0	160,1	191,7	218,6	160,1	147,1	188,6	218,6	147,1

Attachment 6 Physical and chemical parameters of used water at Syrdarya TPP for 2015-2019 years

Physical and chemical parameters of used water at Sirdaryo TPP for 2019

Supply canal

	T, °C	pH	NO_2, mg/l	NO_3, mg/l	NH_4, mg/l	Alcalinity, mgEq/l	Hardness, mgEq/l	Cl_2, mg/l	Fe, mg/l	PO_2	БПК-5, mg/l	н/п	SO_4, mg/l	Suspended solids	TDS, mg/l
Jan	5	8	0,12	9,2	0,21	3,2	13	55,1	0,059	8,7	6,7	0,095	277	35,8	1255
Feb	5,3	8,2	0,085	8,1	0,35	3	13,3	53,3	0,09	7,8	7	0,098	317,6	36	1474
Mar	12	8,3	0,091	8,6	0,38	2,7	13,6	56	0,11	7,2	6,1	0,12	310,5	26	1285
Apr	18	8,2	0,078	8,7	0,28	2,6	14,1	61,2	0,04	7	6,2	0,33	380	38,3	1591
May	21	8,05	0,09	7,8	0,18	2,6	12,2	52,8	0,1	6,1	5,1	0,066	406,7	25,1	1245
Jun	24	8	0,014	8,5	0,19	2,5	12	54,4	0,17	6,5	5,4	0,096	372	40,2	1320
Jul	28	7,9	0,012	8	0,34	2,8	11,9	65,6	0,05	6,5	4,4	0,08	457,4	19	1093
Aug	28	7,75	0,23	6,8	0,24	3	12,6	77,7	0,07	8,6	7,7	0,18	307	18,6	1070
Sep	23	7,73	0,21	7,2	0,19	3,3	11	91	0,09	8	7,3	0,15	271	18,5	1322
Oct	21	7,9	0,044	8,6	0,21	2,8	11,5	88	0,17	9,2	8,5	0,11	297	38,5	1180
Nov	11	7,9	0,035	7,7	0,21	3,1	9,6	77,2	0,17	10,5	8,5	0,07	312,5	21	1265
Dec	12	8,05	0,038	9,3	0,18	3,1	9,6	69,6	0,12	12,6	9,9	0,073	313	10,3	918,3
Mean	17,3	8	0,09	8,2	0,25	2,9	12	66,8	0,1	8,2	6,9	0,12	335,1	27,3	1251,5
Max	28	8,3	0,23	9,3	0,38	3,3	14,1	91	0,17	12,6	9,9	0,33	457,4	40,2	1591

Outlet canal

	T, °C	pH	NO_2, mg/l	NO_3, mg/l	NH_4, mg/l	Alcalinity, mgEq/l	Hardness, mgEq/l	Cl_2, mg/l	Fe, mg/l	PO_2	БПК-5, mg/l	н/п	SO_4, mg/l	Suspended solids	TDS, mg/l
Jan	11	8,1	0,04	9,6	0,24	3,3	9,8	57,9	0,06	12,8	10,7	0,1	301	13	1277
Feb	14	8,2	0,039	9,1	0,38	3,2	9,9	56,6	0,092	11,5	9,3	0,1	347,8	26	1497
Mar	18	8,4	0,046	9,2	0,4	3	12	59,6	0,13	9,5	8,8	0,125	324	44,2	1296,5
Apr	23	8,3	0,24	8,9	0,35	3,3	11	66,6	0,05	8,5	7,6	0,34	412,2	21,8	1693
May	25,3	8,2	0,27	8,6	0,2	2,9	11,8	57,3	0,13	8,9	7,85	0,085	436	19,9	1268
Jun	30	8,15	0,014	9,3	0,22	2,9	12,2	60,2	0,21	6,9	5	0,1	390	22,6	1338
Jul	34	8,05	0,017	8,3	0,39	2,7	12,1	71,6	0,068	6,5	5,7	0,094	474,2	49,8	1169
Aug	34	8	0,099	7,7	0,28	2,7	12,7	80,5	0,087	6,8	5,9	0,2	383	30,9	1106
Sep	28	7,95	0,1	7,9	0,21	2,7	13,8	96,5	0,1	6,9	7,5	0,17	291	45,2	1380
Oct	25	8,1	0,092	8,8	0,22	2,7	13,9	91	0,18	7,6	7	0,12	301	29	1194
Nov	18	8,1	0,09	8,6	0,22	3,2	13,8	80	0,11	8,6	7,6	0,097	389	45	1287
Dec	16,3	8,18	0,14	9,6	0,19	3,4	12,5	73	0,15	9,4	6,93	0,075	324	47,6	945,9
Mean	23	8,1	0,099	8,8	0,27	2,9	12,1	70,9	0,11	8,6	7,5	0,13	364,4	32,9	1288
Max	34	8,4	0,27	9,6	0,4	3,4	13,9	96,5	0,21	12,8	10,7	0,34	474,2	49,8	1693

500 m below

	T, °C	pH		NO_3, mg/l	NH_4, mg/l	Alcalinity,	Hardness,	Cl_2, mg/l	Fe, mg/l	PO_2		н/п	SO_4, mg/l		TDS, mg/l

			NO_2, mg/l			mgEq/l	mgEq/l				БПК-5, mg/l			Suspended solids	
Jan	7	8,1	0,044	8,7	0,28	3	9,4	51,9	0,055	12	9,5	0,048	270	12,5	1306
Feb	7	8,2	0,036	8,5	0,28	3	9	49,5	0,082	11,2	10,1	0,12	298,1	19,4	1560
Mar	13	8,3	0,04	9	0,38	2,8	12	58,5	0,12	9	8,6	0,12	312	39	1290
Apr	20	8,3	0,27	9,5	0,35	3,25	10,7	58,9	0,04	8,4	7,6	0,21	336	21,5	1635
May	22,3	8,2	0,22	8,8	0,2	3	11,4	50,4	0,095	8	7,3	0,068	420	19,4	1205
Jun	24,3	8,2	0,011	8,6	0,21	2,8	11,3	57,9	0,2	6	4,2	0,098	355	21,5	1316
Jul	29	8,1	0,015	8,4	0,35	2,6	11,7	67,8	0,05	6,3	5,3	0,083	455	30,9	1112
Aug	29	8,1	0,09	7,4	0,23	2,5	12,9	73,3	0,13	6,3	5,5	0,22	363	23,8	1222
Sep	25	8,08	0,081	7,9	0,2	2,6	13,6	87,6	0,08	6,6	6,2	0,15	316	37,8	1373
Oct	23	8,15	0,1	9,4	0,26	2,6	13,4	85	0,18	6,6	6,5	0,1	308,5	29	1196
Nov	12	8,2	0,08	8,9	0,24	3,2	13,3	71,1	0,08	8,3	7,2	0,1	270,4	62	1226
Dec	13,3	8,28	0,12	9,2	0,2	3,25	13	65,3	0,088	9,1	7,1	0,06	302	59,4	1081
Mean	19	8,2	0,09	8,7	0,27	2,9	11,8	64,8	0,1	8,15	7,1	0,11	333,8	31,3	1293
Max	29	8,3	0,27	9,5	0,38	3,25	13,6	87,6	0,2	12	10,1	0,22	455	62	1635

Juru Energy

Physical and chemical parameters of used water at Sirdaryo TPP for 2018

Supply canal

	T, °C	pH	NO_2, mg/l	NO_3, mg/l	NH_4, mg/l	Alcalinity, mgEq/l	Hardness, mgEq/l	Cl_2, mg/l	Fe, mg/l	PO_2	БПК-5, mg/l	н/п	SO_4, mg/l	Suspended solids	TDS, mg/l
Jan	4	8,4	0,034	9,5	0,39	2,8	9,3	36,2	0,1	11,6	9,4	0,06	259,4	38,9	1035,7
Feb	3,8	8,5	0,032	9,8	0,42	2,5	8,4	43	0,087	11,4	8,7	0,087	326	24,1	1086
Mar	10	8,4	0,036	8,1	0,3	3,1	9,2	42,2	0,098	8,9	6,5	0,076	263	10,3	1188
Apr	15	8,6	0,033	11,1	0,14	3,2	9,8	60,3	0,077	8,1	5,7	0,08	296,1	36,6	1131
May	20	8,3	0,042	12	0,19	3,1	10,4	59,9	0,12	8,3	5,6	0,08	340,2	18,8	1199
Jun	23	7,9	0,06	10,9	0,4	2,6	10,8	69,9	0,18	6,4	5,4	0,06	349	31,4	1147
Jul	29	7,85	0,03	11,1	0,33	2,9	10,3	68,7	0,1	7,1	4,6	0,06	297,8	16,8	1176
Aug	26,8	7,92	0,025	7,7	0,32	2,4	10,5	80,6	0,06	6,2	5,3	0,16	337	11,6	1185
Sep	23	7,9	0,025	8,1	0,27	2,8	11,4	81,2	0,1	8,3	7,4	0,07	388,2	33,7	1120
Oct	16,3	8	0,016	8,1	0,18	3,1	10,7	87,5	0,06	10,1	6,62	0,071	404,5	35,4	1062,5
Nov	9,3	8,1	0,023	9,1	0,21	2,3	11,1	83	0,11	11,2	7,5	0,04	477	22,6	1491
Dec	6	8,2	0,035	9,3	0,23	3,2	9,5	58,9	0,14	13,7	10,9	0,06	274	12,8	1281
Mean	15,5	8,2	0,033	9,6	0,28	2,8	10,1	64,3	0,1	9,3	7	0,075	334,3	24,4	1175,2
Max	29	8,6	0,06	12	0,42	3,2	11,4	87,5	0,18	13,7	10,9	0,16	477	38,9	1491
Outlet canal															

	T, °C	pH	NO_2, mg/l	NO_3, mg/l	NH_4, mg/l	Alcalinity, mgEq/l	Hardness, mgEq/l	Cl_2, mg/l	Fe, mg/l	PO_2	БПК-5, mg/l	н/п	SO_4, mg/l	Suspended solids	TDS, mg/l
Jan	11	8,5	0,041	11,3	0,44	3,1	9,6	39,5	0,12	11,3	9,6	0,084	296,3	45,7	1106,7
Feb	9,6	8,45	0,033	11,4	0,44	2,6	8,3	45,8	0,095	11,7	8,8	0,092	329	28,3	1097
Mar	17	8,5	0,038	9,2	0,38	3,3	9,6	45,8	0,11	9,5	6,9	0,093	307	10,5	1206
Apr	22	8,6	0,038	11,9	0,2	3,3	9,9	64,7	0,09	7,6	5,9	0,098	310	42,3	1160
May	25	8,35	0,046	13,7	0,21	3,2	10,5	63	0,14	8,6	5,62	0,096	346	21,5	1207
Jun	30	7,9	0,078	13,1	0,49	2,9	11,4	72,8	0,21	6,6	5,6	0,09	370	36,4	1153
Jul	35	7,95	0,037	11,8	0,35	3,1	10,5	73,2	0,13	7,4	4,7	0,08	302	18,5	1186
Aug	31,3	8,2	0,027	8,1	0,34	2,5	10,9	86,8	0,078	6,3	5,3	0,18	359	15,2	1194
Sep	28	8	0,026	8,2	0,23	2,8	12,8	85,5	0,13	8,3	7	0,081	319,5	36,5	1128
Oct	23	8,2	0,017	9,7	0,19	3,2	11,2	90,5	0,076	10,2	6,67	0,086	411,2	37,4	1083,7
Nov	16,3	8,2	0,026	9,6	0,24	2,9	11,4	84,2	0,13	11,8	7,65	0,06	499	25,3	1470
Dec	13	8,35	0,04	10,4	0,25	3,35	9,9	61,9	0,2	13,9	9,9	0,08	293	18	1310
Mean	21,8	8,3	0,037	10,7	0,31	3,02	10,5	67,8	0,13	9,4	7	0,09	345,2	28	1191,8
Max	35	8,6	0,078	13,7	0,49	3,35	12,8	90,5	0,21	13,9	9,9	0,18	499	45,7	1470
500 m below															
	T, °C	pH		NO_3, mg/l	NH_4, mg/l	Alcalinity,	Hardness,	Cl_2, mg/l	Fe, mg/l	PO_2		н/п	SO_4, mg/l		TDS, mg/l

			NO_2, mg/l			mgEq/l	mgEq/l				БПК-5, mg/l			Suspended solids	
Jan	6	8,6	0,036	11,2	0,36	3,1	9,3	34,6	0,1	12,2	10,2	0,09	268,7	45,6	1067,3
Feb	4,5	8,3	0,037	12	0,4	2,7	8,3	46,6	0,078	12,4	9,2	0,091	306	30,7	1170
Mar	12	8,6	0,03	8,4	0,28	3,1	9,3	43,8	0,11	9,6	6,5	0,092	285	10,6	1359
Apr	16	8,7	0,03	12	0,13	3,3	9,7	59,7	0,068	8,2	5,9	0,09	312,6	43,7	1210
May	21	8,4	0,045	12,7	0,18	3	10,2	60,1	0,13	8,6	5,5	0,1	320,2	23,7	1204
Jun	24	8,1	0,06	14	0,4	2,9	11,1	65,2	0,2	6,8	5,6	0,08	395,6	34,6	1180
Jul	28	8	0,03	11,6	0,4	2,9	10,1	71,2	0,12	6,3	4,3	0,06	324	16,4	1075
Aug	26,6	8	0,028	8,9	0,31	2,55	10,2	77,8	0,056	6,7	5,8	0,16	353	15,8	1127
Sep	25	8,05	0,028	8,4	0,2	2,7	10,7	80,69	0,08	8,1	7	0,065	321	37	1134
Oct	18	8	0,016	8,4	0,19	2,95	11	89,4	0,06	10,8	6,77	0,072	393,1	33,9	1073,9
Nov	10	8,15	0,022	9,4	0,23	2,8	11,4	79,4	0,11	12,3	7,9	0,05	443	24,4	1499
Dec	8	8,2	0,036	9,7	0,32	3,2	9,2	54	0,14	12,3	9,7	0,05	252	22,3	1332
Mean	16,6	8,2	0,033	10,6	0,28	2,9	10	63,5	0,1	9,5	7	0,08	331,2	28,2	1202,6
Max	28	8,7	0,06	14	0,4	3,3	11,4	89,4	0,2	12,4	10,2	0,16	443	45,6	1499

Physical and chemical parameters of used water at Sirdaryo TPP for 2017

Supply canal

	T, °C	pH		NO_3, mg/l	NH_4, mg/l	Alcalinity,	Hardness,	Cl_2, mg/l	Fe, mg/l	PO_2		н/п	SO_4, mg/l		TDS, mg/l

			NO_2, mg/l			mgEq/l	mgEq/l				БПК-5, mg/l			Suspended solids	
Jan	6	7,8	0,042	11	0,32	3,2	10	61,4	0,19	10,2	8,6	0,12	493,3	25,5	964,7
Feb	3,5	7,9	0,042	10,5	0,38	3,1	9,8	62,6	0,25	11,4	10,2	0,11	369,2	21,9	921,2
Mar	9,3	7,98	0,028	11,3	0,18	3,2	9,8	66,7	0,1	10,3	7,9	0,1	295,2	34,3	921,5
Apr	16,6	7,89	0,045	10	0,21	3	10,2	73,4	0,17	9,04	7,61	0,08	304,8	25,4	1125,2
May	22	8,1	0,038	11,7	0,14	2,8	9,5	75,2	0,18	8,19	4,53	0,083	284,7	15,2	1162
Jun	26	8	0,024	11,2	0,16	2,6	10	60,5	0,19	7,82	4,6	0,11	310,8	21,2	1012,5
Jul	26,6	7,95	0,034	9,01	0,17	2,78	9,3	49,8	0,061	6,36	4,53	0,07	321,1	55,4	1234
Aug	25,2	8,22	0,036	8,2	0,11	2,53	9	40,7	0,04	6,27	5,32	0,065	321,1	37,2	1089,5
Sep	25,3	8,1	0,022	8,3	0,102	2,72	9,83	47,6	0,07	7,23	5,32	0,105	251	34,3	1209,2
Oct	19,3	8,18	0,025	9,35	0,1	2,69	10,7	61,5	0,13	6,83	4,13	0,1	281,9	47,7	1090,4
Nov	12,3	8,2	0,015	11,2	0,14	3	11,2	52,8	0,17	10,1	5	0,1	341,1	43,9	1110,2
Dec	9	8,52	0,021	11,2	0,14	3,3	10,3	48,6	0,093	10,2	7,9	0,092	308,1	44,3	1228
Mean	17	8,1	0,031	10,2	0,18	2,9	10	58,4	0,14	8,7	6,3	0,094	323,5	33,8	1089
Max	26,6	8,52	0,045	11,7	0,38	3,3	11,2	75,2	0,25	11,4	10,2	0,12	493,3	55,4	1234
Outlet canal															
	T, °C	pH	NO_2, mg/l	NO_3, mg/l	NH_4, mg/l	Alcalinity, mgEq/l	Hardness, mgEq/l	Cl_2, mg/l	Fe, mg/l	PO_2	БПК-5, mg/l	н/п	SO_4, mg/l	Suspended solids	TDS, mg/l

Jan	12	7,9	0,042	12	0,34	3,4	10,1	65,2	0,22	10,6	9,3	0,13	502,6	28,2	976,2
Feb	12	8	0,046	11,7	0,4	3,4	9,9	66,8	0,27	10,9	10,8	0,113	374,5	25,9	936,6
Mar	16,3	8,1	0,034	12,6	0,23	3,3	9,9	69,7	0,13	10,1	8,4	0,11	300,5	35,4	925,8
Apr	19	8	0,047	11	0,23	3,3	10,4	74,9	0,18	9,98	7,87	0,1	309,4	26,4	1138,4
May	28,1	8,2	0,041	12	0,18	3,1	9,9	78,3	0,2	8,41	7,4	0,1	304,6	18	1181,5
Jun	31	8,15	0,025	11,9	0,18	2,85	11,5	62,3	0,22	7,85	4,7	0,13	312,6	23,8	1016
Jul	32	8	0,036	9,37	0,19	2,88	9,5	51,2	0,07	6,62	4,72	0,08	329,6	58	1251,3
Aug	31,6	8,18	0,049	9,2	0,13	2,73	9,36	48	0,05	6,8	5,66	0,09	267,1	40,8	1133,8
Sep	30,6	8,2	0,026	8,8	0,12	2,92	10,22	55	0,087	7,78	5,72	0,12	268	39,2	1227,4
Oct	22,5	8,28	0,03	11,2	0,12	2,75	11,3	64	0,146	7,13	4,53	0,11	288,7	51,7	1106,8
Nov	19,3	8,39	0,019	12,2	0,16	3,2	11,7	64	0,186	10,1	5,1	0,115	352,9	52,7	1127,3
Dec	15,3	8,63	0,026	11,8	0,18	3,6	10,3	51,4	0,102	10,1	7,7	0,12	356,4	46,4	1431
Mean	22,5	8,2	0,035	11,1	0,2	3,1	10,3	62,6	0,15	8,9	6,8	0,11	331	37,2	1121
Max	32	8,63	0,049	12,6	0,4	3,6	11,7	78,3	0,27	10,9	10,8	0,13	502,6	58	1431
500 m below															
	T, °C	pH	NO_2, mg/l	NO_3, mg/l	NH_4, mg/l	Alcalinity, mgEq/l	Hardness, mgEq/l	Cl_2, mg/l	Fe, mg/l	PO_2	БПК-5, mg/l	н/п	SO_4, mg/l	Suspended solids	TDS, mg/l
Jan	6	7,9	0,039	11,6	0,34	3,3	9,8	58,6	0,17	11	9,2	0,13	487,6	28,8	1022
Feb	6,3	8,3	0,047	10,8	0,36	3	9,6	69,3	0,26	12,4	10,6	0,12	379	27,3	931,5

Mar	9,3	8,16	0,049	12,5	0,2	3	10,1	74,1	0,14	9,8	8,5	0,1	300,2	37,3	930,7
Apr	15,6	8,1	0,046	11,6	0,22	3,3	10,1	72,9	0,17	9,15	7,53	0,072	304,2	28,1	1131,5
May	22,3	8,2	0,038	11,9	0,12	3	9,3	76,5	0,19	8,74	7,7	0,13	326,8	18,1	1180
Jun	27	8,2	0,026	12,4	0,2	2,8	12	64	0,21	7,8	4,75	0,12	321,5	24	1021,2
Jul	27	8,1	0,072	9,3	0,17	2,78	8,7	45,1	0,055	6,77	4,99	0,13	322,3	59,7	1161
Aug	26,5	8,2	0,055	8,76	0,12	2,9	8,7	38,6	0,047	6,7	5,53	0,076	259,2	40,2	1098,1
Sep	26,8	8,2	0,024	8,22	0,13	2,85	9,47	48,3	0,084	7,82	5,5	0,1	258,8	37,3	1140,8
Oct	19	8,28	0,03	10,5	0,14	2,73	11,13	63,2	0,13	6,96	4,12	0,13	294,2	53,2	1116,5
Nov	13,3	8,36	0,016	11,3	0,14	2,98	11,1	63,2	0,15	10,2	4,89	0,125	334,8	48,9	1179
Dec	10,6	8,66	0,024	11,6	0,16	3,2	10,2	50,2	0,083	10,4	8,3	0,114	346,3	44,8	1320
Mean	17,5	8,2	0,039	10,9	0,19	3	10	60,3	0,14	9	6,8	0,11	328	37,3	1102,7
Max	27	8,66	0,072	12,5	0,36	3,3	12	76,5	0,26	12,4	10,6	0,13	487,6	59,7	1320

Physical and chemical parameters of used water at Sirdaryo TPP for 2016

Supply canal

	T, °C	pH	NO_2, mg/l	NO_3, mg/l	NH_4, mg/l	Alcalinity, mgEq/l	Hardness, mgEq/l	Cl_2, mg/l	Fe, mg/l	PO_2	БПК-5, mg/l	н/п	SO_4, mg/l	Suspended solids	TDS, mg/l
Jan	4	7,8	0,038	9,9	0,32	3,3	10	61,9	0,09	10,3	7,9	0,05	426,5	30,5	1083
Feb	7,3	7,76	0,04	18,6	0,22	3,08	10	64,8	0,12	11,23	8,2	0,089	384,3	26,8	991,1

Mar	11,6	8,1	0,033	12,4	0,13	3,3	10,6	73,2	0,17	8	4,3	0,11	355,7	32,7	914,7
Apr	16,3	8,05	0,027	12,1	0,1	3,2	10,5	72,3	0,09	7,29	5,14	0,076	273,2	53,9	904,5
May	21,6	8,03	0,039	10,3	0,16	3	11,5	75,2	0,1	7,01	4,5	0,067	350,3	47,8	1150,3
Jun	27	8,1	0,038	11,4	0,2	2,87	12,1	78,6	0,19	7,48	4,12	0,087	469,6	42,4	955,2
Jul	29	8	0,031	12,7	0,1	2,9	12,2	78	0,16	7,2	4,27	0,082	402,1	41,2	904,4
Aug	27,3	7,25	0,027	9,96	0,24	2,43	11,4	78,1	0,11	7,15	4,33	0,063	484,2	102,5	1031
Sep	26	8	0,024	12,2	0,18	2,76	12,3	75,6	0,14	7,33	4	0,079	288,6	39,3	960,7
Oct	11,5	7,8	0,023	11	0,19	3,4	10,5	75,1	0,21	7,2	4,42	0,11	363,2	34,7	941,2
Nov	5,5	7,85	0,024	10,8	0,3	3,3	10,8	80,8	0,23	10,2	7,4	0,1	423,7	39,6	1026,9
Dec	5,3	7,85	0,046	12,5	0,45	3,3	10,9	72,8	0,17	12,26	9,36	0,19	365,6	41,7	1006,7
Mean	16	7,9		12	0,21			73,9	0,15			0,092	382,2		989,1
Max	29	8,1	0,046	18,6	0,45	3,4	12,3	80,8	0,23	12,26	9,36	0,19	484,2	102,5	1150,3
Outlet canal															
	T, °C	pH	NO_2, mg/l	NO_3, mg/l	NH_4, mg/l	Alcalinity, mgEq/l	Hardness, mgEq/l	Cl_2, mg/l	Fe, mg/l	PO_2	БПК-5, mg/l	н/п	SO_4, mg/l	Suspended solids	TDS, mg/l
Jan	11	8	0,03	9,6	0,36	3,35	10	64,6	0,1	10,2	7,9	0,061	436,4	34,1	1103
Feb	13,3	7,8	0,041	19,7	0,29	3,08	10,3	66,6	0,16	10,8	8,27	0,101	395,8	32,8	1014
Mar	17,3	8,2	0,03	13	0,2	3,5	11,1	76,1	0,23	8,27	4,4	0,121	369	34,9	942,4
Apr	21	7,97	0,029	12,6	0,11	3,3	10	74,7	0,096	10,83	5,34	0,087	279,3	72,4	929,8

May	25,6	8,1	0,04	11,3	0,12	3,2	11,6	74,3	0,12	6,98	4,36	0,079	389,7	52,6	1201,9
Jun	31,3	8,18	0,04	12,2	0,24	2,92	12	80,1	0,21	7,52	4,21	0,099	477	45,7	978,9
Jul	35,3	8	0,033	14,3	0,12	2,98	12,6	82,3	0,17	7,94	4,61	0,094	407,9	43	916,3
Aug	33,6	7,75	0,03	10,8	0,27	2,53	12	80,4	0,14	7,41	4,64	0,075	488,9	104,4	1050,8
Sep	31,3	8,02	0,027	13,5	0,22	2,86	11,7	78,9	0,16	7,4	4,2	0,09	300	43	984
Oct	16,8	8	0,024	11,9	0,2	3,35	12	77,2	0,24	7,43	4,68	0,112	368,5	36,2	946,6
Nov	13,3	7,8	0,0245	11,2	0,35	3,5	11,3	7,8	0,25	11,3	7,28	0,11	427,3	42,3	1029
Dec	14,3	7,91	0,047	13	0,46	3,4	11,5	74,4	0,18	11,8	9,14	0,195	369,1	42,6	1008,7
Mean	22,008333	7,9775	0,033	12,758333	0,245	3,1641667	11,341667	69,783333	0,1713333	8,99	5,7525	0,102	392,40833	48,666667	1008,7833
Max	35,3	8,2	0,047	19,7	0,46	3,5	12,6	82,3	0,25	11,8	9,14	0,195	488,9	104,4	1201,9
500 m below															
	T, °C	pH	NO_2, mg/l	NO_3, mg/l	NH_4, mg/l	Alcalinity, mgEq/l	Hardness, mgEq/l	Cl_2, mg/l	Fe, mg/l	PO_2	БПК-5, mg/l	н/п	SO_4, mg/l	Suspended solids	TDS, mg/l
Jan	6,3	8,1	0,04	8,8	0,36	3,4	10	58,1	0,1	10,1	7,1	0,05	427,5	30,7	1064
Feb	8,2	7,9	0,037	19,5	0,24	2,83	10,6	61,7	0,09	10,93	8,03	0,068	381	24,6	996,4
Mar	13	8,1	0,036	12,1	0,15	3,36	10,1	69,1	0,14	7,7	4,47	0,097	355,5	30,9	940
Apr	15	7,93	0,041	12,3	0,11	3,18	10,5	73,3	0,08	11,1	5,47	0,077	291	61,7	956
May	26,6	8,05	0,042	10,4	0,16	3	11,6	75,6	0,08	6,02	3,75	0,067	396,5	50,1	1179,8
Jun	28,6	8,17	0,036	12,5	0,23	2,77	11,1	75,7	0,18	7,43	4,06	0,091	459,6	40	944,8

Jul	31	8,05	0,031	12,9	0,09	2,82	12,3	79,8	0,14	7,08	4,07	0,078	403	39,4	899,4
Aug	29	7,85	0,029	10,35	0,2	2,46	11	79,7	0,12	7,65	4,65	0,08	472,4	100,5	1027
Sep	27,3	7,96	0,022	13,3	0,17	2,81	11,46	73,9	0,156	7,19	3,98	0,078	287,2	39	963,2
Oct	12	7,95	0,027	13,5	0,21	3,3	12,5	7,95	0,26	7,6	4,46	0,12	327,9	31,5	951,5
Nov	8,1	7,85	0,03	13	0,31	3,35	11	89,9	0,24	12,6	7,26	0,125	429,6	41,5	1031,5
Dec	8	7,83	0,049	13,9	0,51	3,3	11,1	69,9	0,19	12,4	9,96	0,16	386,3	41,5	1011,5
Mean	17,758333	7,9783333	0,035	12,7125	0,2283333	3,0483333	11,105	67,8875	0,148	8,9833333	5,6005	0,0909167	384,79167	44,283333	997,09167
Max	31	8,17	0,049	19,5	0,51	3,4	12,5	89,9	0,26	12,6	9,96	0,16	472,4	100,5	1179,8
Т Ч Е Т															

Physical and chemical parameters of used water at Sirdaryo TPP for 2015

Supply canal															
	T, °C	pH	NO_2, mg/l	NO_3, mg/l	NH_4, mg/l	Alcalinity, mgEq/l	Hardness, mgEq/l	Cl_2, mg/l	Fe, mg/l	PO_2	БПК-5, mg/l	н/п	SO_4, mg/l	Suspended solids	TDS, mg/l
Jan	3	8,17	0,033	15,8	0,16	3,05	10	60,9	0,205	9,53	3,94	0,094	491	17,7	1020,7
Feb	3,7	8,13	0,029	17,3	0,19	3,28	9,9	62,6	0,21	9,18	4,12	0,097	441,7	24,9	1010,7
Mar	5	8	0,026	17,4	0,14	3,1	8	69,3	0,24	8,94	3,8	0,1	422,8	33,4	930
Apr	15,7	7,95	0,033	14,1	0,24	3,53	11,1	67,9	0,22	7,84	3,44	0,096	437,2	27,4	1112,7
May	20	8,28	0,039	17	0,1	3,25	11,4	74	0,2	7,85	3,96	0,1	447,2	24,6	1022
Jun	22,3	8,13	0,063	16,6	0,24	3,7	12,8	87,1	0,26	9,6	4,23	0,103	551,7	55,1	1389

Jul	26,3	8,24	0,032	14,2	0,19	2,65	12,3	104	0,17	8,56	4,44	0,094	514,4	38	514,4
Aug	24,7	8,09	0,03	14,3	0,17	2,72	11,9	76,3	0,19	8,5	3,97	0,087	435,9	26,9	1031
Sep	21	8	0,025	16,9	0,12	2,71	12,9	95,8	0,12	7,6	4,94	0,099	412,2	46,6	991,6
Oct	20	8	0,022	12	0,11	2,68	12,6	74	0,11	7,46	3,68	0,081	299,2	33,7	952
Nov	9,8	7,78	0,027	9,71	0,16	2,66	11,1	78,7	0,11	6,97	3,5	0,1	275,67	40,4	852,45
Dec	4,7	8,05	0,03	12,5	0,24	3,15	9,93	69,8	0,15	9,35	4,53	0,1	409,2	33,6	1022,6
Mean	14,7	8,07	0,03	14,8	0,17	3,04	11,2	76,7	0,18	8,4	4	0,096	428,8	33,5	987,4
Max	26,3	8,28	0,063	17,4	0,24	3,7	12,9	104	0,26	9,6	4,94	0,103	551,7	55,1	1389
Outlet canal															
	T, °C	pH	NO_2, mg/l	NO_3, mg/l	NH_4, mg/l	Alcalinity, mgEq/l	Hardness, mgEq/l	Cl_2, mg/l	Fe, mg/l	PO_2	БПК-5, mg/l	н/п	SO_4, mg/l	Suspended solids	TDS, mg/l
Jan	11	8,23	0,037	17,6	0,19	3,15	10	65,8	0,22	9,9	4,06	0,107	501,9	20,7	1036
Feb	12	8,14	0,031	17,6	0,23	3,3	10	72	0,23	9,43	4,2	0,11	448,1	26,8	1034,7
Mar	14	8,05	0,032	17,8	0,24	3,1	8	69,3	0,256	9	4,23	0,114	428,9	37	958
Apr	22	7,98	0,039	14,4	0,26	3,72	11,45	68,5	0,26	7,85	3,46	0,11	441,4	31,4	1132,7
May	26,7	8,34	0,042	17,2	0,14	3,4	11,5	76,6	0,22	8	4,11	0,114	454,8	30,6	1043,3
Jun	29,7	8,24	0,068	17	0,272	3,99	13,1	91,1	0,29	10	4,46	0,114	567,1	62,6	1409,7
Jul	32,2	8,29	0,038	14,7	0,24	2,73	12,5	109,2	0,2	8,74	4,51	0,108	533,1	44,4	1241,8
Aug	31	8,13	0,035	15,3	0,22	2,85	12,2	80,1	0,21	8,7	4,13	0,1	442,4	31,7	1038,3

Sep	25,6	8,15	0,029	18,8	0,15	2,81	13,4	100,2	0,14	7,85	4,84	0,113	431,4	49	1008,2
Oct	23	8,15	0,028	132	0,125	3	13,2	73,5	0,12	6,29	3,88	0,086	304,6	36,2	989,2
Nov	11	7,4	0,039	9,4	0,23	2,7	10	81	0,11	7,1	3,63	0,114	288,1	46,05	875,45
Dec	9,4	8,16	0,035	13,5	0,26	3,26	10	70,4	0,2	9,47	4,77	0,113	419,7	35,4	1048,9
Mean	21	8,105	0,038	15,5	0,21	3,2	11,3	79,8	0,2	8,5	4,2	0,11	438,5	37,6	1068
Max	32,2	8,34	0,068	132	0,272	3,99	13,4	109,2	0,29	10	4,84	0,114	567,1	62,6	1409,7
500 m below															
	T, °C	pH	NO_2, mg/l	NO_3, mg/l	NH_4, mg/l	Alcalinity, mgEq/l	Hardness, mgEq/l	Cl_2, mg/l	Fe, mg/l	PO_2	БПК-5, mg/l	н/п	SO_4, mg/l	Suspended solids	TDS, mg/l
Jan	3,7	8,13	0,033	15,8	0,15	3	9,7	58,6	0,2	9,69	3,84	0,092	480,2	19,6	929,3
Feb	5,3	8,05	0,031	16,8	0,2	3,2	10	61,3	0,2	8,65	3,97	0,095	426,6	24,2	1014
Mar	8	8,1	0,02	17,4	0,16	3,05	9,5	60	0,22	8,9	3,82	0,118	420,9	36,8	1011
Apr	17,7	7,95	0,037	14	0,205	3,4	10,3	67	0,21	8,2	3,42	0,107	420,3	26,3	1101,7
May	21,7	8,27	0,031	16,9	0,087	3,18	11,2	73,6	0,2	7,34	3,88	0,087	426,5	23	1033
Jun	29,7	8,2	0,06	16,4	0,25	3,72	12,5	80,3	0,24	9,6	4,3	0,1	543,2	53,6	1275,7
Jul	28	8,25	0,03	13,9	0,19	2,62	11,9	95,5	0,16	8,51	4,27	0,098	518,1	35,4	1180,3
Aug	26,7	8,06	0,03	14,2	0,18	2,72	11,7	76,7	0,18	8,42	4	0,08	433,5	27,6	1024
Sep	22,6	8	0,022	17,2	0,11	2,8	12,4	95,7	0,13	7,61	4,76	0,083	414,4	45,5	971,7
Oct	20,6	8,1	0,023	10,4	0,1	2,7	12,7	73,3	0,1	6,56	3,39	0,075	291	30,1	943,1

Nov	9	7,41	0,06	5,9	0,18	3	13	84	0,099	7,14	3,33	0,092	257,1	41,4	874,2
Dec	5,6	8,8	0,034	12,7	0,29	3	10	67,3	0,17	9,98	4,8	0,12	394,6	32,2	1018,8
Mean	16,6	8,11	0,034	14,3	0,17	3	11,2	74,4	0,18	8,4	4	0,096	418,9	33	1031,4
Max	29,7	8,8	0,06	17,4	0,29	3,72	13	95,7	0,24	9,98	4,8	0,12	543,2	53,6	1275,7

Note: colored are indicate maximum values

Source: Syrdarya TPP

Attachment 7 Physical and chemical parameters of Dustlik canal for 2019 year

Region	Sampling point		Physical and chemical parameters of water																	
			Date	t, C	pH, -	Hardness	Oxygen demand	Solid content	NH4, mg/l	NO2, mg/l	NO3, mg/l	SO4, mg/l	Cl2, mg/l	PO4, mg/l	НП	Спав	Fe, mg/l	Suspended solids	BOD 5	COD
Sydrarya region	Dustlik canal	head	10.jan	12,5	8,35	3,25	4,12	920	0	0,03	0,82	140	74	0,23	0,05	0	0	110	21	120
		exit	11.1	12,2	7,98	3,48	4,15	770	0	0,04	0,45	190	98,2	0,32	0,07	0,04	0	124	24	140
	Dustlik canal	head	11.2	10,2	8,37	3,25	4,22	915	1,1	0,03	0,83	150	85,4	0,26	0,35	0	0	104	24	136
		exit	12.2	10,5	7,94	3,48	4,26	928	1,25	0,06	0,64	160	96,7	0,35	0,039	0,057	0	120	27	157
	Dustlik canal	head	14.3	18	7,2	2,9	3,96	804	0,22	0,05	o,1	180	70,4	1,1	0,045	0	0	110	25	100
		exit	15.3	18,2	7,4	3,01	4,1	720	0,21	0,9	1,1	201	66,2	0,8	0,04	0,07	0	115	28	110
	Dustlik canal	head	17.4	16	7,24	2,92	3,94	814	0,25	0,07	0,14	165	70,5	1,16	0,042	0	0	120	20	87
		exit	23.4	16,2	7,43	3,05	4,15	728	0,27	0,95	1,13	192	65,2	0,84	0,047	0,07	0	135	24	98
	Dustlik canal	head	18.6	18,2	7,26	2,72	4,9	825	0,45	0,08	0,16	168	75	1,19	0,047	0	0	123	22	89
		exit	20.6	18,8	7,46	3,25	5,15	740	0,37	0,97	1,17	210	68	0,86	0,049	0,075	0	137	28	110
	Dustlik canal	head	16.7	19,2	7,26	5,76	7,15	830	0,42	0,07	1,15	110	78	128	0,37	0	0	82	12	60
		exit	17.7	19,5	7,54	6,35	7,35	860	0,47	0,65	2,1	145	85	1,62	0,046	0,086	0	105	15	75

	Dustlik canal	head	8.8	20,2	7,28	6,1	14	841	0,5	0,06	2,1	119	75	0,3	0,04	0	0,31	52	9,6	41
		exit	9.8	20,5	7,58	6,04	11,3	1130	0,65	0,08	2,5	148	76,4	0,48	0,06	0,045	0,4	66	11	34
	Dustlik canal	head	12.9	19,5	7,88	12,4	5,4	795	0,46	0,07	5,3	141,3	80,3	0,22	0,055	0	0,41	30,6	14	66
		exit	13.9	20,2	7,82	18,2	7,2	1216	0,56	0,06	2,81	135	86	1,64	0,044	0,95	0,53	52	25,2	45
	Dustlik canal	head	17.10	19,5	7,88	12,4	4,8	1059	0,46	0,06	4,6	141,3	80,3	0,22	0,05	0	0,34	30,6	14	69
		exit	18.10	20,2	7,82	18,2	7,2	1216	0,56	0,09	2,8	135	86	1,64	0,04	0,95	0,58	52	25,2	43
	Dustlik canal	head	18.11	10,5	8	3,2	4,2	910	1,9	0,11	0,92	162	54,2	0,6	0,042	0	0,45	134	68	172
		exit	19.11	10,8	7,9	4,4	5,1	889	1,8	1,04	2,3	247	68,7	0,63	0,078	0	0,68	88	78	154
	Dustlik canal	head	13.12	10,5	7,6	3,3	5,1	920	1,2	0,08	4,9	76,9	45,6	0,29	0,07	0	0	106	31	135
		exit	13.12	10,7	8,1	3,49	5,3	877	1,6	0,09	5,8	92,3	48,5	0,9	0,055	0,03	0	110	37	144

Note: head – upstream, exit – downstream sampling points

Source: Syrdarya Ecology and Environmental protection Region Administration

Attachment 8 Some physical and chemical parameters of YG canal for 2019 year

№	Water quality parameters	MPC	Yuzhny-Golodnostepsky canal
1	Color		colorless
2	Smell		odourless
3	Temperature, ^{o}C		17,5
4	pH	6,5-8,5	7,2
5	TDS, mg/l	1000	105
6	NO3, mg/l	0,02	0,05
7	SO4, mg/l	100	173,4
8	NH4, mg/l	0,5	1,5
9	Fe, mg/l	0,05	0
10	Cl2, mg/l	300	39
11	COD ,mg/l	15	96
12	PO2, mg/l	0,3	0

Source: Syrdarya Ecology and Environmental protection Region Administration

APPENDIX O– ZOOPLANKTON & PHYTOPLANKTON SURVEY REPORT

Juru Energy

ZOOPLANKTON AND PHYTOPLANKTON SURVEY REPORT

UZBEKISTAN COMBINED CYCLE POWER PROJECT:

LOCAL SUPPORT IN THE DEVELOPMENT, SUBMISSION AND APPROVAL OF ESIA

CLIENT: 5CAPITALS

Date: May 2020

Juru Energy Ltd.
Suite 1, One George Yard, London
United Kingdom, EC3V 9DF
T: +44 207 859 4028,
F: +44 207 691 9406
E: b.gafurov@juruenergy.com

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Abbreviations/Acronyms

AMB – Active metabolism of biocenosis (status of ecological status)

BPI – Biotic peripheral index

C – Subdominant community view.

D – Dominant community view

O – oligo, β- and α- mesosaprobic levels of pollution of a reservoir by organic substances

SI – Saprobity index

TPP – Thermal Power Plant

YG canal – Yuzhny-Golodnostepsky canal

1. Introduction

Hydrobiology is a complex biological science that studies aquatic ecosystems and their components, which are essential for understanding the features and functions of hydrobionts – aquatic organisms that form communities (biocenoses) that inhabit the water column (plankton), the soil column and surface (benthos), biofouling (periphyton) and macrophytes.

The primary link in the life cycle in Yuzhny-Golodnostepsky canal (hereinafter referred to as "the YG canal") is represented by plant organisms of plankton (single-celled microscopic algae), phytoplankton, that forms the basis of the biological productivity of the canal and largely determines the functioning of aquatic ecosystems and the quality of their waters, i.e. phytoplankton is the main producer of primary organic matter and oxygen, because of which all living matter exists in a body of water.

Zooplankton (colorless flagellates, ciliates, rotifers, cladocerans and copepods) consuming phytoplankton, bacteria and detritus, is itself an essential component in the diet of fish and carnivorous invertebrates, that is, hydrobiological studies of aquatic biocenoses make it possible to determine and predict the formation of the natural forage base of the reservoir. Zooplankton also serves as a good indicator of water pollution, both during a comparative analysis of the species composition and quantitative growth in parts of canal water with varying degrees of anthropogenic impact, and when observing changes in the species composition over an extended time period. Changes in the environment can affect the change in species composition, the ratio of taxonomic groups, and quantitative indicators of zooplankton.

Periphyton, as an integral part of aquatic ecosystems, undergoes various changes with it, due to various natural and anthropogenic factors, which is expressed in spatial and temporal successions of periphyton communities. Due to its confinement to the substrate, periphyton, as an object of observation, allows a wide possibility to experiment in natural conditions and also allows one to judge the average pollution of the water mass for a certain period of time preceding sampling.

The purpose of conducting hydrobiological research is as follows:

- To collect necessary and sufficient data for a comprehensive assessment of the impact of planned Project on the canal's plankton ecology (phytoplankton, zooplankton, periphyton and ichthyofauna), as well as the impact of the environment on the CCGT;
- To compare the state of aquatic ecosystems given the natural and technogenic conditions of the area;
- To assess potential environmental risks for hydrobionts (aquatic organisms).

During the site visit on March, 20, the following tasks were performed:

- Determined the initial state of planktonic and periphyton communities;
- Assessed organic pollution level of water (determined the level of saprobity using the index and bioindication properties of periphyton and zooplankton species);
- Identified the absence of harmful periphyton types, which upon biofouling on submerged parts of technical objects can lead to their efficiency decrease;
- Determined the absence/presence of endemic or rare species; and
- Evaluated the potential fish productivity of the YG canal.

2. Sampling points

To perform hydrobiological research the survey determined 4 locations (sampling points) on YG canal for collection of zooplankton, phytoplankton and periphyton samples. Coordinates of the locations are given in the table below.

Table 1 Sampling points and their coordinates (Source: 5Capitals)

Sampling point no.	Coordinates
P1	40•13'59.27 N 69•6'17.41E
P2	40•13'.51.22N 69•6'28.60E
P3	40•13'45.00N 69•6'36.60E
P4	40•14'4.50N 69•6'8.25E

At the time of sampling, the YG canal had moderate filling, the color of the water ranged from green to grayish-green, the transparency was 0.35-1.2 m (according to Secchi disk), the nature of bottom sediments was a dark gray silt with sediments of sand and clay.

The littoral zone of the canal was overgrown with common reed (*Phragmites communis*) up to 70-80%, reeds (*Scirpus lacustris*) up to 10-15%, cattail (*Tupha latifolia*) 10%. The macrophyte thickets were moderately well grown and covered the bottom of the littoral strip (up to 0.5-1 m from the coast) and were represented by separate small bunches or spots-clusters of stonewort (*Chara sp.*) – 70-80%, fennel-leaved pondweed (*Potamogetom crispus*), and meakin (*Meriophyllum spicatum*) – 20-30%.

In total 11 hydrobiological samples were collected, including 4 samples of phytoplankton, 4 samples of zooplankton, and 3 samples for periphyton.

Table 2 Detailed description of the sampling points on canal (March, 20)

Sampling date	Sampling point / Time	Location	Depth, m	Secchi disk transparency, m	Water temp., °C	Clay	Vegetation
20 Mar, 2020	P1/15:40	YG canal, to the right of Syrdarya TPP; 1-1.5 m from the canal bank (Fig. 1 and 2)	1.0	0.45-0.50	13	clay, gray silt; thickets of macrophytes (chara[1], etc.)	Along the banks of an old cattail, reed
20 Mar, 2020	P2/16:19	YG canal, of Syrdarya TPP; 250m from P1 (Fig. 3 and 4)	1.5	0.35-0.40	13	gray silt, clay bed; thickets of macrophytes (chara, etc.)	Along the banks of the thicket of old cattail and reed
20 Mar, 2020	P3/16:40	YG canal, to the right of Syrdarya TPP; 250m from P2 (Fig. 5 and 6)	1.2	1.2	12	dark gray silts, clay; thickets of macrophytes	Debris and thickets of old cattail and reeds along the shore
20 Mar, 2020	P4/17:05	YG canal, to the right of Syrdarya TPP; 250m from P2, gateway (Figure 4)	1.0	0.95	12	dark gray silts, clay; thickets of macrophytes	Along the coast, scraps and fragments of an old cattail and reeds

[1] Chara is a calcephilic plant, which are able to accumulate calcium in large quantities. Developing in large quantities mainly on littoral areas, at depths of 0.2–4.5 m, they form a rather dense filtration lattice and, to a greater extent than other wetland vegetation, create favorable conditions for the accumulation of silt, which we observed at the sampling locations on canal.

Views of sampling locations are given below.

Figure 1 Sampling point 1 (P1): A - side view

Figure 2 Sampling point 1 (P1): B – place of sampling

Figure 3 Sampling point 2 (P2): A - view from above

Figure 4 Sampling point 2 (P2): B - place of sampling

Figure 5 Sampling point 3 (P3): view A

Figure 6 Sampling point 3 (P3): view B

Figure 7 Sampling point 4 (P4): view A

Figure 8 Sampling point 4 (P4): view B

3. Phytoplankton and periphyton

Phytoplankton are microscopic plant organisms that freely float in the water column and live in all types of canals with sufficient amount of light and dissolved mineral substances. Phytoplankton produce organic substances and oxygen during photosynthesis from mineral substances dissolved in water, thereby ensuring respiration of aquatic organisms. Phytoplankton are a good marker for water quality and determine the productivity of the canal.

Depending on the habitat in the canal, several ecological groups of algae are distinguished:

Phytoplankton – microscopic algae that inhabits in suspension in the water column. There are following forms of phytoplankton:

- *true planktonic (euplanktonic)* species spend their whole lives in suspension. The process of its assimilation and reproduction occur in water column, they sink to the bottom only in a dead state;
- *temporary planktonic* forms also inhabit in the water column, but spend part of their life cycle (at the stage of spores or cysts) at the bottom;
- *passive planktonic* organisms usually inhabit in the water column due to the fact that they attach to other planktonic inhabitants;
- *random planktonic forms* - species that usually inhabit at the bottom or in a biofouling, triggered by an event (e.g. wind or wave transposition) to blend into plankton and are able to survive in a new environment.

Phytoneuston is a form of algae, which inhabits on surface film of water about 5cm thick. They usually inhabit on stagnant water and calm backwaters of flowing waters. All of them are capable of withstanding intense ultraviolet radiation, as well as sharp fluctuations in temperature and concentration of dissolved salts; many have special apparatus that hold them on the surface of the water (aerial caps, mucic structures, etc.).

Phytobenthos - shade-tolerant attached or free-floating algae, which spends entire life cycle at the bottom. The growth and life of phytobenthos microalgae are greatly affected by the availability of light, temperature and water mobility. The water flow allows to bring the necessary nutrients, remove the decay products and wash off the animals that feed on phytobenthos, therefore, as a rule, the diversity of benthic species is greater where there is movement of water.

Periphyton (biofoulings) is one of the constituents of aquatic ecosystems and, as an integral part of it, undergoes various changes due to various natural and anthropogenic factors, which are expressed in spatial and temporal successions of periphyton communities.

Periphyton organisms inhabit on various objects located in the water column - hydraulic structures, water supply walls, snags, logs, aquatic plants and animals; can be attached and mobile. The types of periphyton are *autotrophic organisms* - producers - algae; heterotrophic organisms - consumers: protozoa, rotifers, ciliates, crustaceans, cyclops, daphnia, sponges, bryozoans, worms, bivalves and others; Reducing organisms - filamentous, coccoid, rod-shaped, zoogleal and other bacteria, fungi.

The formation of the periphyton community occurs in certain sequence – the bacteria grow first on the substrate, then fungi, algae, and then larvae and adult forms of invertebrates. Rough substrata colonize faster than smooth ones; horizontal surfaces are more intense than vertical ones. The maximum growth of periphyton is observed on the horizon with optimal lighting conditions, temperature and the level of nutrients.

Due to its confinement to the substrate, periphyton, as an object of observation, allows a wide possibility to experiment in natural conditions while also providing for evaluation of the average pollution of the water mass for a certain period of time preceding sampling.

4. Phytoplankton and periphyton sampling methods

Phytoplankton sampling methods

The bathometric method is considered the most reliable phytoplankton sampling method. Samples taken by the bathometer are used for both quantitative calculation and for the qualitative characteristics of the sample.

Phytoplankton samples were taken with a one-liter Ruttner bathometer; 250 ml were poured into 500 ml dishes, mixed (i.e. integral samples were taken).

A plankton net from silk gauze was used for high-quality collection of phytoplankton. For “soft” fixation of phytoplankton samples a Lugol solution was used (and until color turns slightly yellow), followed by addition of formalin (10 ml of 40% formalin is sufficient for 0.5L of sample). Higher fixative concentrations cause deformation of algae and discoloration of their pigment.

Phytoplankton samples were collected according to generally accepted algological methods (Usachev, 1961; Kiselev, 1969; Makarova and Pichkily, 1970; Talsky, 1997; Mustafaeva et al., 2017), and determinants were used to identify the species composition of microalgae (Zabelina et al., 1954; Kursanov et al., 1977; Moshkova, Gollerbach, 1986; Muzafarov et al., 1988; Khalilov et al., 2012, 2014; Streble, Krauter, 1988). The sample taken in a plastic bottle was fixed with 40% formalin and Lugol solution, and labeled (sample number, date, water body, station). Standard sampling horizons: 0 (surface); 0.5; 1.0; 2.5; 5m.

The settling method was used for phytoplankton sampling. The sediment was, in accordance with the methodology, then brought to 100 ml (5-7 days).

The settling method was used for sample concentration in laboratory environment, as planktonic cells settle at a speed of 1 cm in 3 hours (Fedorov and Kapkov, 2006). Then the samples settled in a shaded place for 5-10 days, followed by slow suction of the filtrate by siphon through a double layer of gauze No.76 (this helps to preserve the fine structures of algae).

Compacting the sample was carried out in two stages: from 0.5L to 0.1L (100ml). After secondary settling (not exceeding 5 days), the solution is sucked out again. Poor samples (winter) are brought to 10ml (usually up to 20ml), very rich (during the bloom period, blue-green) – up to 50ml and even 100ml (in this case, secondary sedimentation is not performed).

The indicator properties of phytoplankton are determined by the fact of the presence or absence of certain species and the degree of their quantitative growth. The following qualitative and quantitative characteristics of phytoplankton were determined:

- Species composition of phytoplankton (Table 6)
- The number of species in each main group – Taxonomic composition of phytoplankton (Table 4);
- Population and biomass of the main groups of phytoplankton – 1.2 (cell population*10^3);

Quantitative processing of data was carried out according to the generally accepted algological method in a Goryaev chamber with a volume (0.001 mm^3) or in a Fuchs-Rosenthal chamber with a volume (3.2 mm^3). Further studies were carried out in the laboratory using

MEIJI microscope. The data obtained during the calculation of phytoplankton were used to calculate its algae population size, for which the following recalculation formula was used:

$$N=n\times v_1/v_2\times W, \quad \text{(Abakumov and et.al., 1987)}$$

Where, N – the number of cells in 1 cm^3 of water;

n – The number of cells in a chamber with a volume of 1 mm^3;

v_1 – Sample concentrate volume (cm^3);

v_2 – Chamber volume (cm^3);

W – The volume of the sample taken (cm^3).

The phytoplankton biomass was determined by the generally accepted calculation method (Usachev, 1961; Kiselev, 1969; Makarova and Pichkily, 1970).

Methodology for the selection and analysis of periphyton samples

Determination of hydrobiological indicators for periphyton, sampling and their processing are usually carried out 3 times a year according to standard methods (Moshkova et al., 1986; Muzaffarov, 1965, 1988; Hydrometanalysis, 1977) during the growing season (spring, summer, autumn).

Periphyton samples should be taken from neutral substrates (stones, concrete structures). Biofouling from higher aquatic vegetation (macrophytes) is collected only in those cases when there are no other substrates at the sampling point.

To assess the quality of water by periphyton the following are determined:

- species composition;
- mass species;
- saprobity index.

A comparative analysis of sampling points according to hydrobiological indicators (taxonomic diversity, dominant and subdominant species, identification of saprobity index) is also carried out.

To determine the species composition of algae, freshwater algae determinants were used in accordance with the analyzed group of hydrobionts and other generally accepted determinants (Talskih, 2015; Salazkin et al., 1984; Mochenko, 1974; Makrushin, 1974; Kutikova, 1970; Kiselev, 1969; Katanskaya, 1981; Zabelina, 1953).

Along with the determination of the species composition of periphyton, the frequency-abundance index "***h***" for each species was assessed using the eye-scale:

- 9 - very often (many in each field of view);
- 7 - often (in each field of view);
- 5 - frequent (not in all fields of view);
- 3 - rare (in few fields of view);
- 2 - very rare (several instances on the specimen);
- 1 - single (single instances in the sample).

Mass (dominant) species that form the governing complex are considered to be those whose abundance is 5-9 points; subdominant – those with an abundance of 3 points; single – the abundance of 1-2 points.

If we aggregate the abundance index "***h"*** by individual taxa (type, family, genus) or functional groups (producers, consumers, reducers), then numerical expressions of abundance ∑h were obtained, which makes it possible to evaluate the relative role of different groups of organisms in peripheral biocenoses and carry out comparative spatial or temporal assessment. The most convenient, as applied to periphyton organisms, it is recommended to use the Pantle-Bucca saprobiological analysis method in Sladecek's modification (Talskih, 2015). This method takes into account the frequency (abundance) of hydrobionts ***"h"*** and their saprobity indicator value ***"S"*** (saprobic valency). The determination of the relative frequency of abundance of "***h"*** is carried out on the eye scale. The saprobic indicator value ***"S"*** and the saprobity zone are determined for each species according to the lists of saprobic organisms (Kursanov et al, 1977).

Both values (h and S) are included in the formula for calculating the saprobity index (SI):

$$S = \frac{\sum(sh)}{\sum h},$$

For statistical reliability of the results of the research, it is necessary that the sample contains at least 12 indicator species with a total frequency of occurrence (abundance) $\sum h$ of 30.

SI is specified with an accuracy of one hundredth.

For the xenosaprobic zone, it is in the range 0-0.50; oligosaprobic – 0.51-1.50; b-mesosaprobic – 1.51-2.50; a-mesosaprobic – 2.51-3.50; polysaprobic – 3.51-4.00.

The conclusion about the quality of water in terms of periphyton was made taking into account information about the species composition and diversity, the frequency of occurrence of species, saprobity of the dominant forms and saprobity index (SI), as well as the biotic periphyton index (BPI), which was developed based on the data collected mainly in the Syrdarya river basin, is applicable region-wide and adapted to the regional characteristics of the rivers of Central Asia (Mustafaeva et al, 2017).

Biotic indices are designed to assess the ecological status and water quality of a water body. They assume immediate change in biotic parameters characterizing the biological state of ecosystems, which from an ecological point of view is considered a central element in regulating the quality of the aquatic environment and allows to attribute each studied section of a water to a specific class of water on a six-point scale of water quality according to hydrobiological indicators (Table 3).

Assessment of the structure of periphyton biocenoses and water quality by the biotic periphyton index (BPI) – its development is based on ranking the biological responses of periphyton to changes in the complex of abiotic conditions and chemical composition of water – from the formation zone to the zone of active dispersion and pollution of surface runoff, as well as digital coding of different states of periphyton biocenoses using grades: from 10-9 (very clean water) to 1-0 (very dirty water). BPI is zero in conditions of pronounced toxic stress.

The proposed evaluation system takes into account, mainly, the sequence of separation from the periphyton the individual indicator species sensitive to water quality, higher taxa and groups of organisms, changes in the functional structure of periphyton (changes in the ratio of producers, consumers and reducers) with increasing pollution load.

Table 3 Classifier of quality and ecological state of surface waters based on SI and BPI values

Water class	Water quality	BPI values	SI Values	Ecological status of biocenosis (desired/expert assessment)
I	Very clean	10-9	<1,0	Background (reference) - AB (F)
II	Clean/lightly polluted	8-7	1.1–1.5	Background (good) - AB
III	Moderately polluted	6-5	1.6–2.5	Fair - AB
IV	Polluted	4	2.6–3.5	Unsatisfactory - AB-Ab
V	Dirty	3-2	3.6–4.0	Bad - Ab
VI	Very dirty	1-0	> 4.0	Invalid - ab

The BPI value grading scale (10-0) given in Table 3 can be considered as a specific ecological spectrum of states of periphyton biocenoses with varying degrees of degradation of their initial ecological structure. As a first approximation, this allows to make a conclusion about the ecological state of periphyton and, indirectly, about the ecological quality of a canal.

The class of water quality by periphyton was determined on the basis of the values of both indices, as well as taking into account the structure of the species composition, the presence in the dominant complex of characteristic species of organisms, and their ecological and geographical characteristics. In the final conclusion pollution level and the general sanitary and ecological condition of the water bodies, apart from the calculated indices, the real situation in the water body was taken into account, e.g. outbreak of growth of certain species and entire groups of organisms confined mainly to contaminated sites, depauperization of the species composition, and general inhibition of growth of producers, the growth of brackish and halophilic species of organisms. Also taken into account were various visual signs of pollution of the water mass and bottom sediments, morphological diversity or monotony of aquatic biocenoses.

In addition, the table shows the characteristics of the ecological invariant states of biocenoses, which are codified in the form of alphabetic characters:

AB (F) - the background ecological state in which the biocenoses are in a state of metabolic and ecological progress and are represented by a complex of species that reflect the natural (undisturbed) gene pool of the region;

AB is a satisfactory ecological state characterized by metabolic and ecological progress of biocenoses;

AB-Ab - a transitional ecological state associated with a noticeable change in the taxonomic and functional structure of biocenoses;

Ab - unsatisfactory ecological state, pronounced degradation of the ecological structure of the initial biocenoses;

ab - absolutely unacceptable ecological state, complete degradation of biocenoses (Talskih, 2015).

Definitions of alphabetic characters:

A - metabolic progress of biocenoses (active metabolism of aquatic biocenoses);

a - the state of metabolic regression of biocenoses (inhibition of the metabolism of aquatic biocenoses);

B - the state of the ecological progress of biocenoses (complication of the ecological structure of aquatic biocenoses);

b - the state of ecological regression of biocenoses (simplification of the ecological structure of aquatic biocenoses).

The above evaluation methods using SI and BPI indices are considered as basic indicators and their application reflects the actual ecological landscape.

5. The results of the analysis of phytoplankton and periphyton samples

Phytoplankton

During the reconnaissance survey and selection of sampling points on YG canal on March 20, 2020, 4 phytoplankton samples were taken, which revealed 111 species, varieties and forms of algae, among which 13 species of cyanobacteria (*Cyanophyta*) and diatoms (*Bacillariophyta*) – 85 species, green (*Chlorophyta*) - 10 species and euglen (*Euglenophyta*) - 3 species (Table 4). The taxonomic structure of spring phytoplankton in YG canal is presented in Table 4.

Table 4 Taxonomic composition of the phytoplankton and periphyton communities of the studied sections of the YG canal (March, 20)

Taxon / No. of samples	Phytoplankton					Periphyton		
	1	2	3	4		1	2	3
Cyanophyta	8	11	4	7		12	10	6
Bacillariophyta	66	55	36	57		76	61	53
Euglenophyta	1	3	-	1		-	-	-
Chlorophyta	7	6	2	4		5	5	4
Total number of species	**82**	**75**	**42**	**69**		**93**	**76**	**63**

The dominant complex of phytoplankton communities in YG canal was represented mainly by producers, the most developed and the most diverse of which are diatoms, blue-green and green algae, as well as a small diversity of euglena species.

Samples taken in the canal on March 20, 2020, revealed 13 species (11.71%) of blue-green algae (*Cyanophyta*), forms and varieties of which are represented by widespread ***b***-, ***ba***- and ***a***-saprobic planktonic colonial and filamentous forms of algae from genera *Microcystis, Merismopedia, Dactylococcopsis, Gloeocapsa, Oscillatoria, Phormidium, Lyngbya, Spirulina* (Table 6).

In spring samples of phytoplankton, the number of blue-green algae varied from 187,500*10³ cells/l to 1456,250*10³ cells/l, and the biomass, respectively, from 1.988 mg/l to 39.188 mg/l (Fig. 9).

*Table 5 Quantitative development of spring phytoplankton (March, 20) at sampling points at YG canal (population: cells*10³/biomass mg/l)*

Taxon / No. of samples	1	2	3	4
Cyanophyta	1075,00 13.288	1456,250 39.188	187,500 1.988	893,750 8.456
Bacillariophyta	2181,250 2574.706	1162,500 1403.538	462,500 388.350	1262,500 1366.163
Euglenophyta	6,250 1.800	18,750 71.088	-	6,250 3.513

Chlorophyta	162,500 1965.288	237,500 991.013	100,00 28.550	50,00 6.075
Total number/Biomass	**3425,00** **4555.082**	**2875,00** **2504.827**	**750,00** **418.888**	**2212,500** **1384.207**

According to taxonomic diversity, diatoms (*Bacillariophyta*) dominate in the phytoplankton samples of researched locations on YG canal – 85 species, which accounted for 76.58% of the total number of species, forms and varieties. Diatoms are represented mainly by widespread freshwater ***o- o-b-***, ***b-*** saprobic planktonic forms from the genera *Melosira, Cyclotella, Synedra*, Fragilaria, *Diatoma (D.elongatum)*, *Asterionella* and freshwater-brackish-water *ba*-mesosaprobic forms from phytobenthos genus *Cocconeis, Achnanthes*, *Amphora, Navicula, Rhoicosphenia, Surirella*, as well as *a-b-*, *a*-saprobic brackish-water and brackish-marine species, characteristic of reservoirs with slightly increased water salinity (*Gyrosigma acuminatum, G. spenseri, Navicula Kolbei, N. spicula, Hantzschia virgata, Nitzschia sigma, N. sigmoidea, N.palea, Amphora proteus, Amphiprora paludosa, Surirella Capronii*, etc.).

Diatoms usually have large cell sizes. Therefore with a single occurrence they create an increased number. The number of diatoms in spring samples varies from 462,500*10³ cells/l to 2181,250*10³ cells/1, the biomass was from 388.350 mg/l to 2574.706 mg/l (Fig. 9).

Green algae (Chlorophyta) in the surveyed points had poor growth and represented by 10 species or 9.01% of the total number of species, forms and varieties, which are mainly represented by widespread *b*-mesosaprobic species from the genera *Ankistrodesmus, Oocystis, Chlorella, Chlamidomonas, Dictyosphaerium, Scenedesmus, Cosmarium*, filament from the genera *Cladophora*, *Spirogyra*, etc. The number of green algae in spring samples ranges from 50.00*10³ cells/liter to 237, 500*10³ cells/liter, the biomass was from 6.075 mg/liter to 1965.288 mg/l (Fig. 9).

Euglenophytes (Euglenophyta) algae, which are mainly represented by the genera *Euglena*, *Phacus, and Astasia*, were also observed in the phytoplankton samples with a single occurrence. The number of euglena algae in spring samples ranges from 6.250*10³ cells/l to 18.750*10³ cells/l, the biomass is from 1.800 mg/l to 71.088 mg/l (Fig. 9).

The diagram in Figure 9 illustrates the fluctuations in the number of algae of spring phytoplankton in the surveyed points at YG canal.

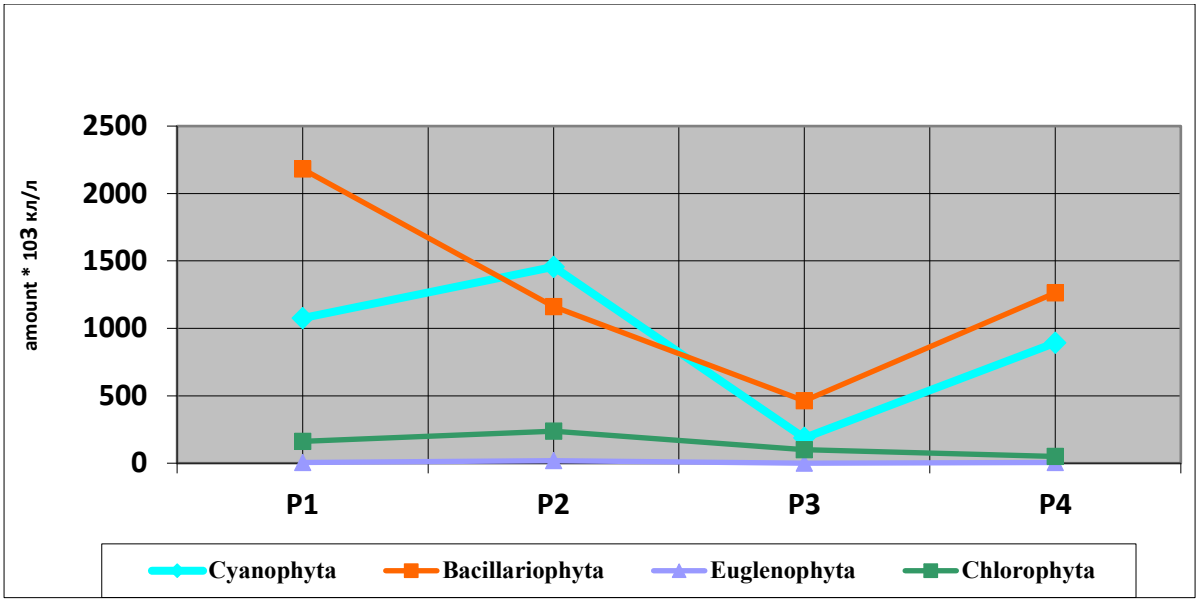

*Figure 9 Diagram of fluctuations in the phytoplankton abundance (*10³ cells/l) in YG canal samples, March 20, 2020.*

The species composition of the phytoplankton and periphyton communities of the surveyed points at YG canal is shown in the table below.

Table 6 Summary of the species composition of the phytoplankton and periphyton communities of the surveyed points at the YG canal (March, 20)

№	Taxon/No. of samples	S	Phytoplankton				Periphyton		
	CYANOPHYTA		1	2	3	4	2	3	4
1	Dactylococcopsis acicularis Lemm.	b	+	+	+	+	+	+	-
2	Merismopedia glauca (Ehr.) Nag.	b	-	+	+	-	+	-	-
3	M.punctata Meyen	b-a	-	C	-	-	-	+	-
4	M.tenuissima Lemm.	b-a	-	C	-	-	+	-	-
5	Microcystis aeruginosa Woron.	b-a	D	-	-	D	C	+	+
6	Gloeocapsa alpina Nag. end. Brend.	b	-	-	+	+	+	+	-
7	Gl.turgida (Kütz.) Hollerb.	b	+	+	-	+	-	-	-
8	Gl.minima (Kütz.) Hollerb.	b	+	+	-	-	-	-	-
9	Oscillatoria limosa Ag.	b-a	+	-	-	-	C	+	+
10	Osc.formosa Bory	a-b	+	+	-	-	C	+	-
11	Spirulina major Kütz.	b	-	C	-	-	C	-	+
12	Phormidium ambiguum Gom.	b	-	-	-	-	+	+	+
13	Ph.uncinatum (Ag.) Gom.	b-a	-	+	-	+	C	+	+
14	Ph.papillaterminatum Kissel.	b	C	C	-	+	+	+	-
15	Lyngbya Kuetzingiana (Kütz.) Kirchn.	b	C	D	+	C	C	C	C
	BACILLARIOPHITA								
1	Melosira varians Ag.	o-b	C	+	+	+	D	D	C
2	Cyclotella kuetzingiana Thw.	b	-	-	+	+	+	+	-
3	C.meneghiniana Kütz	b-a	+	+	+	+	+	+	+
4	C.comta (Ehr.) Kütz.	b-a	-	+	-	-	+	+	-
5	Coscinodiscus sp.	b	-	+	+	-	+	-	+
6	Asterionella gracilissima (Hantzsch.) Heib.	o-b	D	C	+	D	D	+	C
7	Diatoma elongatum Ag.	o-b	+	+	-	+	+	+	-
8	D.elongatum v.tenue (Ag.) V.H.	o-b	+	+	+	+	C	C	-
9	D.vulgare Bory.	b	-	-	-	-	+	-	+

№	Taxon/No. of samples	S	Phytoplankton				Periphyton		
10	D.vulgare v.productum Grun.	b	-	-	-	-	+	-	+
11	Fragilaria crotonensis Kitt.	o-b	D	C	+	C	D	D	C
12	Fr.capucina Desm.	o-b	C	+	+	+	C	C	C
13	Fr.construens (Ehr.) Grun.	b	D	C	C	C	D	D	D
14	Synedra acus Kütz.	o-b	+	+	+	-	C	+	-
15	S. capitata Ehr.	b	-	+	-	-	-	+	-
16	S. minuscula Grun.	b	+	-	+	-	+	-	-
17	S. pulchella (Ralfs) Kütz.	b	+	+	-	-	+	+	-
18	S. tabulate (Ag.) Kütz.	b-a	-	-	-	+	-	-	-
19	S. ulna (Nitzsch.) Ehr.	b	+	+	+	+	D	D	D
20	S.ulna v.amphirhynshus (Ehr.) Grun.	b	-	-	-	+	C	C	-
21	S.Vaucheria Kütz.	b	-	-	+	-	-	+	-
22	Eunotia arcus Ehr.	o-b	+	+	-	+	+	+	-
23	Cocconeis pediculus Ehr.	b	C	C	+	+	D	+	D
24	C.placentula Ehr.	o-b	-	+	-	-	-	-	C
25	C. placentula v. euglypta Ehr.	o-b	+	-	-	-	+	C	C
26	Achnanthes sp.(nodosa?)	o	+	+	+	+	+	+	-
27	Ach.affinis Grun.	o	+	+	+	+	+	C	-
28	Ach.minutissima Kütz.	o-b	+	-	-	+	+	C	-
29	Rhoicosphenia curvata (Kütz.) Grun.	b	C	C	+	+	C	D	C
30	Diploneis Smithii v. pumilla (Grun.) Hust.	b-a	-	+	-	-	-	+	+
31	Navicula anglica Ralfs	b	+	-	-	+	+	-	-
32	N.bacillum Ehr.	b-a	-	+	-	-	-	-	+
33	N.cryptocephala Kütz.	a-b	+	+	+	+	D	C	D
34	N.cryptocephala v. intermedia Grun.	b-a	+	+	-	+	C	D	C
35	N.cryptocephala v.veneta (Kütz.) Grun.	b-a	+	+	-	-	+	+	+
36	N.cincta (Ehr.) Kütz.	b-a	+	-	-	-	+	+	+
37	N.gracilis Ehr.	b-o	+	-	+	+	+	+	-
38	N.kolbei Poretzky et Anissimova	b-a	-	-	+	+	-	-	-
39	N.microcephala Grun.	b-o	+	+	-	+	+	+	+
40	N.radiosa Kütz.	o-b	-	+	+	+	-	-	+
41	N.protracta v. subcapitata Woronichin	a-b	-	-	-	-	+	-	+
42	N.pygmaea Kütz.	a	-	+	-	-	-	-	+
43	N.pupula Kütz.	b	-	-	-	-	+	+	-
44	N.spicula Hickie	a	+	+	-	-	-	-	-
45	Pinnularia viridis (Nitzsch.) Ehr.	b	+	-	-	-	+	-	-
46	P.microstauron (Ehr.) Cl.	o	-	-	-	-	+	-	-
47	Caloneis silicula (Ehr.) Cl.	o-b	+	-	-	-	+	-	-
48	Caloneis amphisbaena (Bory) Cl.	b	+	+	+	+	+	-	C
49	Gyrosigma attenuatum (Kütz.) Rabenh.	b	+	-	-	+	+	+	C
50	G.acuminatum (Kütz.) Rabenh.	b	C	+	-	+	D	+	D
51	G.scalproides (Rabenh.) Cl.	b	+	-	-	+	+	-	C
52	G.spenceri (W.Sm.) Cl.	b-a	+	-	-	-	+	-	C
53	Pleurosigma elongatum W.Sm.	b-a	+	-	-	-	+	-	C
54	Amphora ovalis Kütz.	b-o	C	C	+	+	C	C	C
55	A.proteus Greg.	a	-	-	-	+	-	-	+
56	A. veneta Kütz.	a-b	+	+	-	+	+	+	-
57	Cymbella affinis Kütz.	b-o	C	+	+	+	C	D	D
58	C.amphicephala Nag.	o	+	-	-	-	+	+	+
59	C.cistula (Hemp.) Grun.	b	C	+	+	+	C	D	D
60	C.cymbiformis (Ag.?, Kütz.) V. H.	o	-	-	-	-	-	+	-
61	C.helvetica Kütz.	o-x	-	-	-	-	+	+	-
62	C.helvetica v.curta Cl.	b-o	-	-	-	-	+	C	-
63	C.lanceolata (Ehr.) V.H.	b	C	C	+	C	C	D	C
64	C.tumida (Breb.) V.H.	b	C	+	+	+	C	D	C
65	C.ventricosa Kütz.	o-b	+	-	-	+	+	D	C

№	Taxon/No. of samples	S	Phytoplankton				Periphyton		
66	C.ventricosa v.ovata Grun.	o-b	-	-	-	+	-	C	C
67	Gomphonema olivaceum (Lyng.) Kütz.	b	+	+	+	+	C	D	C
68	G.olivaceum v.calcareum Cl.	b	+	+	-	+	+	-	-
69	Epithemia acrus Kütz.	b	+	+	-	-	-	+	-
70	E.turgida (Ehr.) Kütz.	b	+	-	-	-	+	+	-
71	Rhopalodia gibba v.ventricosa (Ehr.) Grun	o-b	-	-	-	-	+	-	-
72	Anomoneoneis sphaerophora (Kütz.) Pfitz.	b-a	-	-	+	-	-	+	-
73	Amphiprora palludosa W.Sm.	b-a	-	-	-	-	+	-	-
74	Hantzschia virgata (Roper) Grun.	b-a	-	-	-	-	+	-	-
75	Bacillaria paradoxa Gmelin	b-a	C	+	+	C	D	C	D
76	Nitzschia acicularis W.Sm.	a	+	+	+	+	-	+	-
77	N.capitellata Hust.	b	+	+	+	C	+	+	D
78	N.dissipata (Kütz.) Grun.	o-b	+	-	-	+	+	+	+
79	N.filiformis (W.Sm.) Hust.	b	+	+	+	+	C	+	C
80	N.linearis W.Sm.	o-b	-	-	-	+	-	-	-
81	N.lorenziana v.incurta Grun.	b	-	+	-	-	-	+	-
82	N.obtusa W.Sm.	b	+	-	-	+	+	-	-
83	N.obtusa v.scalpelliformis Grun.	b-a	-	-	-	+	+	-	-
84	N.palea (Kütz.) Grun.	a	+	+	-	+	+	+	C
85	N.punctata v.aralensis Borzsczow	a	+	-	-	-	-	-	-
86	N.sigma (Kütz.) W.Sm.	a-b	+	+	-	+	C	-	+
87	N.sigmoidea (Ehr.) W.Sm.	b	+	+	+	+	D	+	D
88	N.spectabilis (Ehr.) W.Sm.	b-a	+	-	-	-	C	-	+
89	N.tryblionella Hanzsch	a-b	+	+	-	+	+	-	+
90	N.tryblionella v.levidensis (W.Sm.) Grun.	a-b	+	-	-	+	-	-	-
91	N.vermicularis (Kütz.) Grun.	b	C	+	+	C	D	C	C
92	Cymatopleura solea (Breb.) W.Sm.	b-a	+	+	-	+	C	+	+
93	C.elliptica (Breb.) W.Sm.	b	+	-	-	-	C	-	-
94	Surirella Capronii Breb.	b-a	+	+	-	+	C	+	+
95	S.ovata Kütz.	b	+	+	+	C	C	+	+
96	S.linearis W.Sm.	b	-	+	-	+	-	-	-
97	S.robusta Ehr.	b-a	+	+	-	-	+	-	-
	EUGLENOPHYTA								
1	Euglena sp.	b-a	-	+	-	+	-	-	-
2	Phacus sp.	b	-	+	-	-	-	-	-
3	Astasia sp.	a-b	+	+	-	-	-	-	-
	CHLOROPHYTA								
1	Ankistrodesmus falcatus (Corda) Ralfs.	b	+	+	+	+	+	+	+
2	Ank.minimum Korsch.	b	-	+	-	-	+	-	-
3	Chlorella sp. (vulgaris?)	b	-	-	-	+	-	-	-
4	Oocystis sp. (natans Lemm.)	b	+	-	-	-	-	-	-
5	Chlamidomonas sp.	b	+	-	-	+	-	-	-
6	Dictyosphaerium ehrenbergianum Naeg.	b	-	C	+	-	-	+	-
7	Cosmarium formulosum Hofm.	b	-	+	-	-	-	+	+
8	Scenedesmus quadricauda (Turp.) Breb.	b	+	-	-	+	-	+	-
9	Algae sp.	b	+	+	-	-	-	-	-
10	Cladophora glomerata (L.) Kütz.	b-o	+	-	-	-	C	+	-
11	Ulothrix zonata Kütz.	o-b	-	-	-	-	C	-	-
12	Spirogyra porticalis (Hass.) Kütz.	b-o	+	+	-	-	+	-	+
13	Enteromorpha intestinalis (L.) Link.	a-b	-	-	-	-	-	-	D
	Total species of microalgae		**82**	**75**	**42**	**69**	**93**	**76**	**63**
	Consumers:								

№	Taxon/No. of samples	S	Phytoplankton				Periphyton		
1	Amoeba sp.	a		+					
2	Bodo sp.	a-b					+	+	+
3	Colurella colurus	o-b							+
4	C.uncilla	b-a						+	+
5	Chilodonella uncinata	b-a		+				+	
6	Rotaria sp.	b-a					+	+	+
7	Proalis sp.	b					+	+	
8	Baetis sp.	b					+		+
9	Nematoda gen.sp.	a				+	C	+	C
10	Oligochaeta sp.	a		+			+		+
11	spicullu -Spongilla lacustris gemmula	b-a		+	+		+		
12	Arcella sp.	b-a					+		+
13	Cyphoderia ampulla	b-a	+			+	+		
14	Euglypha sp.	b-a		+			+	+	+
15	molluscus	b-a						+	
16	Micota sp.						+	+	

NB: mass (D-dominant) species forming the dominant complex is considered to be those with an abundance of 5–9 points; subdominant (C) - those with an abundance of 3 points; single (+) - an abundance of 1-2 points.
S - saprobity index, which is used to determine the level of organic pollution of water canals, is a description of the symbolism of the index is given in sections below.

None of the above-mentioned species are listed neither International Red list nor Red Book of Uzbekistan.

Periphyton

The following characteristics were determined from the periphyton indices: taxonomic and species composition (Table 7), description of mass species, saprobity indices, and water quality class (Table 7).

During a one-year reconnaissance spring survey of the YG canal, 3 samples (S1-S3) were taken according to periphyton indices, in which 112 species, varieties and forms of microalgae were found, where 13 were blue-green (Cyanophyta), 90 were diatomic (Bacillariophyta) and 9 green (Chlorophyta) species of algae (Table 6).

The dominant complex of periphyton communities, as well as the dominant complex of the phytoplankton community, during the research period was represented mainly by producers, the most developed and diverse among which are diatoms, blue-green and green algae. Organisms from the consumer group were also observed with low occurrence in individual samples.

Table 7 The taxonomic structure of the periphyton of the researched sections of YG canal (March, 20)

Taxon / No. of samples	**S1**	**S2**	**S3**
Cyanophyta	12	10	6
Bacillariophyta	76	61	53
Euglenophyta	-	-	-
Chlorophyta	5	5	4
Number of species	**93**	**76**	**63**
SI min-max	1.87	1.79	1.98
BPI (Biotic peripheral index)	6	6	6
Class of water quality	III	III	III

Ecological state	AB	SB	AB[2]

Biofouling was mainly collected from stalks of higher aquatic vegetation (reed thickets, reeds) or flooded macrophytes of the bottom layers (crested beds, chara), in which the most abundant and diverse are planktonic freshwater-brackish-water and brackish-water colonial, filamentous and brackish-water marine species characteristic of water bodies with slightly increased salinity.

13 species of the blue-green algae (*Cyanophyta*) samples were observed among the blue-green algae in periphyton which amounted to 11.61% of the total number of species and forms of algae. The dominant complex of blue-green algae is represented by nearly the same complex of widespread planktonic freshwater-brackish-water and brackish colonial and filamentous forms as the phytoplankton community.

Microcystis aeruginosa Woron., *Oscillatoria limosa Ag., Osc.formosa Bory, Phormidium ambiguum Gom., Ph.uncinatum (Ag.) Gom., Spirulina major Kütz., Lyngbya Kuetzingii (Kütz.) Schmidle* and others are the most abundant and massive in the fouling.

In samples, diatoms are represented by 90 species, which amounted to 80.36% of the total number of forms and varieties. The most widespread species in periphyton were planktonic forms of diatoms: *Melosira varians Ag., Cyclotella meneghiniana Kütz., Diatoma elongatum v.tenue (Ag.) VH, Fragilaria crotonensis Kitt., Fr.capucina Desm., Fr.construens (Ehr.) Grun., Synedra acus Kütz., S.ulna (Nitzsch.) Ehr., S.ulna v. Amphirhynchys (Ehr.) Grun., As well as species characteristic of phytobenthos: Cocconeis pediculus Ehr., C.placentula Ehr., Rhoicosphenia curvata (Kütz.) Grun., Gomphonema olivaceum (Lyng.) Kütz., N. cryptocephala Kütz. N. cryptocephala v. intermedia Grun. Amphora ovalis Kütz., Bacillaria paradoxa Gmelin, Nitzschia palea (Kütz.) Grun., N.spectabilis (Ehr.) Ralfs. N.sigma (Kütz.) W.Sm., N.sigmoidea (Ehr.) W.Sm., N.vermicularis (Kütz.) Grun., Cymatopleura solea (Breb.) W.Sm., C.elliptica (Breb.) W.Sm., Surirella capronii Breb., S.ovata Kütz.*

Green algae (Chlorophyta) in the surveyed areas had poor growth and represented by 9 species, or 8.03% of the total number of species, forms and varieties, which are mainly represented by widespread *b*-mesosaprobic species from the genera *Ankistrodesmus, Dictyosphaerium*, *Scenedesmus, Cosmarium*, filamentous from the genera *Cladophora, Spirogyra, Ulothrix, Enteromorpha*, etc.

Some samples of periphyton revealed organisms representing the group of consumers (amoeba, protozoa, rotifers, nematodes, chironomid larvae and oligochaetes). Samples S1 and S2, on the stems of macrophytes (chara, reed) had marked formations in dark brown to brownish-olive in color, leathery, hard deposits from shell organisms of the genera *Arcella, Cyphoderia, Euglypha*, and also spicules *Spongilla lacustris* gemmule.

The water quality in the surveyed sections of canal mainly corresponds to class III — moderately polluted water; less often – transitional III-IV class (which is associated with increased mineralization). The BPI values are basically 6 points and the SI ranges between 1.79-1.98, which corresponds to ***o-b-***, ***b-*** and ***b-a-*** mesosaprobic conditions, the ecological state is mainly ***AB***.

[2] Water quality class corresponds to III in terms of indicators and BPI - 6 points, the environmental status of AB

The comparative characteristics of phytoplankton and periphyton species at samples taken at the YG canal is shown in the figure below.

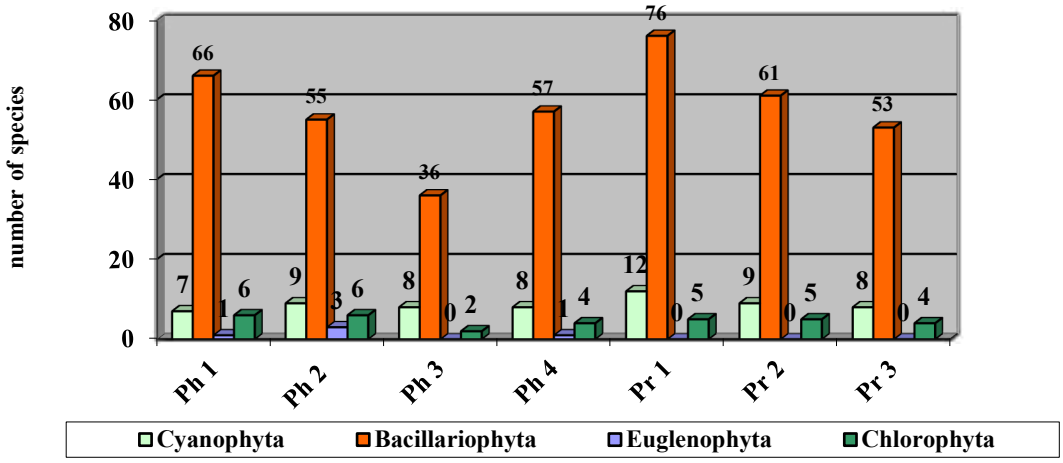

Figure 10 Comparative characteristics of the number of species found in samples of phytoplankton (Ph. 1-4) and periphyton (Pr. 1-3) at the YG canal, March 20, 2020.

6. Zooplankton communities at the surveyed sections of YGC

Zooplankton is a “soaring” component of aquatic ecosystems, consisting of animals that can travel short distances through their muscular organs. Representatives of zooplankton vary significantly in size: nanoplankton (unicellular simplest: foraminifera, radiolarians, ciliates - 100nm), microzooplankton (annelids: rotifers up to 50μm) and mesoplankton (0.2-20mm) copepods - copepods and cladocerans - cladodes. In this research, we consider rotifers — Rotifera, and crustaceans (cladocerans — Cladocers and copepods — Copepods). Many representatives of crustaceans have very well-developed filtering apparatuses, and are a kind of “orderlies” of canals: filtering out a large number of bacteria, particles of detritus and phytoplankton as a nutrient mixture, they reduce the level of pollution of reservoirs and lower its trophic level (organic load). Therefore, during the flowering of phytoplankton, there is also a “flash” of the development of zooplankton. Depending on the type of ecosystem and the abundance of zooplankton, the daily filtration activity of these animals can range from 9% to 90% of the reservoir volume. Filterer-zooplankton are the most vital link in the pasture food chain in the ecosystem, the main consumers of primary products.

Thus, zooplankton is one of the most important functional units in the ecosystem of any water body. They play the role of natural biofilters and actively influence the formation of water quality. Its composition, structure and level of growth determine the direction and intensity of the flow of matter and energy in streams and reservoirs. Many planktonic animals make vertical migrations, which contributes to the transfer of matter to depths on the surface. Zooplankton organisms, by type of nutrition, are predominantly filtering agents (phytoplankton, bacteria), sedimentators (detritus) and predators (rotifers, ciliates). Zooplankton is also a good fodder for zoobenthos and fish. Knowledge of the structural and functional characteristics of zooplankton allows it to be used as a system of biocenotic level for indicative purposes in diagnosing ecosystems as stages of their natural development and in assessing changes in this process under the influence of anthropogenic factors.

Materials and methods

Zooplankton Sampling Technique

The aim of this work was to assess the ecological state of the YG canal by generally accepted methods for studying zooplankton, as well as to determine the trophic state of these reservoirs using bioindication methods, i.e. to determine the saprobity and trophicity of water.

Zooplankton samples were taken using Jedi conical nets: medium d=18.5cm, gauze size No.68 and small d=14cm, gauze size No.72, and processed according to the methods. The methods of collecting zooplankton involved a combination of separate water scooping and subsequent separation of plankton from water, which is carried out either by filtering the water delivered to the surface using 10L, filtering through a small Jedi net (from the shore) or dividing a certain amount of water while vertically pulling the middle Jedi net with boats (the volume of filtered water was determined by the formula: $V = \pi R2 * h$, where R is the radius of the inlet of the net, h is the length / depth of the fished layer of water).

Samples were fixed with 40% formalin, bringing the sample concentration to 4% and labeled in accordance with the entries in the Field Journal. Materials after identification and processing of samples were prepared for storage.

The technique for preparation and microscopy of specimens included: when processing a fixed material, specimens were prepared in a drop of water, in aqueous glycerin — formalin (1-part glycerol per 1 part of formalin). To preserve the specimen for a long period, the material is enclosed in a solid medium: glycerin – gelatin, Canadian balsam.

Identification of organisms: during identification of the sample, we used triocular and binocular microscopes (Meiji, Japan), using conventional determinants, specimen needles, slides and coverslips (Kutikova, 1970; Mochenko, 1974; Tsallolikhina et al, 1994).

Determination of the species composition of zooplankton was carried out under a binocular and a microscope using conventional determinants. In the presence of a small number of zooplankters in the sample (up to 500 specimens), the sample was completely calculated, pouring its contents in 2-3 portions into Bogorov chamber. In cases when the sample contained a large number of organisms, a part of it was counted, taking with the help of a pipette stamp V=1.25ml. Individual zooplankton weights (w, mg) were calculated using allometric growth formulas relating the length (l, mm) and weight (w) of crustaceans: w = q*l3 (Salazkin et al, 1984).

Indication of water pollution by using zooplankton.

To characterize the level of water pollution, were used saprobity of zooplankton species (like in case of phytoplankton), which was determined in accordance with standardized methods (1977), herewith:

- the oligosaprobic zone ***(o)***, which is characterized by the absence of hydrogen sulfide and carbon dioxide H_2S and CO_2, is very small, and has a normal oxygen content O_2, a minimum of dissolved organic substances, a low number of water inhabitants, but significant species diversity (saprobity index = 1.0);
- the mesosaprobic zone is divided into ***β-*** and ***α***-mesosaprobic subzones; The *β*-mesosaprobic subzone is characterized by the presence of ammonia, nitrous and nitric acids, there are no amino acids, H_2S is very small, O_2 is sufficient for the complete oxidation of organic matter; the species diversity of aquatic organisms is

still high, their abundance and biomass are quite high, ammonia, amino acids, O_2 are still present in *α*-mesosaprobic waters in noticeable amounts, H_2S and CO_2 are greater than in the *β*-mesosaprobic subzone, but there are no undecomposed proteins; mineralization of organic matter is mainly due to its aerobic oxidation;

- the saprobity index of *β*-mesosaprobic waters is 1.1–2.0, and that of *α*-mesosaprobic waters is 2.1–3.0; the polysaprobic zone (*ρ*) is characterized by the presence in the water of undecomposed proteins, traces of hydrogen sulfide, a low oxygen content, significant amounts of CO_2, and a reducing type of biochemical processes. Self-purification in these waters is mainly due to the activity of bacteria; the saprobity index is 3.1-4.5.

The calculation of the zooplankton saprobity index (SI) at the sampling points was determined according to the Pantle-Bucca method in the Sladecek modification, according to the formula: $S = \sum hs / \sum h$, where *h* is the frequency of occurrence of individuals of the species, which was characterized by the following estimates: 1 - single, 2 - rarely, 3- often, 5- often, 7-very often, 9-mass quantity, and where *s* is the indicator weight of each species, which was determined in accordance with the Unified methods[3].

The trophic level of the reservoir: oligo-meso-eutrophic is determined in accordance with the biomass of zooplankton (Table 8) or/and the level of soluble phosphorus in the reservoir.

Table 8 Concentration of phosphorus, biomass of zooplankton and ichthyomass in water bodies of different trophic levels

Type of pond	Phosphorus concentration mg/m³	Biomass, g/m³	Ichthyomass, g/m²
Ultra oligotrophic	< 3	< 0.5	1.25
Oligotrophic	1-10	0.5-1	1.25-2.5
Mesotrophic	4-40	1-4	2.5-10
Eutrophic	200-400	4-16	10-40
Hypereutrophic	> 400	> 16	> 40

Besides, the ratio of the biomass of filterers and sedimentators (i.e. “peaceful” forms of zooplankton) to the biomass of “predatory” species of zooplankton is used to identify the water quality. The higher the biomass of “peaceful” species, and the smaller the biomass of “predatory” species, the better the ecological situation in aquatic ecosystems. Predatory (facultative predators) species usually include some Cyclops and rotifers of some genera *Brachionus*. All species of Cladocera are classified as peaceful species.

The species composition of zooplankton.

For sample collection 4 locations at the YG canal were determined at a 250m distance from each other. Zooplankton and phytoplankton samples at locations 1, 2 and 3 were taken close to the clay coast, where the depth of the canal was 1-1.5 m. Locations’ biotopes were littoral with submerged higher vegetation and coastline overgrown with perennial land vegetation. The 4th location had a biotope different from the previous ones, which was characterized by

[3] Unified methods: water quality. Methods of biological analysis of water.

the absence of reed or cattail thickets and a depth of 3-4 m. Based on different types of the biotopes, identified species at samples 1, 2 and 3 were represented by plankton-benthic *Harpacticoida g.sp* and phytophilic littoral species *Alona rectangula, Chydorus sphaericus Megacyclops viridis*, and at the 4th station, an euplankton species, *Daphnia pulex*, was found as dominant. All identified species are represented by widespread, eurytopic species of the *Palaearctic* fauna. No unique (endemic) or rare / endangered species were found among determined zooplankton species.

During the analysis of collected samples, there were found such species as *Megacyclops viridis*, *Paracyclops affinis*, *Harpacticoida g.sp.*; 3 species of *Cladocera*: *Alona rectangula*, *Chydorus sphaericus, Daphnia pulex*; and 2 species of *Rotifera*: *Euchlanis dilatata*, *Brachionus quadridentatus*. Please note that there were species determined at sampling point 3. Overall, 8 species of zooplankton were identified (Table 9).

Table 9 Species determined in 4 samples collected from the YG canal

Location no.	Species	Abundance, ind./m³ (N)	Biomass, thousand / m³ (B)	Saprobity (s) and abundance (h) of species
№1	*Megacyclops viridis*	400	40	β-o - 1,6(3)
	Paracyclops affinis	4000	182.8	o-β - 1,25(7)
	Chydorus sphaericus	1600	56	β-o - 1,75(5)
	Alona rectangula	400	14	o-β - 1,3 (3)
	Euchlanis dilatata	5200	4.68	β-o - 1,75 (7)
Total:	5 Species	**11600**	**297.48**	**S=1.47**
№2	*Megacyclops viridis*	350	34.5	β-o - 1,6(3)
	Paracyclops affinis	1600	720	o-β - 1,25(7)
	Harpacticoida g.sp.	410	20.6	-
	Euchlanis dilatata	800	0.8	β-o - 1,75 (5)
	Brachionus quadr.	380	0.36	β -2.0 (3)
Total:	5 species	**3600**	**132.76**	**S=1.57**
№3	No species were found in this location **This sampling location had a large amount of detritus. Therefore, there were not determined any species of zooplankton.**			
№4	*Megacyclops viridis*	300	42.1	β-o - 1,6(3)
	Paracyclops affinis	6100	252.9	o-β - 1,25(7)
	Daphnia pulex	8000	1360	β -2.0 (9)
	Euchlanis dilatata	750	0.85	β-o - 1,75 (3)
Total:	4 Species	**18000**	**1753.6**	**S=1.67**

Despite having a small number of species (8 species diversity) it is a quite large amount for the YG canal.

The calculated indices of saprobity varied in the range of 1.47 (oligo saprobic-beta mesosaprobic zone) to 1.67 (beta mesosaprobic-oligosaprobic zone), that corresponded to a quality from slightly polluted to moderately polluted waters. Despite a large amount of dissolved organic substances (mesosaprobic zone), its decomposition occurs because of sufficient amount of oxygen (rapid flow). Besides, filter species of zooplankton (abundant development of the planktonic species Daphnia pulex) accumulate quick self-cleaning feature of the water body.

In addition to the true daphnia filter (filtering phytoplankton and plant and animal dead remains) determined from collected samples, there were found, a group of planktobenthic species

(*Chydorus sphaericus and Alona rectangula Harpacticoida g.sp.*) and cyclops; filter predators (*Megacyclops viridis and Paracyclops affinis*). These species are inhabitants of aqua flora and also contribute to a decrease in pollution of the water body.

According to the development of zooplankton biomass, the canal can be characterized as oligomesotrophic with a biomass of 0.32g/m^3 (oligotrophic level) to 1.75g/m^3 (mesotrophic) level, which contributes to the development of ichthyomass from 2.5 to 10g/m^2. From benthic organisms, there were found: mosquito larvae (Chironomidae), dragonfly larvae (Odonata). So, the biomass of chironomids was about 6 g/m^2.

It is important to highlight that a sufficient biomass of zooplankton and benthos retrieved from sampling points at the YG canal as well as good water quality may lead to the development of fishery.

7. Survey results and findings

The below findings were made based on the survey results:

The phytoplankton species of the surveyed area are represented by 111 species, forms and varieties of algae, 13 of which are blue-green, 85 are diatoms, 10 are algae. The dominant complex is composed of diatoms, blue-green and green microalgae, which are abundantly present in all the researched areas of the canal. In addition, there was also observed euglena microalgae with low diversity and abundance (up to 3 types of species). Furthermore, relatively low amount of consumer organisms such as protozoa, rotifers, sessile ciliates, bryozoans, and nematodes were found in phytoplankton samples.

The majority of detected phytoplankton species are widespread in moderate conditions and have wide ecological valence. Phytoplankton species are represented by freshwater, freshwater - brackish-water, brackish-water and brackish-water - marine forms of algae. True planktonic species are (P) - 16 species, plankton-benthic (P-B) - 43, phytobenthos (B) - 65, epiphytes (Ep) - 3 and saprophil (Sp) - 3 species (1).

The periphyton species determined in collected samples from the YG canal, are mainly represented by diatoms, blue-green, and green microalgae. Consumer organisms of zooplankers (protozoa, rotifers, chironomid larvae, nematodes, oligochaetes, shell amoebas, etc.), as well as representatives of the Fungi kingdom (mushrooms), are constantly present with low abundance in the fouling.

Sampling points are places with a shallow depth, respectively, well warmed up and heavily overgrown with macrophytes; therefore, species that prefer highly eutrophic and overgrown reservoirs (the canal littoral zone) are dominated. However, it can be concluded that there were decreased water level in canal at the time of sampling, that in turn affected the development of periphyton (slightly moderate development). There were observed stems of macrophytes (reeds, reeds, hara, urut, crested ridges), formations from dark brown to brownish-olive in color, leathery, hard deposits from shell organisms of the genera *Arcella, Cyphoderia, Euglypha*, as well as spicules *Spongilla lacustris* gemmule.

An analysis of the ecological characteristics of the detected periphyton species indicates that spring periphyton species mainly consist from o- (oligo), o-b- (oligo-beta), b (beta) -test freshwater, freshwater-brackish-water and ba (beta alpha) - mesosaprobic brackish water forms. The water quality of YG canal refers to class III - moderately-polluted water. The biotic periphyton index (BPI) is 6 points, the saprobity index (IS) is 1.79-1.98, and the ecological state is AB. The meaning of alphabetic characters: AB - a satisfactory ecological state,

characterized by the metabolic and ecological progress of biocenoses. However, during widespread drop in water level, siltation as well as an increase in the level of trophicity and mineralization (in places with the smell of rotting vegetation) occurred α-saprobic brackish-water-marine forms of algae prevailed.

The calculated saprobity indices for zooplankton species correspond to the transitional quality of waters: from slightly polluted to moderately polluted waters. The presence of the dominant filter species *Daphnia pulex* indicates the high self-cleaning ability of the canal.

Neither rare nor endemic species were identified among the collected zooplankton samples. There were no species were found among the collected periphyton samples that may cause rapid fouling of mechanical surfaces, which can reduce the efficiency of used technologies.

The abundant quantitative reproduction of primary production (diatoms, green algae), as well as zooplankton and benthos, which are primary source of food for fish, are primary inhabitants of the YG canal.

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9. Annex 1

Collected samples of zooplankton

Collected samples of phytoplankton

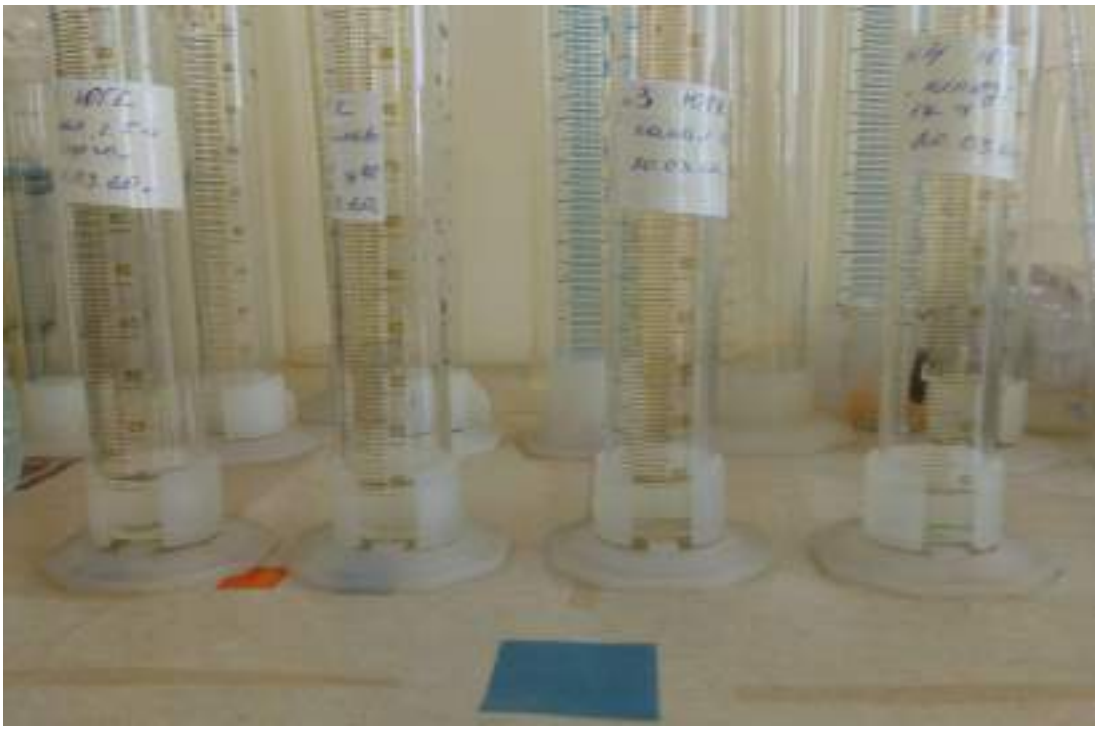
Phase I - 4 samples of phytoplankton (left) and 3 samples of periphyton (right)

Sedimentation of phytoplankton samples (7 days), sample volume 500 ml.

Phase II - Phytoplankton samples - sedimentation up to 100 ml

Settling samples of phytoplankton and bringing the volume to 100 ml (5 days)

Phase III –- Settling and bringing up to 10 ml



Settling of phytoplankton samples and increasing the volume to 10 ml (5 days)

Phytoplankton samples were prepared for qualitative and quantitative analysis and storage of sample sediment (sample volume 10 ml).

10. Annex 2

Photo report from sample collection

APPENDIX O-1– MACROINVERTEBRATES & FISH SURVEY REPORT

Macroinvertebrates and fish survey report

UZBEKISTAN COMBINED CYCLE POWER PROJECT:

LOCAL SUPPORT IN THE DEVELOPMENT, SUBMISSION AND APPROVAL OF ESIA

CLIENT: 5CAPITALS

Date: July 2020

Juru Energy Ltd.
Suite 1, One George Yard, London
United Kingdom, EC3V 9DF
T: +44 207 859 4028,

Tashkent – 2020

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Abbreviations/Acronyms

α- mezosaprobic zone characterizes the average (above moderate) water contamination

α-ρ-saprobic zone is characterized by severe water pollution

β-α- mesosaprobic zone is characterized by moderate water pollution

B- biomass

D_{mn} – Menhinick's index

D- Simpson's diversity index

N- number

S – saprobity of a species, an indicator of organic pollution of a reservoir

s - the indicator weight of the species usually takes values from 1-4 (the higher the indicator weight, the greater the contamination of the reservoir)

TPP – Thermal power plant

YG canal – Yujzno Golodnostepsky canal

INTRODUCTION

The head section of the Yuzjno Golodnostepsky canal (YG) named after A.A. Sarkisov with a length of 14.5 km and a maximum flow rate of 350 m³ / s. Base gauging locations on the Syrdarya - Kyzylkishlak, Nadezhdensky, Chinaz and Kokbulak, as well as at the head structures of the canals - Southnogolodnostepsky, "Dustlik", Verkhny Dalverzinsky, Nizhny Dalverzinsky, Begovat, at pumping location from the Syrdarya and distribution "sprinklers" from Yustlik

The bed of the canal consists of sands, often with loamy and sandy loam cover. The banks of the canal in the researched area are steep, mostly deep. The level regime of the YG canal is mainly determined both due to natural, seasonal changes in the amount of water inflow, as well as due to water discharges into the lower pool of the Farkhad HPP, as well as the water content of the year and the operation mode of the HPP fluctuates, but the general pattern of the level variation from year to year remains constant. Under the influence of strong stable winds blowing along the channel, surge level fluctuations are highly developed.

YG canal is located in the zone of temperate continental climate of Uzbekistan. The southern part of the Tashkent region is characterized by lower humidity and higher summer temperatures. The maximum air temperature in the YG canal zone is +45C°.

Macroinvertebrate and fish survey were performed on YG canal during 24-25 of June, 2020. The objectives of the research were to identify species composition of fish and macroinvertebrates as well as determine type of species that are listed in IUCN and red Book of Uzbekistan.

Furthermore, for fish survey were collected secondary related to the followings:

- Fishing seasons and allowed fishing volume per year/ month;
- Information regarding fishing groups (commercial/local) as well as their activities near the Project site;
- Closest fishing areas near the project site and within 2km form the intake and outfall as well as their locations on the map (if aviable);
- Information about fish kills in the past due to power plant cooling water (high temperature), deoxygenation or other causes.

I. Macroinvertebrates

1.1. Visual characteristics of the main biotopes at macroinvertebrates sampling locations.

In littoral and central zone of the YG canal water transparency was low. Sediments in littoral zone, thickets of aquatic vegetation, were presented by a small amount of black or grey silt mixed with a large amount of clay. Sediments in the water were silted sand and clay. The water temperature on the surface layer was 26-27,5°C.

In the water, near the littoral zone, there were pieces of submerged aquatic vegetation that apparently covered the depth of the littoral zone in early spring: watermilfoils, pondweed, etc. (genus Potamogeton – 3 species, genus Ceratophyllum -1 species, Myriophyllum spicatum). Cattails and reeds, whose fouling along the littoral zone was 60-70% in March, occupied almost the entire littoral zone (90-95%) in June, 2020.

By midday the temperature (14:00) reached 40°C. Visually, the water level was lower, and the turbidity (water color is dirty-greenish) was higher in comparison to the survey performed on March 2020. Near the bank of canal spots of oil products and foam were not observed. It worth to mention that water level in canal was significantly decreased (perhaps it occurred due to the dam broke in Sardoba on May 1st). The littoral zone with submerged vegetation, which was typical for March 2020, was completely absent in June 2020. From an insignificant distance, about 0.1-0.3 meters of canal bank the deep-water part of the channel bed

abruptly begins (5-8 m). YG canal banks were overgrowing by reeds (90-95%). These made a challenge to find a place with macrophytes.

There was a lack of available places for sampling benthos because it abruptly becomes deep, i.e. at a distance of 0.1-0.3 m from littoral zone the deep-water part of the canal bed with 3-8 m depth begins.

Macroinvertebrates sampling was performed from 6 location: 3 from canal banks and 3 from middle point of canal.

Table 1: Sampling locations and description

Location	Coordinates		Sampling depth	Water temperature (surface)	Notes
	Latitude	Longitude			
1 (MB1)*	40°13'35.53"N	69° 6'38.57"E	0.3 m	+26°C	Between the reeds
2 (MB2)	40°13'55.77"N	69° 6'19.81"E	0.5 m	+26°C	No macrophytes
3 (MB3)	40°14'0.73"N	69° 6'11.53"E	0.1 m	+27°C	Between the reeds[1]
4 (MD1)[2]	40°13'42.85"N	69° 6'35.70"E	8 m	+27°C	Average water flow, Water color is greenish-muddy
5 (MD2)**	40°13'48.68"N	69° 6'29.48"E	8 m	+28°C	Average water flow, Water color is greenish-muddy, depth is covered with hardened clay
6(MD3)	40°13'55.30"N	69° 6'17.88"E	8 m	+28°C	Average water flow, Water color is greenish-muddy
7 (MB4)***	40°13'42.00"N	69° 6'37.18"E	0.5 m	+27°C	Between the reeds

*MB- Macroinvertebrates Bank – samples collected from the canal banks;
**MD - Macroinvertebrates Depth – samples collected from the canal depth.

[1] YG canal banks were covered by reeds for 90-95% that made impossible to collect samples from place where there macrophytes

[2] MD1 location is differs from the initial Canal WQ 1 (control point). WQ1 was very hard clay soil

***MB4 – an additional location was selected during the sampling period to have more samples for the detailed study of macroinvertebrates because it was impossible to get the samples from MD2 and MD3.

By midday the temperature (14:00) reached 40°C. Visually, the water level was lower, and the turbidity (water color is dirty-greenish) was higher in comparison to the survey performed on March 2020. Near the bank of canal spots of oil products and foam were not observed. It worth to mention that water level in canal was significantly decreased (perhaps it occurred due to the dam broke in Sardoba on May 1st). The littoral zone with submerged vegetation, which was typical for March 2020, was completely absent in June 2020. From an insignificant distance, about 0.1-0.5 meters of canal bank, the deep-water part of the channel bed abruptly begins (5-8 m). YG canal banks were overgrowing by reeds (90-95%). These made a challenge to find a place with macrophytes.

Fig.1. Sampling at MB1 location – Between reeds

Fig.2. Sampling at MB2 location – No macrophytes

Fig.3. Sampling at MB3 location – Between the reeds

1.2. Sampling methodology

Standard macroinvertebrate net - D-frame dip net was used to collect samples from canal banks (MB1 -4). When sampling between reeds, D-frame dip net was immersed into its thicket and the areas between reeds were “swept” for 60-120 seconds. At the location 2 (MB2) there was softer clay silts. Therefore D-frame dip net was immersed in the soil to 10 cm depth and the soil surface was scraped with a cutting edge.

Petersen grab was used to collect macroinvertebrates samples from the depth of canal (MD1-3).

Collection of samples from the depth of canal was performed at three locations (MD1-3). At each location, the Peterson grab was lowered till depth to grab soil. On average, at each location, the Peterson grab was dropped up to 5 times. However, the depth of canal at the locations MD2 and MD3 were covered by hardened clay, that made impossible to grab samples. All attempts to grab samples from these locations were failed. It was only possible to get sample at the location MD1. Peterson grab fell into a pit from where the stream does not wash away organic residues. Thus, it was possible to find place which could give a valuable information about «depth» benthos.

For the purposes of hydrobiological monitoring, the most convenient and versatile sampling tool in water streams is a scraper: a metal frame like a net put on a stick, but with a flat cutting edge, with the help of which you can scrape the top layer of soil.

When sampling in rivers, the scraper is installed downstream relative to the substrate from which the sampling is carried out, so that the organisms and soil particles and substrate pieces are taken into the scraper net by the stream.

The saprobity index (organic pollution) of location s was calculated using the formula:

$$S = \frac{\sum sh}{\sum h} \quad (1)$$

where S – saprobity index; s – indicator significance; h – relative number of species.

Indicator significance (s): for oligosaprobic macroinvertebratesmacroinvertebrates organisms is compiled 1; for ß- mesosaprobics – 2; for α- mesosaprobics – 3; for polisaprobes – 4. The indicator significance of the species (numerical expression) of zoobenthous organisms were determined from literary sources: determinants, developments and experience of specialists of Uzhydromet under the Cabinet of Ministers (Talskikh, 1996).

Table 2. Recalculating the number of benthic samples collected with scraper, for 1 m² according to the method of. Bulgakov G.P.

Number of species(h)	Frequency	Number of organisms detected in the sample volume:							Sample per m²
		1x	1,5x	2x	2,5x	3x	4x	5x	
1	Once	-	-	1	1	1	1-2	1-3	Up to 6
2	Very rarely	1	1-2	2	2	2-3	3-4	4-5	7-12
3	Rarely	2-5	3-7	3-10	3-13	4-15	5-20	6-25	13-62
5	Quite often	6-10	8-15	11-20	14-25	16-30	21-40	26-50	63-125
7	Often	11-20	16-30	21-40	26-50	31-60	41-80	51-100	126-250
9	Very often	>20	>30	>40	>50	>60	>80	>100	>250

1.3. The results of macroinvertebrates sampling analysis

Overall, there were collected 5 samples of macroinvertebrates (from MB1-4 and MD1). Representatives of Ephemeroptera, Odonata, Gastropoda, Bivalvia, Colembola, Trichoptera were observed in samples collected from banks, while Tubificidae, Chironomidae, Naididae – in sample taken from the depth (MD1).

According to preliminary data, rare dragonfly species such as Large dragonflies, damselflies, etc.were not observed in samples.

Taxonomic characteristics of macroinvertebrates biocenoses

In June 2020, 31 species of organisms from 7 taxonomic groups were found in macroinvertebrates of YG canal: faggot worms (Trichoptera) – 2 species, Odonata – 3 species, bedbugs (Hemiptera) – 1 species, beetles (Coleoptera) – 3 species, larvae and pupae of Diptera (Diptera) – 12 species, molluscs (Mollusca) – 7 species, smallworms (Oligochaeta) – 3 species. Thus, the greatest diversity of species was observed for Diptera, mainly due to the family Chironomidae, which was represented by 14 species.

Table 3. Species composition and relative number of species (h) of the YG canal macroinvertebratesmacroinvertebrates (June, 2020); (* - empty shells and pelts)

Species	MB1	MB2	MB3	MD1	MB4
	1	2	3	4	5
Trichoptera					
Agrypnia sp.	1		1		
Orthotrichia sp.			3		
Odonata					
Ophydogomphus cecilia	*				
Ishnura pumilio L.	1		1		
Calopteryx virgo Linnaeus	3				
Diptera					
Odontomyia sp.	3				
Musca domestica Linnaeus	1				
Chironomidae					
Corynoneura scutellata Winnertz	5	3	3		1
Cricotopus trifascia	3	3	3		1
Cricotopus gr. bicinctus Meigen	5	5	3		3
Polypedilum scalaenum Schrank	3		3		

Species	MB1	MB2	MB3	MD1	MB4
	1	2	3	4	5
Chironomus halophilus Kieffer			3		
Chaetocladius sp.		3		5	3
Chironomus plumosus Linnaeus		3			
Chironomus tummy	5	3			
Cryptochironomus gr. defectus Kieffer			3		
Cladotanytartus sp.		3			
chrysalis of Chironomidae	3				
Hemiptera					
Plea minutissima Leach			1		
Coleoptera					
Dryops ps. (larvae)			1		
Laccophillus sp. (larvae)			1		
Enochrus sp. (larvae)	1				1
Mollusca					
Physa ocuta Draparnaud	9	2			
Planorbis planorbis Linnaeus		*			
Anisus leavis	*	*			1
Lymnaea ovata Draparnaud	3		1		3
Lymnaea auricularis Linné	2				
Physa fontinalis L.	2				
Anodonta sp.		*			
Oligochaeta					
Nais elinguis Müller		3			1
Limnodrilus hoffmeisteri f. typica Claparede		3		3	
Ilyodrilus hammoniensis (Michaelsen)	1	5		5	
Total species:	**18**	**14**	**15**	**3**	**8**

Note: Species composition and relative number of species (h): for random finds (very rarely) – 1; very rarely-2; rarely-3; quite often-5; often-7; very often-9.

None of determined macroinvertebrates species are listen in IUCN and Red Book of Uzbekistan.

1.4. Quantitative growth of macroinvertebrates

As it was noted earlier, the macroinvertebratesmacroinvertebrates of the YG canal is developing unevenly in quantitative terms. Thus, the highest numbers during reconnaissance sampling were observed at the MB1 -1063 sample per m^2 and mainly due to chironomid larvae and mollusks Physa ocuta Draparnaud, the main contribution to which was made by Chironomus tummy and Corynoneura scutellata Winnertz. The highest biomass values are also typical for MB1-27,229 g/m^2, due to chironomid larvae and mollusks. Small numbers were recorded at the MB3-137 sample per m^2, but the samallest- 3 species was observed at the MD1. The lowest values of biomass were found at MD1 - 0.410 g/m^2. Analysis of main groups of macroinvertebratesmacroinvertebrates showed the dominance of representatives of Diptera at almost all points of the YG canal in terms of their overall quantitative indicators of benthic fauna.

Table 4. Quantitative characteristics and saprobity of YG canal macroinvertebrates species (June, 2020)

Notes:

N- number;

B- biomass of species;

S – saprobity of species;

s – indicator weight;

Date	Location №	Taxonomic group	Species	(N), Species number per m^2	(B), g/m^2	(S)	(s)
24.06.2020	MB1	Trichoptera	Agrypnia sp.	6	0,94	β-α	2,5
		Odonata	Ophydogomphus cecilia*	-	-	α-ρ	3,5
			Ishnura pumilio L.	6	0,034	α	3
			Calopteryx virgo Linnaeus	25	0,072	β-α	2,5
		Diptera	Odontomyia sp.	31	9,300	α	3
			Musca domestica Linnaeus	6	0,925	α-ρ	3,5
		Diptera (Chironomidae)	Chironomus tummy	144	0,900	ρ	4
			Cricotopus gr. bicinctus Meigen	75	0,115	α	3
			Cricotopus trifascia	48	0,070	α	3
			Corynoneura scutellata Winnertz	119	0,167	β-α	2.5

Date	Location №	Taxonomic group	Species	(N), Species number per m^2	(B), g/m^2	(S)	(s)
			Chaetocladius sp. (setosipennis)	75	0,113	α	3
			Polypedilum scalaenum Schrank	56	0,09	α	3
			Chironomidae gen sp. (pupae)	31	0,194		
		Coleoptera	Enochrus sp. (larvae)	6	12,92	α	3
		Mollusca	Lymnaea ovata Draparnaud	44	0,229	α	3
			Lymnaea auricularis Linné	13	0,135	α	3
			Physa fontinalis L.	13	0,068	α-ρ	3,5
			Physa ocuta Draparnaud	363	0,942	β-α	2,5
			Anisus leavis*	-	-	β	2
		Oligochaeta	Ilyodrilus hammoniensis (Michaelsen)	6	0,015	ρ	4
		6	**18**	**1063**	**27,229**	**β-α**	**S=2,83**
24.06.2020	MB2	Diptera (Chironomidae)	Chironomus tummy	56	0,35	ρ	4
			Cricotopus gr. bicinctus Meigen	75	0,105	α	3
			Cricotopus trifascia	31	0,056	α	3
			Corynoneura scutellata Winnertz	44	0,048	α	3
			Chaetocladius sp. (setosipennis)	25	0,023	α	3
			Cladotanytartus sp.	25	0,045	α	3
			Chironomus plumosus Linnaeus	31	0,031	ρ	4
		Mollusca	Physa ocuta Draparnaud	13	0,034	β-α	2,5
			Planorbis planorbis Linnaeus*	-	-	α	3

Date	Location №	Taxonomic group	Species	(N), Species number per m²	(B), g/m²	(S)	(s)
			Anisus leavis*	-	-	β	2
			Anodonta sp.*	-	-	α-ρ	3,5
		Oligochaeta	Ilyodrilus hammoniensis (Michaelsen)	63	0,150	ρ	4
			Limnodrilus hoffmeisteri f. typica Claparede	13	0,033	ρ	4
			Nais elinguis Müller	19	0,002	β-α	2,5
		3	**14**	**395**	**0,877**	**α**	**S=3,11**
24.06.2020	MB3	Trichoptera	Orthotrichia sp.	56	0,112	α	3
			Agrypnia sp.	6	0,94	β-α	2,5
		Odonata	Ishnura pumilio L.	6	0,03	α	3
		Coleoptera	Dryops ps. (larvae)	6	0,035	α	3
			Laccophillus sp. (larvae)	6	0,042	α	3
		Hemiptera	Plea minutissima Leach	6	0,03	α-ρ	3,5
		Diptera (Chironomidae)	Cricotopus gr. bicinctus Meigen	38	0,068	α	3
			Cricotopus trifascia Edwards	25	0,038	α	3
			Corynoneura scutellata Winnertz	50	0,070	α	3
			Chaetocladius sp. (setosipennis)	63	0,094	α	3
			Polypedilum scalaenum Schrank	31	0,050	α	3
			Chironomus tummy	56	0,350	ρ	4
			Chironomus halophilus Kieffer	31	0,279	ρ	4
			Cryptochironomus gr. defectus Kieffer	25	0,063	α	3
		Mollusca	Lymnaea ovata Draparnaud	6	0,031	α	3

Date	Location №	Taxonomic group	Species	(N), Species number per m^2	(B), g/m^2	(S)	(s)
		6	**15**	**411**	**2,232**	**β-α**	**S=2,78**
24.06.2020	MD1	Diptera (Chironomidae)	Chaetocladius sp. (setosipennis)	80	0,120	α	3
		Oligochaeta	Ilyodrilus hammoniensis (Michaelsen)	80	0,190	ρ	4
			Limnodrilus hoffmeisteri f. typica Claparede	40	0,100	ρ	4
		2	**3**	**200**	**0,410**	**α-ρ**	**S=3,62**
24.06.2020	MB4 (additional point)	Diptera (Chironomidae)	Cricotopus gr. bicinctus Meigen	19	0,027	α	3
			Cricotopus trifascia Edwards	6	0,013	α	3
			Corynoneura scutellata Winnertz	6	0,006	α	3
			Chaetocladius sp. (setosipennis)	44	0,055	α	3
		Mollusca	Lymnaea ovata Draparnaud	44	0,308	α	3
			Anisus leavis	6	0,042	β	2
		Oligochaeta	Nais elinguis Müller	6	0,001	β-α	2,5
		Coleoptera	Enochrus sp. (larvae)	6	0,045	α	3
		4	**8**	**137**	**0,497**	**α**	**S=2,85**

Based on number and biomass of each species in the sample, the indicators of species number (sample per m^2), biomass (g/m^2), as well as the saprobity index for each sampling locations were calculated.

Table 5. Number and biomass of macroinvertebrates taxonomic groups

Date	Location№	Taxonomic group	Species number in a group	Number	Biomass
24.06.2020	MB1	Trichoptera	1	6	0,94
		Odonata	3	62	0,106
		Diptera	8	585	11,874
		Coleoptera	1	6	12,92

Date	Location№	Taxonomic group	Species number in a group	Number	Biomass
		Mollusca	5	433	1,374
		Oligochaeta	1	6	0,015
		6	**18**	**1063**	**27,229**
24.06.2020	MB2	Diptera	7	287	0,658
		Mollusca	4	13	0,034
		Oligochaeta	3	95	0,185
		3	**14**	**395**	**0,877**
24.06.2020	MB3	Trichoptera	2	62	1,052
		Odonata	1	6	0,03
		Diptera	8	319	1,112
		Coleoptera	2	12	0,077
		Mollusca	1	6	0,031
		Hemiptera	1	6	0,03
		6	**15**	**411**	**2,232**
24.06.2020	MD1	Diptera	1	80	0,120
		Oligochaeta	2	120	0,290
		2	**3**	**200**	**0,410**
24.06.2020	MB4 (additional point)	Diptera	4	75	0,101
		Coleoptera	1	6	0,045
		Mollusca	2	50	0,350
		Oligochaeta	1	6	0,001
		4	**8**	**137**	**0,497**

II. Indices of saprobity and biodiversity of macroinvertebrates organisms of YG canal

2.1. Indices of saprobity of macroinvertebrates and pollution

According to macroinvertebrates indicators for June 2020, MB3 and MB2 correspond to the β-α-mesosaprobic zone, i.e. the saprobity indicators (S) are in the range between 2.5 and 3.00. This means that the water quality corresponds to class III-IV: transition from moderately polluted water to polluted water.

β-α-mesosaprobic zone is characterized by the presence of nitrogen compounds in the form of nitrates and nitrites in the water. Among other things, amino and amido acids can be noted, which is why the conditions of the hydro-environment tend to change into a semi-anaerobic mode. There is not as much dissolved

oxygen in water as in the β-mesosaprobic zone, so the freezing at the bottom and at night due to the termination of photosynthesis is much more frequent. The presence of hydrogen sulphide in large quantities (layered grey and dark grey silts with the smell of hydrogen sulphide) was noted. The nature of biochemical processes is oxidizing-reducing. MB1 and MB4 correspond to the α-mesasaprobic zone, i.e. saprobity indicators (S) are in the range between 3.00 and 3.50. This means that the water quality corresponds to class IV - polluted water.

α-mesosaprobic zone is characterized by the presence of amino and amido acids in water. Hydro-environment conditions tend to change into semi-anaerobic mode. There is little oxygen dissolved in the water, which can cause freezing at the bottom and at night due to the termination of photosynthesis. Presence of hydrogen sulphide in large quantities (layered grey and dark grey, or even black silts with the smell of hydrogen sulphide) was noted. The nature of biochemical processes is oxidizing-reducing.

MD1 correspond to the α- ρ -saprobic zone, i.e. the saprobity indicators (S) are in the range between 3.50 and 4.00. This means that the water quality corresponds to class IV-V –transition from polluted to highly polluted water.

The α- ρ -saprobic zone is characterized by the presence of decomposing proteins, large amounts of hydrogen sulphide and methane in the water. Organisms are deficient in dissolved oxygen in water, because the environment is almost anaerobic. The nature of biochemical processes is regenerative.

2.2. Indices of species diversity of macroinvertebrates

To establish the structural characteristics of macroinvertebrates organisms were calculated diversity indices (Menhinick's indices) using the following formula:

$$D_{mn} = \frac{S}{\sqrt{N}} \quad (2)$$

where S – number of identified species; N – total number of all identified species.

A larger index value corresponds to a greater species diversity.

Table 6. Diversity according to Menhinick's index

Date	Location №	number of identified species S	total number of all identified species N	Diversity index D_{mn}
24.06.2020	MB1	18	1063	0,017
24.06.2020	MB2	14	395	0,705
24.06.2020	MB3	15	411	0,718
24.06.2020	MD1	3	200	0,212
24.06.2020	MB4 (additional point)	8	137	0,684

According to Menhinick's index calculation, biodiversity prevails at MB2, where the value of Menhinick's index is 0.718; MB4 Menhinick's index is 0.705.

At MD1, where the value of Menhinick's index is equal to 0.212, the lowest species diversity is noted.
Simpson's diversity index is a measure of biodiversity of habitat. It takes into account the number of species present, as well as the abundance of each species. Thus, a group that is dominated by one or two species is considered less diverse than a group in which the species present have similar numbers.
The measure of species concentration in sampled macroinvertebrates, according to the Simpson's diversity index, is calculated using the following formula:

$$D = \frac{\sum n(n-1)}{N(N-1)}$$

или

$$D = \sum (n/N)^2$$

where:

- n = the total number of organisms of a particular species;

- N = the total number of organisms of all species.

The value of **D** ranges between 0 and 1:

With this index, 0 represents infinite diversity and 1, no diversity.

Table.7 A measure of species concentration in sampled macroinvertebrates, according to Simpson's diversity index

Date	Location №	Taxonomic group	Species	number of each species (n)	Concentration of species D
24.06.2020	MB1	Trichoptera	Agrypnia sp.	1	0,005
		Odonata	Ophydogomphus cecilia*	-	-
			Ishnura pumilio L.	1	0,005
			Calopteryx virgo Linnaeus	4	0,023
		Diptera	Odontomyia sp.	5	0,029
			Musca domestica Linnaeus	1	0,005
		Diptera (Chironomidae)	Chironomus tummy	23	0,134
			Cricotopus gr. bicinctus Meigen	12	0,070
			Cricotopus trifascia	8	0,046
			Corynoneura scutellata Winnertz	19	0,111
			Chaetocladius sp. (setosipennis)	12	0,070
			Polypedilum scalaenum Schrank	9	0,052
			Chironomidae gen sp. (куколки)	5	0,029
		Coleoptera	Enochrus sp. (larvae)	1	0,005
		Mollusca	Lymnaea ovata Draparnaud	7	0,041
			Lymnaea auricularis Linné	2	0,012
			Physa fontinalis L.	2	0,012
			Physa ocuta Draparnaud	58	0,339
			Anisus leavis*	-	-
		Oligochaeta	Ilyodrilus hammoniensis (Michaelsen)	1	0,005

Date	Location №	Taxonomic group	Species	number of each species (n)	Concentration of species D
		6	**18**	**171**	**0,993**
24.06.2020	MB4	Diptera (Chironomidae)	Chironomus tummy	9	0,142
			Cricotopus gr. bicinctus Meigen	12	0,190
			Cricotopus trifascia	5	0,079
			Corynoneura scutellata Winnertz	7	0,111
			Chaetocladius sp. (setosipennis)	4	0,063
			Cladotanytartus sp.	4	0,063
			Chironomus plumosus Linnaeus	5	0,079
		Mollusca	Physa ocuta Draparnaud	2	0,031
			Planorbis planorbis Linnaeus*	-	-
			Anisus leavis*	-	-
			Anodonta sp.*	-	-
		Oligochaeta	Ilyodrilus hammoniensis (Michaelsen)	10	0,159
			Limnodrilus hoffmeisteri f. typica Claparede	2	0,031
			Nais elinguis Müller	3	0,047
		3	**14**	**63**	**0,995**
24.06.2020	MB 2	Trichoptera	Orthotrichia sp.	9	0,136
			Agrypnia sp.	1	0,015
		Odonata	Ishnura pumilio L.	1	0,015
		Coleoptera	Dryops ps. (larvae)	1	0,015
			Laccophillus sp. (larvae)	1	0,015
		Hemiptera	Plea minutissima Leach	1	0,015
		Diptera (Chironomidae)	Cricotopus gr. bicinctus Meigen	6	0,090

Date	Location №	Taxonomic group	Species	number of each species (n)	Concentration of species D
			Cricotopus trifascia Edwards	4	0,060
			Corynoneura scutellata Winnertz	8	0,121
			Chaetocladius sp. (setosipennis)	10	0,151
			Polypedilum scalaenum Schrank	5	0,075
			Chironomus tummy	9	0,136
			Chironomus halophilus Kieffer	5	0,075
			Cryptochironomus gr. defectus Kieffer	4	0,060
		Mollusca	Lymnaea ovata Draparnaud	1	0,015
		6	**15**	**66**	**0,927**
24.06.2020	MD1	Diptera (Chironomidae)	Chaetocladius sp. (setosipennis)	2	0,4
		Oligochaeta	Ilyodrilus hammoniensis (Michaelsen)	2	0,4
			Limnodrilus hoffmeisteri f. typica Claparede	1	0,2
		2	**3**	**5**	**1,000**
24.06.2020	MB3	Diptera (Chironomidae)	Cricotopus gr. bicinctus Meigen	3	0,136
			Cricotopus trifascia Edwards	1	0,045
			Corynoneura scutellata Winnertz	1	0,045
			Chaetocladius sp. (setosipennis)	7	0,318
		Mollusca	Lymnaea ovata Draparnaud	7	0,318

Date	Location №	Taxonomic group	Species	number of each species (n)	Concentration of species D
			Anisus leavis	1	0,045
		Oligochaeta	Nais elinguis Müller	1	0,045
		Coleoptera	Enochrus sp. (larvae)	1	0,045
		4	**8**	**22**	**0,997**

III. Fish fauna of the Syrdarya basin

Currently, 70-71 species belong to 55 genera, 17 families live in natural reservoirs of Uzbekistan. Among them, 48 species are indigenous (two species-Syrdarya sturgeon Pseudoscaphirhynchus fedtschenkoi (Kessler, 1872) and bastard sturgeon *Acipenser nudiventris* (Lovetsky, 1828), apparently disappeared from the fish fauna of Uzbekistan in the second half of the 20th century; it is also not clear whether it exists in the waters of the Republic common perch Perca fluviatilis, the same goes for ruffe Gymnocephalus cernuus and the minnow Phoxinus cf. brachyurus), 17 species (of 48) – endemic to the Aral sea basin, 26 species (of 70) – commercial fish and 25 species are alien species from the Caspian, Black and Baltic seas, Caucasus, the European part of Russia, lakes of Kyrgyzstan, rivers of the Far East; currently 22 species of fish disappeared, small are 7, common and even numerous – 18 types.The fish fauna of the Syrdarya basin includes 60 species of fish, 10 of them are endemic species (found only in the Syrdarya basin): *Pseudoscaphirhynchus fedtschenkoi, Aspiolucius esocinus, Barbus brachycephalus, Capoetobrama kuschakewitschi, Leuciscus lehmani, Leuciscus squalisculus, Nemacheilus kuschakewitschi, Cottus gobio jaxartensis, Cottus spinulosus u Alburnoides oblongus* (Salizov and Kamilov, 1995; Wundzettel, 1994).

Fish fauna of Syrdarya, starting from confluence of its components and up to the Chardari reservoir, including the Kairakkum reservoir, has almost a single composition. The difference is that within middle stream of the river there is Opsariichthys uncirostris-an inhabitant of sections of watercourses with stony-shingle soil, but Schizotorax intermedius is not marked.

Mass spawning migrations are typical for *Hypophthalmichthys molitri*, Ctenopharyngodon *idella*, *Aspiolucius esocinus*, *Cyprinus carpio*, *Abramis brama orientalis*, *Pelecus cultratus*, *Stizostedion lucioperca*, *Silurus glanis* and *Rutilus rutilus aralensis*.

The reservoir itself is also characterized by residential forms of phytophilic fish species. In fact, the reservoir and middlecourse of the river are inhabited by a single ichthyocenosis that uses the ecological advantages of the reservoir and the river (Salikhov and Kamilov, 1995; Wundzettel, 1994).

IV. Fish fauna of YG canal

4.1. Methods for studying the species composition of fish in YG canal

As fishing tools for commercial fishing, we used fixed nets with a mesh of 25, 45 mm.

Fig.4. Starting point of fish observation on YG canal

Fish were planned to be measured according to the Pravdin scheme (1966): body length to the end of the scale cover (SL) with an accuracy of 1 mm, and body weight (W).

Fish survey was conducted by using non-lethal methods, i.e., netting (two fishing nets with cell size of 25 mm and 45 mm), observation method as well as fishermen survey. The species is determined using commonly accepted determinants. Fishing survey on YG canal was performed during a day time on 24 (day time)– 25 (night time), June.

Fig. 5. Preparation and installation of fishing nets (25 and 45 mm) for 100 m along both canal banks

Thus, the data on the species composition of fish in YG canal were given only after a survey of local fishermen.

When interviewing amateur fishermen if YG canal to determine the species of fish photos of fish fauna of the Syrdarya were used.

4.2. Results of the study of YG canal fish fauna

Fish survey started with observation of canal banks. During the observation the following species were determined:

- Korean sawbelly (Hemiculter leucisculus),
- rose bitterling (Rhodeus ocellatus),
- micropercops (Micropercops gen.sp.),
- amur goby (Rhinogobius bruneu),
- eastern gambusia (Gambusia affinis).

After canal observation, at 11 am two nylon fishing nets were set up across the canal. Nets (25 to 45 mm, the length of each net – 100 m). Nets were checked two times: at midnight and on in the morning (on 25th of June). During the night was strong wind, that blew one of the nets. Unfortunately, there were no fish was found in the remained net.

All species except Gambusia affinis are species accidentally fallen into reservoirs of Uzbekistan (with commercial species (M*ylopharyngodon piceus, Ctenopharyngodon idella* and other acclimatized commercial fish of the East Chinese complex)). *Gambusia affinis* is an acclimated species in Uzbekistan, in order to deal with malarial mosquito. The size of fry of 5 species of weed fish visually observed near the bank was 2-3 cm (the size of adult species reaches 10-15 cm).

According to the results of the survey of local fishermen, in amateur nets in YG canal were determined 23 species of fish (Table 8; indicated the types along with rare endangered species *Capoetobrama kuschakewitschi* that according to the survey cannot be found in nets of fishermen in YG canal).

Furthermore, survey resulted that among 23 species were determined such fish species as a roach-Rutilus rutilus (30%), carp - Cyprinus carpio (20%), carp (15%), snakehead (15%) - Channa argus, silver carp - Hypophthalmichthys molitrix, zander - Sander lucioperca, Amur triplelip - opsariichthys uncirostris (decrease in catches as they are located in the list). According to the fisherman, the average age of fish in YG canal is 2-3 years, while their weight is 1-2 kg. Furthermore, there are 2 endemic species listed in the red Book of Uzbekistan can be found in canal Aspiolucius esocinus, Barbus brachycephalus. Capoetobrama kuschakewitschi was not mentioned as a habitant of YG canal.

Table. 8. The species composition of YG canal fish fauna determined according to the survey of fishermen

Latin name	English name	Status	Presence in YG canal
Pike family – Esocidae			
Esox lucius	Pike	*	+
Minnow family – Cyprinidae			
Abramis sapa aralensis	Aral white-eye bream	Ss	+
Alburnoides taeniatus	Striped bystranka	*	+
Aspiolucius esocinus	Pike asp	E R	+
Aspius aspius taeniatus	Aral asp	Ss	+
Barbus brachycephalus	Aral barbel	E R	+

Barbus capito conocephalus	Turkestan barbel	Ss	+
Varicorhynus capoeta heratensis	Samarkand khramulya	E	+
Capoetobrama kuschakewitschi	Sharpray	E R	-
Carassius auratus gibelio	Silver Prussian carp	*	+
Ctenopharyngodon idella	Grass carp	A	+
Cyprinus carpio	Common carp	*	+
Hemiculter leucisculus	Sharpbelly	I	+
Hypophthalmichthys molitrix	Silver carp	A	+
Opsariichthys uncirostris amurensis	Amur three-lips	I	+
Pelecus cultratus	Sabre carp or (sabrefish)	*	+
Rhodeus ocellatus ocellatus	Rosy bitterling	I	+
Rutilus rutilus aralensis	Aral roach	Ss	+
Catfish family – Siluridae			
Silurus glanis	Wels catfish	*	+
Livebearers family – Poecilidae			
Gambusia affinis	Mosquitofish	A	+
Perch family – Percidae			
Stizostedion lucioperca	Zander	*	+
Sleeper gobias family – Eleotrididae			
Micropercops cinctus	Freshwater sleeper	I	+
Goby family – Gobiidae			
Rhinogobius bruneus	Amur goby	I	+
Snakeheads family – Channidae			
Channa argus	Snakehead	I	+

Notes:

**** - Aboriginal (indegious) species***

– - almost extinct aboriginal species

E – Endemic species.

Ss – local subspecies.

E-R - endemic species listed in the Red Book of Uzbekistan (Red list of Uzbekistan endangered species of fish)

A – acclimated species

I – accidentally introduced species.

More often than other commercial species are found: ***Rutilus rutilus*** (30%), ***Cyprinus carpio*** (20%), carp (15%), snakehead (15%) - ***Channa argus***, ***Opsariichthys uncirostris*** white carp - ***Hypophthalmichthys molitrix***, ***Sander lucioperca***, (decrease in nets as they are located in the list). The largest fish, most often found in fish nets, have a mass of 1-2 kg and an average age of 2-3 years.

According to the results of a survey of fishermen, 2 endemic species listed in the Red book of Uzbekistan are very rarely seen in YG canal: *Aspiolucius esocinus, Barbus brachycephalus*.

Aral roach – *Rutilus rutilus aralensis* Berg. In the last decade, roach has become one of the main commercial species not only in YG canal, but also throughout Uzbekistan.

Carp – *Cyprinus carpio L.* Common commercial fish that was widely spread earlier and up to now.

Snakehead- ***Channa argus warpachowskii* Berg.** In the 1960s, the snakehead accidentally fell into the reservoirs of Uzbekistan.

Silver Prussian carp- Carassius auratus gibelio (Bloch). It lived in Aral Sea basin, Amu Darya and Syrdarya downstreams.

V. Fishing activities in the Republic of Uzbekistan

Permissions and prohibitions. Reservoirs that are used or can be used for commercial fishing or are important for the reproduction of fish stocks are considered fisheries. Commercial fishing (fishing) on fishery reservoirs is carried out by organizations and enterprises under contracts concluded in accordance with the established procedure which allow to conduct commercial fishing.

For commercial fisheries special contracts allow fishing year-round (excluding the restricted period from April 16 to May 31) and in unlimited quantities, but taking into account the size of fishing nets specified for each commercial species (and sometimes for a reservoir) (usually within the range of 24-55 mm) (from the Literary source: Decree of the Chairman of State committee of the Republic of Uzbekistan on ecology and environmental protection "On approval of the rules of hunting and fishing in the territory of the Republic of Uzbekistan, registration № 1569, Ministry of Justice from 2.05.2006)".

It is forbidden to engage in fishing gear and other structures more than 2/3 of the width of the riverbed, stream or canal, as well as simultaneously or alternately launch nets from opposite banks for fishing, fishing with the use of explosives, toxic or narcotic drugs, electric current and various electric fishing installations (including electric fishing rods), piercing fishing tools.

Commercial fishing during the spawning period is prohibited:

a) in the Amudarya and Syrdarya from March 10 to May 31;

b) on reservoirs of the Republic of Karakalpakstan and Khorezm region from April 25 to June 10;

c) on other all reservoirs from April 16 to May 31.

Sport and Amateur fishing is allowed on reservoirs of general use to all citizens free of charge (up to 5 kg), except for territories of reserves, fish nurseries, pond and other cultural fish farms, or for a fee on the assigned lands of fishing societies according to permits of these societies.

Information about fishing groups (commercial) and their activities near the Project site

There are no commercial fishing groups or fish farming organizations within a 2 km radius of project site. However, according to the survey of fishermen, in the near future it is planned to organize a pond farm (the area of the pond is about 0.7 ha), located 1 km above the Syrdarya TPP.

Fig. 6. a branch of YG canal, 1 km above the Syrdarya TPP, next to the bridge (the place where fish farming is planned)

Information about fish kills

There were no cases on fish kills due to the activities of TPP all around the Uzbekistan. However, as a result of changing flow of Syrdarya river, there were changes in the hydrological regime flow rate, as well as thermal regime of the YG canal, which affected the spawning time for such fish as carp, zander, and carp.

VI. Possible impact of the TPPs on the fish fauna of the YG canal

So far, in Uzbekistan no scientific research has been conducted on the effect of power plants on fish species of derivation canals. However, in existing literature the following factors may affect fish fauna under the influence of TPP are:

1) Formation of fish fauna under the influence of thermification of reservoirs.

An increase in temperature in local biotopes of reservoirs makes significant changes, both in the composition of fish fauna and in the biological indicators of individual species. The impact of temperature factors on the fish fauna will be emerged in the following ways:

A) Cold-loving species will disappear from fish communities (in dumping areas).

B) There will be a shift in the phases of the life cycle, which will result in earlier maturation of fish and accelerated growth of fries of various species, but fish of a certain age will be smaller than usual;

C) There will be a violation of fish reproduction cycles (a mismatch between the readiness to spawning, the need for food and the state of the forage base in areas of heated waters).

Thermification impacts on hydroecosystems, by contributing to the increase of water mineralization, and slows down the activity of reducing bacteria and self-cleaning processes. This, in turn, results in interaction of heated water with storm drains and with aerotechnogenic pollution. For example, on thermification zones of a number of locations, there is an increase in the number of biogenic compounds and organic substances that indicate eutrophication processes. In the zones of thermification of reservoirs, there may be a noticeable increase in the amount of a number of pollutants with toxic effects for hydrobionts.

2) Apart from temperature factor, the number of fishes will be affected by such factors as the ingress of commercial carp into the water intakes, as well as the death and injury of fish on the barrier grids at the water intakes of locations.

Forecast of the temperature factor influence on the fish fauna of YG canal

During the June, 2020, the temperature of surface water of YG canal water was +28°C, in the Farkhad derivation canal (where the water comes to the YG canal), at the same time, the temperature was +33°C.

Constant increase of temperature in canal as well as discharge of Syrdarya TPP relatively change the natural temperature of YG canal. This, in turn, can cause early maturation and then cause the death of fish species. For instance, if the normal mature period of fish is April-May, it can occur in February-March. Furthermore, lack forage resources as well as sharp drops in temperature (up to 0°C in April) may lead to the fish death.

Furthermore, species composition prevailing at present in YG canal such as ***Hypophthalmichthys molitrix*** and ***Sander lucioperca a***re very sensitive to the temperature changes. It also will affect to the size and weight composition of the fish fauna i.e., if now the fish fauna of the canal is represented by 2-3-year-old species with a weight of 1-2 kg, under the influence of temperature, size-weight composition will tend to decrease.

VII. Conclusion

Macroinvertebrates of YG canal is quite diverse in terms of species. The basis of benthic fauna on the above points of the canal (sediments of which are mainly dark grey, almost black silt, fine-grained sand and clay) consist of mollusks: Physa acuta and chironomids: several representatives of the genus Chironomus, as well as Cricotopus gr. bicinctus, Polypedilum scalaenum, Chaetocladius sp. (setosipennis) oligochaetes: Nais elinguis, Ilyodrilus hammoniensis, Limnodrilus hoffmeisteri f. typica.

Species that have a conservation status (for example, large beautiful dragonfly species) have not been found in the macroinvertebrates of YG canal.

In the fish fauna of YG canal (according to surveys of fishermen) there are 23 species of fish. The basis of ichthyocenosis currently consist of *Rutilus rutilus Cyprinus carpio, Channa argus, Opsariichthys uncirostris, Hypophthalmichthys molitrix, Sander lucioperca*. The largest species of fish fauna found in fishermen's nets are 1-2 kg of individuals, 2-3 years old. *Rutilus rutilus* is most often found in the nets, species of which weight 0.4-0.5 kg at the age of 2-3 years.

Rare, protected species found in nets of fishermenare *Aspiolucius esocinus, Barbus brachycephalus*, which have an international vulnerability status (IUCN status – 3.1 vulnerable species).

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Annex 1 The species composition of the modern fish fauna of the Syrdarya river

Latin name	English name	Notes
Sturgeon family – Acipenseridae		
Pseudoscaphirhynchus fedtschenkoi	Syrdarya sturgeon	E R
Ray finned fish family – Salmonidae		
Salmo gairdneri	Rainbow trout	A
Salmo ischchan issikogegarkuni	Salmo ischchan issikogegarkuni	A
Freshwater whitefish family – Coregonidae		
Coregonus lavaretus	Common whitefish	I
Coregonus peled	Peled	A
Coregonus sardinella	Least cisco	I
Pike family – Esocidae		
Esox lucius	Pike	*
Minnow family – Cyprinidae		
Abbottina rivularis	Chinese false gudgeon	I
Abramis brama orientalis	Freshwater beam	*
Abramis sapa aralensis	Aral white-eye bream	Ss
Alburnoides bipunctatus eichwaldi	South Caspian sprilin	*
Alburnoides oblongus	Tashkent Riffle Bleak	E
Alburnoides taeniatus	Striped bystranka	*

Aristichthys nobilis	Bighead carp	A
Aspiolucius esocinus	Pike asp	E R
Aspius aspius taeniatus	Aral asp	Ss
Barbus brachycephalus	Aral barbel	E R
Barbus capito conocephalus	Turkestan barbel	Ss
Varicorhynus capoeta heratensis	Samarkand khramulya	
Capoetobrama kuschakewitschi	Sharpray	E R
Carassius auratus gibelio	Silver Prussian carp	*
Chalcalburnus chalcoides aralensis	Danube bleak	Ss
Ctenopharyngodon idella	Grass carp	A
Cyprinus carpio	Common carp	*
Diptychus dybowskii	Scaleless osman	*
Diptychus maculatus	Scaly osman	*
Diptychus sewerzowi	Svercovy osman	*
Gobio gobio lepidolaemus	Linnaeus	Ss
Hemiculter leucisculus	Sharpbelly	I
Hypophthalmichthys molitrix	Silver carp	A
Leuciscus idus oxianus	Turkestan ide	Ss

Leuciscus lehmani	Zeravshan dace	E
Leuciscus squalisculus	Syrdarya dace	E
Mylopharyngodon piceus	Black carp	I
Opsariichthys uncirostris amurensis	Amur three-lips	I
Pelecus cultratus	Sabre carp or (sabrefish)	*
Pseudogobio rivularis	Amur false gudgeon	I
Pseudorasbora parva	Stone moroko	I
Rhodeus ocellatus ocellatus	Rosy bitterling	I
Rutilus rutilus aralensis	Aral roach	Ss
Scardinius erythrophthalmus	Rudd	*
Schizothorax intermedius	Sattar snowtrout	*
Cobitidae		
Cobitis aurata aralensis	Sabanejewia aurata	Ss
Nemacheilus dorsalis	Kessler	*
Nemacheilus kuschakewitschi	Kuschakewitsch loach	E
Nemacheilus labiatus	Plain thicklip loach	I
Nemacheilus stoliczkai	Triplophysa stoliczkai	*

Nemacheilus strauchi	Spotted thicklip loach	I
Catfish family – Siluridae		
Silurus glanis	Wels catfish	*
Ictaluridae		
Ictalurus punctatus	Channel catfish	A
Sisoridae		
Glyptosternum reticulatum	Turkestan catfish	*
Oryziatidae		
Oryzias latipes sinensis	Chinese rice fish	I
Livebearers family – Poecilidae		
Gambusia affinis	Mosquitofish	A
Percidae		
Gymnocephalus cernua	Ruffe	*
Perca fluviatilis	European perch	*
Stizostedion lucioperca	Zander	*
Eleotrididae		
Micropercops cinctus	Micropercops	I
Goby family – Gobiidae		
Rhinogobius bruneus	Amur goby	I

Snakeheads family – Channidae		
Channa argus	Snakehead	I
Cottus gobio jaxartensis	Chatkal sculpin	E
Cottus spinulosus	Turkestan sculpin	E

Note:

* - Aboriginal species

– - almost extinct aboriginal species

E – Endemic species.

Ss – local subspecies.

R - endemic species listed in the Red Book of Uzbekistan

A – acclimated species

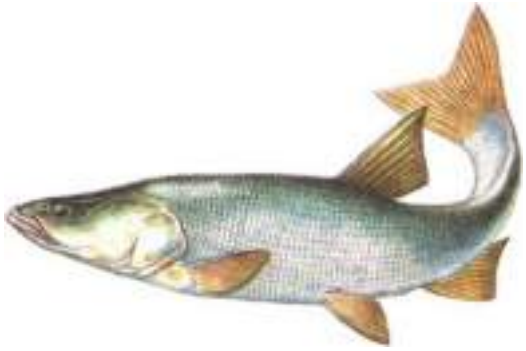
I – accidentally introduced species.

Annex 2. Fish species of Syrdarya river listed in Red Book of Uzbekistan

Fish species of the middle stream of Syrdarya listed in the Red book of Uzbekistan (2006)

As mentioned above, *Pseudoscaphirhynchus fedtschenkoi* is a completely extinct endemic species, 3 other rare species: *Aspiolucius esocinus, Barbus brachycephalus, Capoetobrama kuschakewitschi*, are on the verge of extinction.

Aspiolucius esocinus - spreading area is Aral sea basin. Length up to 60 cm, weight up to 5 kg, maximum age up to 10 years. It breeds in February-March at a temperature of 5-10°C. The species is listed in the International Red Book (2000), the Red book of Kyrgyzstan (2006), Kazakhstan (1999), and Uzbekistan (2006).

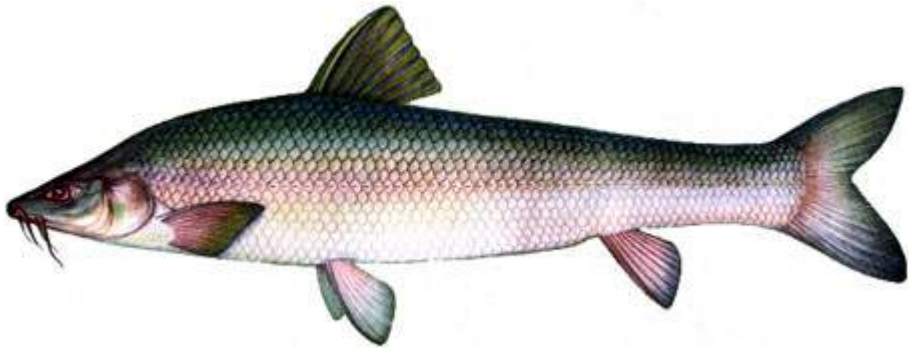


Aspiolucius esocinus- Pike asp

IUCN status – 3.1 vulnerable species.

Barbus brachycephalus brachycephalus – Aral barbel

The body length of mature individuals can reach 103 cm with a weight of 21 kg. Lives about 9-10 years (the maximum age of this species is 13 years). Migratory fish. Matures at 5-6 years of life. It migrates to rivers 10-12 months before spawning. The species was listed in the Red book of Uzbekistan in 2006.

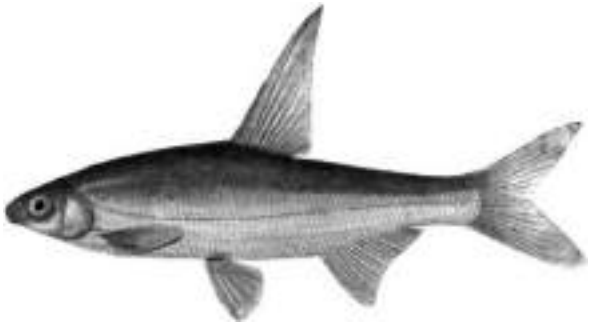


Barbus brachycephalus brachycephalus - Aral barbel

IUCN status – 3.1 vulnerable species.

Capoetobrama kuschakewitschi

The length reaches 25 cm, weight up to 150 grams. Maturity reaches 3 years with a body length of 10-14 cm. Spawning takes place in April-June at a shallow depth.



***Capoetobrama kuschakewitschi* -** Sharpray

Listed in the Red book of Uzbekistan (2006).

Information about commercial fish.

Aral roach – *Rutilus rutilus aralensis* Berg. In the last decade, roach has become one of the main commercial species not only in YG canal, but also throughout Uzbekistan.

Carp – *Cyprinus carpio L.* Common commercial fish that was widely spread earlier and up to now.

Snakehead- *Channa argus warpachowskii* Berg. In the 1960s, the snakehead accidentally fell into the reservoirs of Uzbekistan. Currently, the snakehead is widely spread in the reservoirs of the Syrdarya and Amu Darya basins. The snakehead is numerous in reservoirs that are richly overgrown with vegetation throughout the system of reservoirs of these rivers. Although it is a predator, and therefore an undesirable participant in the ichthyofauna for ponds and reservoirs where other aquaculture objects are cultivated, fish have been used in commercial fishing in the last decade.

Silver Prussian carp- Carassius auratus gibelio (Bloch). In the Aral sea basin, it lived in the lower reaches of the Amu Darya and Syrdarya. In the 1950s, silver carp were introduced to the fish farms of the Tashkent region and the Kattakurgan reservoir from the Moscow region (Savino fish farm), which independently and through the settlement of pond cultivated fish spread across most of the reservoirs of all the rivers of Uzbekistan, and also occurs in the foothills of the Charvak reservoir. Although the fish was not previously commercial, now its share in the fishery has increased enough to be considered commercial.
Species listed in the red book of Uzbekistan.

APPENDIX O-2– LABORATORY ANALYSIS RESULTS (SEDIMENT, WATER, GROUNDWATER, SOIL)

Государственный комитет Республики Узбекистан
по экологии и охране окружающей среды
Центр специализированного аналитического контроля
в области охраны окружающей среды (ЦСАК)

ИНФОРМАЦИОННЫЙ ОТЧЁТ

о выполнении работ по отбору и лабораторному исследованию проб поверхностных вод и донных отложений в районе строительства парогазовой установки (ПГУ) мощностью 1500 МВт в Сырдарьинской области

Руководитель работ
Директор ЦСАК при
Госкомэкологии РУз Файзиев Р.Х.

ТАШКЕНТ – 2020

Таблица 3.4.1 - Результаты физико-химического анализа поверхностных вод Южно-Голодностепского канала им. Саркизова

Наименование параметров (требований)	Место отбора и содержание				Норма по НД (ОБУВ)	Соответствие параметров (требований)	Предел обнаружения (диапазон измерений O'z O'U)
	Южно-Голодностепский канал им. Саркизова						
	№1	№2	№3	№4			
1	2	3	4	5	6	7	8
pH	8,42	8,38	8,37	8,37	6,5-8,5	Соответствует	от 1 до 14
Взвешенные вещества, мг/л не более	**94**	**102**	**84**	**86**	15	Не соответствует	от 5-500 мг/дм^3
Ионы аммония, мг/л не более	0,10	0,15	0,20	0,15	0,5	Соответствует	от 0,2-2,0 мг/дм^3
Нитраты, мг/л не более	7,9	6,2	6,9	6,75	40	Соответствует	от 0,4-80 мг/дм^3
Нитриты, мг/л не более	**0,109**	**0,081**	**0,082**	**0,085**	0,08	Не соответствует	от 0,02-0,60 мг/дм^3
Натрий, мг/л не более	62,100	86,50	59,300	**146,50**	120	Не соответствует гр.5	0,02 ppm
Хлориды мг/л, не более	134,99	120,45	116,9	120,4	300	Соответствует	от 10-500 мг/дм^3
Сульфаты, мг/л не более	**310**	**300**	**283,0**	**292,2**	100	Не соответствует	от 25-500 мг/дм^3
Сульфиды, мг/л не более	не обн.	не обн.	не обн.	не обн.	-	Соответствует	от 0 до 1 мг/дм^3
Минерализация, мг/л не более	810	720	675	697,5	1000	Соответствует	от 20-10000 мг/дм^3
ХПК, мг0/л не более	**80**	**60**	**100**	**40**	15	Не соответствует	от 10 до 100 мг0/дм^3
БПК, мг0/л не более	**7,2**	**5,4**	**8,9**	**3,7**	3	Не соответствует	от 0,1 до 15 мг0/дм^3
Фосфаты мг/л, не более	не обн.	не обн.	не обн.	не обн.	0,3	Соответствует	от 0,01-0,80 мг/дм^3
Алюминий, мг/л не более	0,008	0,007	0,008	0,006	0,2	Соответствует	от 0,02-0,2 мг/дм^3
Барий, мг/л не более	не обн.	не обн.	не обн.	не обн.	2	Соответствует	от 1-10 мг/дм^3
Ванадий, мг/л не более	не обн.	не обн.	не обн.	не обн.	0,001	Соответствует	от 0,005-0,20 мг/дм^3
Калий, мг/л не более	**106,100**	**70,071**	14,400	17,510	50	Не соответствует гр.2, 3	0,04 ppm
Кадмий, мг/л не более	0,00388	0,00445	0,0039	**0,00538**	0,005	Не соответствует гр.5	0,02 ppm
Свинец, мг/л не более	**0,0177**	**0,0185**	**0,0235**	**0,0360**	0,01	Не соответствует	0,2 ppm
Марганец, мг/л не более	0,00408	0,00300	0,00738	**0,0116**	0,01	Не соответствует гр.5	0,05 ppm
Медь, мг/л не более	**0,00379**	**0,00358**	**0,00368**	**0,0074**	0,001	Не соответствует	от 0,001-0,01 мг/дм^3
Никель, мг/л не более	0,00373	0,00270	0,00338	0,00388	0,01	Соответствует	0,1 ppm
Ртуть, мг/л не более	не обн.	не обн.	не обн.	**0,000025**	0,00001	Не соответствует гр.5	0,1-10 ppb
Хром (+3), мг/л не более	0,00638	0,00503	0,00625	0,0120	-	-	0,09 ppm

Хром (+6), мг/л не более	0,001	**0,0015**	**0,00175**	**0,00175**	0,001	Не соответствует гр.3, 4 и 5	от 0,001-0,25 мг/дм^3
Цинк, мг/л не более	0,00700	0,00508	0,00840	**0,0105**	0,01	Не соответствует гр.5	от 0,01 до 0,64 мг/дм^3
Железо, мг/л не более	**0,132**	**0,118**	**0,141**	**0,195**	0,05	Не соответствует	от 05 до 2 мг/дм^3

Таблица 3.4.2 - Результаты физико-химического анализа поверхностных вод (№№1-3)

Наименование параметров (требований)	Место отбора и содержание			Норма по НД (ОБУВ)	Соответствие параметров (требований)
	Поверхностные воды				
	№1	№2	№3		
1	2	3	4	5	6
pH	8,04	7,89	7,78	6,5-8,5	Соответствует
Взвешенные вещества, мг/л не более	**190**	**160**	**216**	15	Не соответствует
Ионы аммония, мг/л не более	0,07	0,32	0,36	0,5	Соответствует
Нитраты, мг/л не более	1,20	0,70	0,75	40	Соответствует
Нитриты, мг/л не более	0,0405	0,0502	0,040	0,08	Соответствует
Натрий, мг/л не более	**133,300**	**145,300**	100,600	120	Не соответствует гр.2 и 3
Хлориды мг/л, не более	236,24	202,49	134,99	300	Соответствует
Сульфаты, мг/л не более	**425**	**376**	**326**	100	Не соответствует
Сульфиды, мг/л не более	не обн.	не обн.	не обн.	-	Соответствует
Минерализация, мг/л не более	**1530**	**1395**	**1170**	1000	Не соответствует
ХПК, мг0/л не более	**100**	**100**	**120**	15	Не соответствует
БПК, мг0/л не более	**7,9**	**7,9**	**9,4**	3	Не соответствует
Фосфаты мг/л, не более	0,046	0,046	не обн.	0,3	Соответствует
Алюминий, мг/л не более	0,006	0,007	0,005	0,2	Соответствует
Барий, мг/л не более	не обн.	не обн.	не обн.	2	Соответствует
Ванадий, мг/л не более	не обн.	не обн.	не обн.	0,001	Соответствует
Калий, мг/л не более	10,800	16,610	18,990	50	Соответствует
Кадмий, мг/л не более	**0,00818**	**0,00573**	0,00228	0,005	Не соответствует гр.2 и 3
Свинец, мг/л не более	**0,0556**	**0,0424**	**0,0357**	0,01	Не соответствует
Марганец, мг/л не более	**0,0329**	**0,0356**	**0,0477**	0,01	Не соответствует
Медь, мг/л не более	**0,00760**	**0,00546**	**0,00523**	0,001	Не соответствует
Никель, мг/л не более	0,00440	0,00310	0,00543	0,01	Соответствует
Ртуть, мг/л не более	не обн.	не обн.	**0,000038**	0,00001	Не соответствует гр.5
Хром (+3), мг/л не более	0,0140	0,0125	0,0142	-	-
Хром (+6), мг/л не более	**0,0023**	**0,0022**	**0,0024**	0,001	Не соответствует
Цинк, мг/л не более	**0,0124**	**0,0105**	**0,0111**	0,01	Не соответствует
Железо, мг/л не более	**0,124**	**0,131**	**0,138**	0,05	Не соответствует

Таблица 3.4.3 - Результаты физико-химического анализа подземных вод (№№1-2)

Наименование параметров (требований)	Место отбора и содержание		Норма по НД O'z DSt 950:2011	Соответствие параметров (требований)
	Подземные воды			
	№1	№2		
1	2	3	4	5
pH	8,05	8,32	6-9	Соответствует
Взвешенные вещества, мг/л не более	276	134	-	-
Ионы аммония, мг/л не более	0,30	0,32	-	-

Нитраты, мг/л не более	0,60	0,55	45	Соответствует
Нитриты, мг/л не более	0,02	0,0403	-	-
Натрий, мг/л не более	111,30	151,700	-	-
Хлориды мг/л, не более	67,49	134,99	250	Соответствует
Сульфаты, мг/л не более	**418**	**520**	400	Не соответствует
Сульфиды, мг/л не более	не обн.	не обн.	-	-
Минерализация, мг/л не более	742,5	**1125**	1000	Не соответствует гр.3
ХПК, мг0/л не более	**60**	**80**	-	-
БПК, мг0/л не более	**5,4**	**7,2**	-	-
Фосфаты мг/л, не более	не обн.	не обн.	3,5	Соответствует
Алюминий, мг/л не более	0,006	0,007	0,2	Соответствует
Барий, мг/л не более	не обн.	не обн..	0,1	Соответствует
Ванадий, мг/л не более	не обн.	не обн.	-	Соответствует
Калий, мг/л не более	13,42	15,280	-	-
Кадмий, мг/л не более	**0,00163**	**0,00198**	0,001	Не соответствует
Свинец, мг/л не более	**0,0364**	**0,0453**	0,03	Не соответствует
Марганец, мг/л не более	0,0349	0,0455	0,1	Соответствует
Медь, мг/л не более	0,00475	0,00510	1	Соответствует
Никель, мг/л не более	0,00550	0,00610	0,1	Соответствует
Ртуть, мг/л не более	0,000011	не обн.	0,0005	Соответствует
Хром (+3), мг/л не более	0,00988	0,0124	-	-
Хром (+6), мг/л не более	0,0015	0,00175	0,05	Соответствует
Цинк, мг/л не более	0,0138	0,00852	3	Соответствует
Железо, мг/л не более	0,169	0,171	0,3	Соответствует

Таблица 3.5.1 – Результаты химического анализа почв

№	Наименование параметров (требований)	Место отбора						Почва №7 (Фоновый пункт наблюдений)	Соответствие параметров (требованний)	Предел обнаружения (диапазон)
		Почва №1	Почва №2	Почва №3	Почва №4	Почва №5	Почва №6			
1	2	3	4	5	6	7	8	9	10	11
1	pH	7,70	**8,0**	7,80	**8,05**	7,75	7,53	7,81	Не соответствует гр.4, 6	0-14
2	Гумус, мг/кг	13000,0	**14200**	10300,0	10800,0	11100,0	12200,0	12400,0	Не соответствует гр.4	0-3% и выше
3	Хлориды Cl, мг/кг	130,0	180,0	**590,0**	240,0	**1330,0**	**4800,0**	270,0	Не соответствует гр.5, 7 и 8	0-0,36 ppm и свыше
4	Сульфаты SO_4, мг/кг	**2840,0**	1290,0	**2970,0**	1120,0	**2320,0**	**3160,**	1570,0	Не соответствует гр.3, 5, 7 и 8	0-0,48 ppm и свыше
5	Оксид фосфора(V) P_2O_5, мг/кг	**16,5**	4,9	**36,0**	**49,0**	**28,0**	**34,2**	5,2	Не соответствует гр.3, 5, 6, 7 и 8	0-30 ppm и свыше
6	Нитраты NO_3, мг/кг	14,0	**38,2**	**21,2**	**28,5**	**202,4**	**53,0**	16,0	Не соответствует гр.4, 5, 6, 7 и 8	0-5 ppm и свыше
7	Кальций Ca, мг/кг	**1420,0**	680,0	**1720,0**	660,0	**1840,0**	**2280,0**	1020,0	Не соответствует гр.3, 5, 7 и 8	0- 0,2 ppm и свыше
8	Магний Mg, мг/кг	**1330,0**	520,0	**1650,0**	590,0	**1660,0**	**2040,0**	760,0	Не соответствует гр.3, 5, 7 и 8	0- 0,2 ppm и свыше
9	Натрий Na, мг/кг	**1420,0**	680,0	**1720,0**	660,0	**1840,0**	**2280,0**	1020,0	Не соответствует гр.3, 5, 7 и 8	0,02 ppm
10	Калий K, мг/кг	**1330,0**	520,0	**1650,0**	590,0	**1660,0**	**2040,0**	700,0	Не соответствует гр.3, 5, 7 и 8	0,04 ppm
11	Свинец Pb, мг/кг	20,770	20,722	25,370	22,371	40,686	37,064	80,180	Соответствует	0,2 ppm
12	Марганец Mn, мг/кг	**412,000**	**342,000**	**342,000**	**388,000**	**340,000**	**338,000**	319,000	Не соответствует	0,05 ppm
13	Медь Cu, мг/кг	**23,200**	**20,310**	**23,170**	**22,360**	**23,030**	**22,870**	19,080	Не соответствует	0,09 ppm
14	Цинк Zn, мг/кг	**66,110**	**54,150**	51,370	**60,110**	**67,000**	**66,320**	52,900	Не соответствует гр.3, 4, 6, 7 и 8	0,02 ppm
15	Хром Cr, мг/кг	**17,815**	**18,636**	**16,415**	**19,796**	**15,597**	14,642	15,124	Не соответствует гр.3, 4, 5, 6 и 7	0,09 ppm
16	Железо Fe, мг/кг	**17998,900**	**19204,800**	**16989,000**	**21871,000**	15425,000	15797,600	16972,000	Не соответствует гр.3, 4, 5, 6	0,1 ppm
17	Ртуть Hg, мг/кг	**0,0093**	0,0067	**0,0082**	**0,0075**	0,0073	0,0070	0,0073	Не соответствует гр.3, 5, 6	0,1-10 ppb

№	Наименование параметров (требований)	Место отбора						Почва №7 (Фоновый пункт наблюдений)	Соответствие параметров (требований)	Предел обнаружения (диапазон)
		Почва №1	Почва №2	Почва №3	Почва №4	Почва №5	Почва №6			
1	2	3	4	5	6	7	8	9	10	11
18	Никель Ni, мг/кг	**29,383**	**23,616**	**27,244**	**28,631**	**26,470**	**26,463**	22,280	Не соответствует	0,1 ppm
19	Кадмий Cd, мг/кг	**1,730**	**1,636**	**1,704**	**1,714**	**1,988**	**1,872**	1,618	Не соответствует	0,02 ppm
20	Алюминий Al, мг/кг	**4,48**	**4,44**	**4,24**	**4,42**	3,42	**4,32**	4,19	Не соответствует гр.3, 4, 5, 6 и 8	0-10,8 ppm и свыше

Таблица 3.5.2 – Результаты химического анализа донных отложений

№	Наименование параметров (требований)	Место отбора			
		Донные №1	Донные №2	Донные №3	Донные №4
1	2	3	4	5	6
1	pH	8,12	8,12	8,15	8,07
2	Гумус, мг/кг	16800,0	18100,0	15100,0	19000,0
3	Хлориды Cl, мг/кг	420,0	28,0	28,0	28,0
4	Сульфаты SO_4, мг/кг	680,0	490,0	400,0	780,0
5	Оксид фосфора(V) P_2O_5, мг/кг	4,0	6,0	3,4	4,2
6	Нитраты NO_3, мг/кг	11,8	11,8	16,5	12,5
7	Кальций Ca, мг/кг	560,0	280,0	260,0	400,0
8	Магний Mg, мг/кг	300,0	200,0	210,0	340,0
9	Натрий Na, мг/кг	560,0	280,0	260,0	400,0
10	Калий K, мг/кг	300,0	200,0	210,0	340,0
11	Свинец Pb, мг/кг	34,154	31,074	31,730	34,782
12	Марганец Mn, мг/кг	254,000	270,000	272,000	268,000
13	Медь Cu, мг/кг	24,750	30,710	30,260	33,780
14	Цинк Zn, мг/кг	58,360	53,580	67,290	70,430
15	Хром Cr, мг/кг	15,348	15,070	16,164	16,672
16	Железо Fe, мг/кг	17362,400	18204,000	15016,000	1975,200
17	Ртуть Hg, мг/кг	0,0065	0,0065	0,0062	0,0063

№	Наименование параметров (требований)	Место отбора			
		Донные №1	Донные №2	Донные №3	Донные №4
1	2	3	4	5	6
18	Никель Ni, мг/кг	19,615	17,761	23,637	24,097
19	Кадмий Cd, мг/кг	2,066	2,226	2,094	1,984
20	Алюминий Al, мг/кг	3,71	4,19	4,20	4,27

Таблица 3.5.3 – Результаты химического анализа почв и донных отложений хлорорганическими пестицидами ДДТ и его метаболитами

№	Место отбора	Контролируемые ингредиенты				
		α-ГХЦГ (альфа-изомер гесахлорциклогексана)	γ-ГХЦГ (гамма-изомер гесахлорциклогексана)	ДДЕ ($C_{14}H_9Cl_4$) - 4,4'-Дихлордифенилдихлорэтилен	ДДД ($C_{14}H_{10}Cl_4$) - 4,4'-Дихлордифенилдихлорэтан	ДДТ ($C_{14}H_9Cl_5$) - 4,4'-Дихлордифенилтрихлорэтан
1	2	3	4	5	6	7
1	Почва №1	0,001	н/о	0,027	н/о	н/о
2	Почва №2	н/о	н/о	0,006	н/о	н/о
3	Почва №3	0,001	н/о	0,005	н/о	н/о
4	Почва №4	0,001	н/о	н/о	н/о	н/о
5	Почва №5	н/о	н/о	н/о	н/о	н/о
6	Почва №6	н/о	н/о	н/о	н/о	н/о
7	Почва №7	0,001	н/о	н/о	н/о	н/о
8	Донные №1	н/о	н/о	0,002	н/о	0,001
9	Донные №2	0,002	0,001	0,002	н/о	0,004
10	Донные №3	н/о	н/о	н/о	н/о	н/о
11	Донные №4	н/о	0,002	0,001	н/о	н/о
ПДК по СанПиН РУз №0191-05		Сумма изомеров – 0,1 мг/кг		ДДТ и его метаболиты (сумма) – 0,5 мг/кг		

Нитраты, мг/л не более	0,60	0,55	45	Соответствует
Нитриты, мг/л не более	0,02	0,0403	-	-
Натрий, мг/л не более	111,30	151,700	-	-
Хлориды мг/л, не более	67,49	134,99	250	Соответствует
Сульфаты, мг/л не более	**418**	**520**	400	Не соответствует
Сульфиды, мг/л не более	не обн.	не обн.	-	-
Минерализация, мг/л не более	742,5	**1125**	1000	Не соответствует гр.3
ХПК, мг0/л не более	**60**	**80**	-	-
БПК, мг0/л не более	**5,4**	**7,2**	-	-
Фосфаты мг/л, не более	не обн.	не обн.	3,5	Соответствует
Алюминий, мг/л не более	0,006	0,007	0,2	Соответствует
Барий, мг/л не более	не обн.	не обн..	0,1	Соответствует
Ванадий, мг/л не более	не обн.	не обн.	-	Соответствует
Калий, мг/л не более	13,42	15,280	-	-
Кадмий, мг/л не более	**0,00163**	**0,00198**	0,001	Не соответствует
Свинец, мг/л не более	**0,0364**	**0,0453**	0,03	Не соответствует
Марганец, мг/л не более	0,0349	0,0455	0,1	Соответствует
Медь, мг/л не более	0,00475	0,00510	1	Соответствует
Никель, мг/л не более	0,00550	0,00610	0,1	Соответствует
Ртуть, мг/л не более	0,000011	не обн.	0,0005	Соответствует
Хром (+3), мг/л не более	0,00988	0,0124	-	-
Хром (+6), мг/л не более	0,0015	0,00175	0,05	Соответствует
Цинк, мг/л не более	0,0138	0,00852	3	Соответствует
Железо, мг/л не более	0,169	0,171	0,3	Соответствует

APPENDIX P– LIST OF ARCHAEOLOGICAL & CULTURAL SITES WITHIN SYRDARYA REGION

O‘ZBEKISTON RESPUBLIKASI
MADANIYAT VAZIRLIGI
O‘zbekiston, Toshkent, 100029, Taras Shevchenko, 1-uy
Tel.: +998 71 256-44-72, 256-44-82
e-xat: madaniyat.devon@exat.uz, www.madaniyat.uz

MINISTRY OF CULTURE
REPUBLIC OF UZBEKISTAN
1, T.Shevchenko, Tashkent city, 100029, Republic of Uzbekistan
Tel.: +998 71 256-44-72, 256-44-82
e-xat: madaniyat.devon@exat.uz, www.madaniyat.uz

2020 у. «27» 03 № 01-12-03-1380 «___» _____ 20__ г.

“Juru Energy Ltd.”
компаниясига

2020 йил 19 мартдаги
UZB-ACWA-CCGT-20/20/12-сонли хатингизга

Сирдарё вилоятида 1500 Мвт қувватга эга буғ-газ қурилмасини қуриши режалаштирилаётган ҳудудлар яъни Ширин шаҳри ва Боёвут туманидаги маданий мерос объектларининг рўйхати ва маълумоти иловага мувофиқ юборилмоқда.

Ўзбекистон Республикасининг 2001 йил 30 августдаги 269-II-сонли Қонунининг 36-моддасига мувофиқ:

- маданий мерос объектларини муҳофаза қилиш ва улардан фойдаланиш тўғрисидаги қонун ҳужжатларининг бузилишида айбдор шахслар белгиланган тартибда жавобгар бўладилар.

Илова: 2 варақ

Вазир ўринбосари-
Маданий мерос департаменти
бошлиғи **К. Акилова**

Ижрочи: Х. Холмуродов
Тел: 71) 227-05-86

Т/р	Объект тўлиқ номи	Объект даври	Объект манзили	Кўчмас мулкка бўлган ҳуқуқ
60.	Николай Ильченко	1999 йил	Навоий шоҳ кўчаси, 26-уй	Давлат мулки. Гулистон шаҳар ободонлаштириш бўлими оператив бошқарув ҳуқуқи асосида
61.	Василий Корнейко	1999 йил	Навоий шоҳ кўчаси, 26-уй	Давлат мулки. Гулистон шаҳар ободонлаштириш бўлими оператив бошқарув ҳуқуқи асосида
62.	Фёдор Нишурин	1999 йил	Навоий шоҳ кўчаси, 26-уй	Давлат мулки. Гулистон шаҳар ободонлаштириш бўлими оператив бошқарув ҳуқуқи асосида
63.	Аскарни урушга жўнатиш ҳайкали	1974 йил	Маданият ва истироҳат боғи	Давлат мулки. Сирдарё вилояти маданий мерос бошқармаси оператив бошқарув ҳуқуқи асосида
64.	Алишер Навоий ҳайкали	1987 йил	Навоий шоҳ кўчаси	Давлат мулки. Гулистон шаҳар ободонлаштириш бўлими оператив бошқарув ҳуқуқи асосида
Боёвут тумани				
Археология ёдгорликлари				
65.	Қўрғонтепа 1	Аниқланмаган	Чанговул қишлоғи	Давлат мулки. Сирдарё вилояти маданий мерос бошқармаси оператив бошқарув ҳуқуқи асосида
Монументал санъат ёдгорликлари				
66.	Елена Стемпковская бюсти	1969 йил	1-Боёвут	Давлат мулки. Сирдарё вилояти маданий мерос бошқармаси оператив бошқарув ҳуқуқи асосида
67.	Усмон Юсупов бюсти	1974 йил	2-Боёвут	Давлат мулки. Сирдарё вилояти маданий мерос бошқармаси оператив бошқарув ҳуқуқи асосида
68.	Алишер Навоий ҳайкали	1989 йил	"А.Навоий" МФЙ	Давлат мулки. Сирдарё вилояти маданий мерос бошқармаси оператив бошқарув ҳуқуқи асосида
Мирзобод тумани				
Монументал санъат ёдгорликлари				
69.	Райимжон Муҳаммадиев бюсти	1990 йил	21-сонли мактаб ҳудудида	Давлат мулки. Сирдарё вилояти маданий мерос бошқармаси оператив бошқарув ҳуқуқи асосида

Т/р	Объект тўлиқ номи	Объект даври	Объект манзили	Кўчмас мулкка бўлган ҳуқуқ
70.	Турғун Аҳмедов бюсти	1973 йил	Янги йўл маҳалласи	Давлат мулки. Сирдарё вилояти маданий мерос бошқармаси оператив бошқарув ҳуқуқи асосида
71.	Турғун Аҳмедов бюсти	1980 йил	"Навбаҳор" МФЙ ҳудудида	Давлат мулки. Сирдарё вилояти маданий мерос бошқармаси оператив бошқарув ҳуқуқи асосида
Ширин шаҳар				
Монументал санъат ёдгорликлари				
72.	Амир Темур ҳайкали	2002 йил	Шаҳардаги ҳарбий бўлинма ҳудудида	Давлат мулки. Ширин шаҳар ободонлаштириш бўлими оператив бошқарув ҳуқуқи асосида
73.	Она ҳайкали	1990 йил	Ширин шаҳри марказида	Давлат мулки. Ширин шаҳар ободонлаштириш бўлими оператив бошқарув ҳуқуқи асосида

UNOFFICIAL TRANSLATION BY JURU ENERGY

MINISTRY OF CULTURE OF THE REPUBLIC OF UZBEKISTAN

21ST of March, 2020

№01-12-03-1580

TO: "Juru Energy Ltd."

In response to the Juru Energy's request dated 19th of March, 2020 №UZB-ACWA-CCGT-20/20/12:

As per your request, we are sending an information regarding cultural heritage in Shirin town and Bayavut district of Syrdarya region, where planned the construction of CCGT with a capacity of 1500 MV.

In accordance with the article 36 of the Law №269-II of the Republic of Uzbekistan, dated on 30th of August, 2001:

- Any violation of the law of the protection and use of the objects of cultural heritage will be prosecuted.

Annex to the letter in 2 pages.

Deputy minister,

Head of cultural heritage department **K.Akilova**

Executor: X.Kholmurodov

Tel: 71 227-05-86

UNOFFICIAL TRANSLATION BY JURU ENERGY

№	Name of object	Construction year	Location address	Real estate right
Bayavut district				
Archaeological heritage				
1	Kurgantepa 1	Not determined	Changavul village	State property. Syrdarya regional department of cultural heritage on the basis of the right of operative management
Monumental cultural heritage				
2	Bust of Helena Stempkovskaya	1969 year	1-Boyovut	State property. Syrdarya regional department of cultural heritage on the basis of the right of operative management
3	Bust of Usmon Yusupov	1974 year	2-Boyovut	State property. Syrdarya regional department of cultural heritage on the basis of the right of operative management
4	Monument of Alisher Navoi	1989 year	Makhalla “A.Navoi”	State property. Syrdarya regional department of cultural heritage on the basis of the right of operative management
Shirin town				
Monumental cultural heritage				
1	Monument of Amir Temur	2002 year	On the territory of military unit	State property. Shirin town landscaping department on the basis of operational management rights
2	Monument of mother	1990 year	At the centre of Shirin town	State property. Shirin town landscaping department on the basis of operational management rights

APPENDIX Q– LIVELIHOOD RESTORATION PLAN TERMS OF REFERENCE

ACWA Power Sirdarya 1,500MW CCGT Power Plant (IPP)

Republic of Uzbekistan

Livelihood Restoration Plan:

Terms of Reference

Prepared for:

June 2020

Document Information

Project Name	ACWA Power Sirdarya 1,500MW CCGT Power Plant (IPP), Republic of Uzbekistan
5Cs Project Number	1305/001/085
Document Title	Livelihood Restoration Plan: Terms of Reference
Client	ACWA Power
5Cs Project Manager	Eva Muthoni Kimonye
5Cs Project Director	Ken Wade

Document Control

Version	Date	Description	Author	Reviewer	Approver
1	04/06/2020	LRP	EMK	MKB	KRW

1	Financial Capital
2	Social Capital
3	Natural Capital
4	Manufactured Capital
5	Human Capital

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5 Capitals Environmental and Management Consulting
Principal office: PO Box 119899 Sheikh Zayed Road, Dubai, UAE
☏+971 4 343 5955 🖷+971 4 343 9366

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1 INTRODUCTION

1.1 The Project

The government of the Republic of Uzbekistan aims modernise and increase the electricity production in the country in order to foster economic growth. As part of this aim, the government plans to develop new gas fired Combined Cycle Gas Turbine (CCGT) plants on two adjacent plots of land near other existing power infrastructure near the settlement Shirin, a border town with Tajikistan. The eastern plot of land has been allocated to ACWA Power for development of a 1,500MW CCGT plant (the Project), whilst the western plot is being assessed separately for competitive bids by the IFC (part of the World Bank Group).

The Project scope also includes the design, development, construction, commissioning, testing and transfer of a 500/220kV switchgear station to the JSC National Electric Networks of Uzbekistan. This switchgear station will be a common facility between the ACWA Power Sirdarya Project and the adjacent CCGT project currently under the IFC tender. JSC National Electric Networks of Uzbekistan will be responsible for the operations and maintenance of the switchgear station once it has been constructed.

ACWA Power are seeking an amount of project finance from financial Institutions who have their own internal environmental & social investment policies/standards, or may be members of voluntary agreements such as the Equator Principles. At this stage, it is understood that the European Bank for Reconstruction and Development (EBRD), Asian Development Bank (ADB) and Deutsche Investitions-und Entwicklungsgesells (DEG) are involved in discussions relating to provisions of finance.

It is known that the land at the Project site was previously used and in some cases is still being used for agricultural purposes by local farmers, who leased the land from the local government under specific land lease agreements. It is our understanding that land lease termination orders have been issued to previous land users to release their agricultural land for the Project. However, it is not clear at this point whether those farmers who are still cultivating their land have been issued with the lease termination notice. ACWA Power is therefore required to identify what processes have been fully undertaken by the government concerning land acquisition and the impacts and impacts of displacement to any displaced farmers, including economic impacts and loss of livelihoods. Based on the process that have taken place, these will be analysed versus the lenders requirements to identify if there is need for a separate compensatory measure or livelihood restoration.

1.2 Background and Context

5 Capitals Environmental and Management Consulting (5 Capitals) has been engaged by ACWA Power to undertake the independent EIA and ESIA processes, as well as certain other environmental & social related scope which also include the Livelihood Restoration Plan (LRP). 5 Capitals has partnered with a locally based consultant, 'Juru Energy' (Tashkent, Uzbekistan) to undertake certain elements of the scope, which include provision of support in addressing issues relating to land acquisition, identification of affected farmers, valuation of assets etc.

Information obtained by ACWA Power from Shirin and Boyavut District shows that some farmers have received notification on termination of their land lease agreement between January and February 2020 to allow for the development of the Project. In addition, 5 Capitals has been provided with documents showing that the government of Uzbekistan has started the valuation of assets on the farms both on the ACWA Power and a IFC future project on adjacent land. This valuation data will need to be validated.

In order to determine the number of farmers that will be impacted by the involuntary land acquisition, 5 Capitals and Juru Energy are in consultation with the local government and local community leaders. At present, it is expected that between seven (7) to eleven (11) farmers will be impacted. Initial consultations were undertaken with eight (8) farmers between 22nd April and 1st May 2020 through telephone calls. This was due to movement restrictions imposed in Uzbekistan due to the COVID-19 pandemic.

Chapter 6 of the SanPin № 0350-17 national regulations requires the establishment of a health protection zone (HPZ) around a new thermal power plant with a radius of 500m around each air emissions stack structure. As a result, 5 Capitals via Juru Energy have written a letter to the Ministry of Health in Uzbekistan to determine the implication of this requirement on neighbouring farms and whether the famers located within a 500m radius can continue with their agricultural activities during the operations of the Project. Based on the feedback received from the Ministry, 5 Capitals and Juru Energy will be able to determine whether these lands also need to be included in the LRP.

1.3 Objectives of the Livelihood Restoration Plan

The main objectives of the LRP will include:

- Gain a full understanding of the current situation concerning land use and validation on what the government has done up to date;
- Identify the key differences and gaps between Uzbekistan land acquisition and compensation process and the lenders requirements.
- Provide accurate information about the project design, impacts, implementation and monitoring requirements to the project affected people:

- Ensure the people who are affected by the project are fully compensated and the livelihoods that are lost due to economic displacement are re-established, and their living standard is improved or at the level it was before the land acquisition and economic displacement at no cost to them;
- Ensure that the affected people are not impoverished as a consequence of the involuntary land acquisition or loss of livelihood as a result of the project development;
- Ensure that the affected people are informed and aware of the land acquisition process and livelihood restoration;
- Ensure that the affected people have access and are aware of the grievance resolution mechanism available for the project; and
- Provide, additional support and assistance to vulnerable groups where they exist.

2 LEGAL FRAMEWORK AND STANDARDS

2.1 National Regulations

LAND RIGHTS, ACQUISITION AND RESETTLEMENT

- Civil Code of the Republic of Uzbekistan "Civil code" (№ 163- I, 21.12.1995, as amended on 22.01.2020);
- Land Code (1998 as amended 2010) (№ 598-I, 30.04.1998, as amended on 28.08.2019);
- Law of the Republic of Uzbekistan on State Land Cadastre No.666-I of 28.08.1998
- Presidential Decree № UP-5742 "On Measures for The Efficient Use of Land and Water Resources in Agriculture"
- Resolution № 146 of the Cabinet of Ministers "On the Procedure for Compensation for Losses of Land Owners, Users, Tenants and Owners, As Well As Losses Of Agricultural And Forestry Production".
- SanPin № 0350-17, Chapter 6 "Sanitary-technical classification of production enterprises, thermal power plants, storage facilities and the sizes of the minimum sanitary protection zones (SPZ) for them"
    - Requires the establishment of a health protection zone ("HPZ") around any new TPP. The HPZ will have a radius of 500 m around each stack.

2.2 Lender Requirements

At this stage, it is understood that the European Bank for Reconstruction and Development (EBRD), Asian Development Bank (ADB) and Deutsche Investitions-und Entwicklungsgesells (DEG) are involved in discussions relating to provisions of finance. As a result, the project will be required to adhere to the following lender requirements in regards to involuntary land acquisition:

- ADB's SPS (2009), Safeguard Requirement 2: Involuntary Resettlement;
- EBRD's Land Acquisition and Livelihood Restoration requirements as laid out in the Performance Requirement 5; and
- Equator Principles IV (2020) requires projects to evaluate the specific risks of the project to determine the applicability of the IFC Performance Standards under Principle 3
    - IFC Performance Standard 5: Land Acquisition and Involuntary Resettlement

3 PROJECT OVERVIEW

The Project is a 1,500MW natural gas fired Combined Cycle Gas Turbine (CCGT) power plant, that will operate independently and offload power to the grid via a shared electrical switchgear station with a future CCGT project (being tendered by IFC), expected on adjacent land.

The main project facilities will include:

- Power block and stacks including 2 * Gas Turbines (GT), 2 * Heat Recovery Steam Generators (HRSG) and 1 * Steam Turbine (ST);
- Closed Loop Cooling Water system and Open Loop Cooling System;
- Gas receiving terminal;
- Intake and outfall;
- Water treatment (to be confirmed);
- Wastewater treatment; and
- Ancillary/support facilities (i.e. electrical system, site entrance and security building, laboratory, workshops etc).

Associated facilities will include:

- Gas pumping station and supply;
- 500/220kV switchgear station;
- Overhead transmission lines; and
- Access road.

Figure 3-1 Project Location & Field Patterns

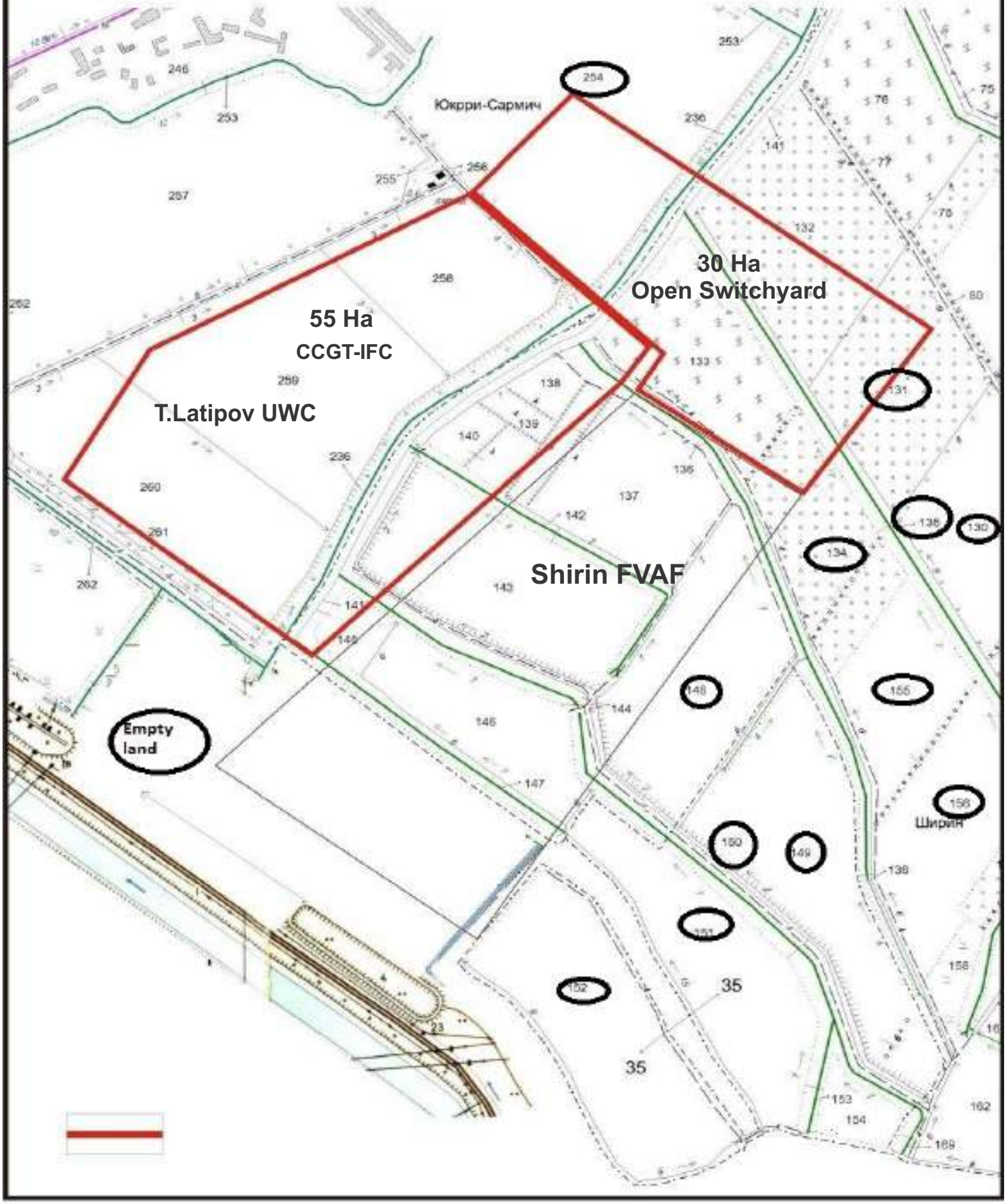
4 TERMS OF REFERENCE

The following Terms of Reference have been identified for the LRP:

ELEMENT	TERMS OF REFERENCE
Identification of current situation	This will include: • Consultation with relevant government authorities to determine what has been done in relation to notifying the impacted farmers on termination of their land lease agreement, asset valuation, compensation etc. • Validation of data received from the relevant government authorities on the impacted farmers. • Identify the location of land that will be used for the project associated facilities. • Identify the exact number of farmers who are impacted by the development of the ACWA Power project. • Determine the number of farmers who are no longer using their land vs those who are still farming.
Gap Analysis between national and lender's requirements	This section will seek to establish the gaps between the Uzbekistan national requirements for involuntary land acquisition and livelihood restoration and the lenders requirements in order to ensure that the project is in line with all the lender's requirements.
Socio-Economic Survey	This will include but not limited to the following components: • Socio-economic survey of the affected people to include but not limited to demographic characteristics, sources of income, levels of income, distribution of income by income sources, education, health, community infrastructure etc. • Identification of vulnerable households. • Determination of the project land acquisition requirements and the land take. • Announcement of the census and inventory to affected people. • Implementation of census of affected people and assets inventory through field surveys. • Valuation of land and assets. • Disclosure of preliminary findings during meetings with the affected people. • Validate the impact assessment and compensation strategy.
Stakeholder consultation	A series of stakeholder engagement activities will be undertaken in order to develop the LRP and complete the process. The consultations will be undertaken once the exact number of affected households is confirmed. Focus group consultations will be undertaken with women and vulnerable groups to ensure that their concerns are incorporated in the LRP.
Land requirements and impact assessment	This section of the LRP will include the following: • Identify the need for land acquisition. • Assess the impacts of the project land take on the affected people's means of livelihood and incomes. • Consultation with the affected people on the impacts. • Mitigation and management measures for the identified impacts.
Eligibility and entitlement	• Establish the eligibility criteria in accordance to lenders requirements. • Establish a cut off data for the eligibility to the LRP measure as part of the census and assets inventory • Public announcement of the cut off date

ELEMENT	TERMS OF REFERENCE
	• Develop an entitlement matrix for the affected people which will include loss of land, crops, trees, structures on the land etc. • Establish requirements for additional support for affected vulnerable households if applicable.
Inventory and Valuation of property losses	• The valuation of the assets will be undertaken by an independent valuator who will take into consideration the valuation exercise that has been carried out by the government in the past and existing assets in the impacted farms. • Establish a methodology to determine compensation rates for the lost assets. • The asset inventory will be endorsed by the affected people by signing an inventory form in which they agree to the list of affected assets. • Valuation will be discussed with them during the negotiation of the compensation package.
Institutional arrangements	Identify the stakeholders who will be responsible for the implementation and monitoring of the LRP i.e. • ACWA Power • Government ministries • Local officials in Shirin • EPC Contractor etc.
Implementation of the LRP	This will establish the main steps that will be followed in the implementation of the LRP prior to access of the land for the start of the main construction activities.
Information disclosure, consultation and participation	• Information regarding the land acquisition principles and eligibility for compensation will be provided to the affected communities. • The draft LRP will be disclosed to the project affected communities after which any comments will be integrated in the final LRP. • Establish a transparent and open communication process with the affected communities
Grievance Mechanism	A grievance mechanism will be established in the LRP by which the project affected persons will be able to submit their grievances and/or comments regarding the project. This procedure will be clearly outlined in the LRP and will be in line with the project grievance procedure established as part of the Stakeholder Engagement Plan.
Monitoring and Reporting	This will include the project monitoring and audit requirements of the land acquisition process at different stages including the progress made by vulnerable groups.

Syrdaya region Boyavut district T.Latipov UWC and Shirin FVAF
land parcels territory for construction
CCGT 1200-1400 MW based on Public Private Agreement.
History
Scale 1:10000



APPENDIX R– MINUTES OF CONSULTATION MEETINGS

APPENDIX R-1– MINUTES MEETING AT BAYAVUT DISTRICT

MINUTES OF MEETING

Public consultation in Bayavut district

To assist 5 Capitals in conducting ESIA baseline surveys for Uzbekistan CCGT project, on May 28, 2020, Juru Energy (Juru) arranged and held public consultations with the people from Directly Affected Communities (DAC) living in Bayavut district, Syrdarya region. These communities are closest to the project site with potential ecological influence from the project. Meeting agenda included discussion of issues related to the environmental impact from the project. Summary of the consultations is provided below.

Stakeholder group:	Directly Affected Communities
Number of participants from local community	12 people from Sarmich community[1] 6 farmers
Representatives of local administration	Mr. Muzaffar Khomidjonov – Deputy Mayor of Bayavut district Mr. Rustam Kurbanov – Head of investments department
Representatives of the Project	Mr. Sherzod Onarkulov – ACWA Power Syrdarya LLC (Tashkent) Ms. Umida Rozumbetova – Juru Mr. Aziz Shoraimov – Juru Mr. Abdullo Adkhamov – Juru
Meeting language:	Uzbek
Date:	**28.05.2020**
Start time:	**9:40**
End time:	**11:00**
Method of engagement:	Formal letter (invitation) to the local municipality on 27.05.2020
Venue:	Yard of school no. 45
Used materials and visual aids	Project presentation

I. Agenda for meeting

1. General overview of the CCGT construction:
   - Purpose, nature and scale of construction
   - Timeline and schedule of construction

2. Impacts of CCGT
   - Positive (e.g., opportunities for new job placements, cheaper electricity and etc)
   - Negative (noise, air pollution, and etc.)
   - Measures for negative impact mitigation
   - Safeguard measures (that will be taken to reduce impact on environment and communities)

3. Discussions

[1] Sarmich community was labelled as H1 in Scoping report (Table **Error! No text of specified style in document.-Error! Main Document Only.** Sensitive Receptors)

1. Starting the public consultation on behalf of ACWA Power, Mr. Sherzod Onarkulov congratulated the local community with Eid al-Fitr and expressed condolences over the Sardoba tragedy.

Then he briefed the participants on the goals and main objectives of the project as well as the timeline of the project. He underlined that construction of ACWA CCGT with a total capacity of 1500 MWt was a part of national reforms implemented in the energy sector of Uzbekistan.

Mr. Onarkulov mentioned about that there will be used the latest modern technologies of the world class both during the construction and operational phases. And for this reason, the efficiency coefficient of CCGT will be more than 60%.

He also said that on August, 2020 there will be official opening ceremony for construction works on the allocated land. The whole construction process will start on September/October, 2020.

2. Following the opening speech, Ms. Umida Rozumbetova (Juru) gave the project presentation where she explained the main project features and details, including:

1. Geographical location;
2. Planned technology type;
3. Positive and possible negative impacts of the project;
4. On-going activities at the current stage of the project;
5. Measures for mitigation of negative impact.

3. Q&A session followed the presentation, where local community asked questions related to the socio-economic impact from the project on the district. Affected farmers were mainly concerned about the compensation for the losses of agricultural crops.

Question	Answer
Yoldashev Bahtiyor, farmer: Could you please clarify what should farmers expect regarding the compensation for agricultural crops loses? My farm land was returned back to the administration. But I have around 3 000 fruit trees remaining on the farm.	***M.Khomidjonov:*** Your farm land was returned back because according to the Land Code, State owns all land in our Republic, and State has a right to return it back under urgent reasons. As for the compensation, there strict regulations for performing valuation and compensation processes. Compensation will be paid by developer of the Project. In close cooperation with ACWA power, Bayavut district administration will evaluate farm land. All actions and decisions taken for this issue will be announced to farmers. At the moment, the process is going on, and we are dealing with legal issues. You are welcome to give any feedback regarding the project. ***Sh.Onarkulov*** Before to proceed with compensation process, first of all we need to get the State Resolution for implementation of this Project. After that, Project developer will make a land lease agreement with Bayavut district administration. The compensation process will be performed according to the national as

	well as international requirements. Each farmer, who has been affected by the Project, will take a part in this process. We will evaluate the land and agricultural crops in close cooperation with farmers.
Kurbonali Mavlonov: local resident I wonder if there is enough water in the canal to support the operation of new CCGT and existing Syrdarya TPP?	***Sh.Onarkulov*** After the modernisation of 6 power units at existing Syrdarya TPP, the water consumption will be decreased. Moreover, the new CCGT will use modern water supply system, which allows to reach zero discharge of technical water to canal, except treated sanitary and rainfall water
Asatulla Djamilov, Leader of community Does the project include improving social infrastructure or building a new one in local area? I mean schools, kindergartens, residential buildings and etc?	***Sh.Onarkulov*** First of all the local infrastructure is the direct responsibility of local municipality which means that local municipality usually has long term plans and schedule for the development of infrastructure. Therefore the issues related to the infrastructure development first of all should be addressed to the Boyovut district khokimiyat. From our side currently we preparing curriculum for 4 new specialisations and we aim to implement them in College of Energy of Shirin town as well as training courses for retraining specialists. With this, we aim to prepare high qualified specialist in accordance with international standards. Furthermore, while the Project construction as well as its operation phases, we will be able to help to improve local infrastructure.
Asatulla Djamilov, Leader of community Does the Project envisage any safety measures?	***Sh.Onarkulov*** During construction and operational phases, the Project will strictly follow all safety measures required by national and international standards. Besides, the Project will work in close collaboration with State Committee on ecology and environmental protection as well as with other relevant governmental organisations. ACWA Power implemented similar projects in different countries such as Saudi Arabia, UAE, Jordan, Turkey and etc. Therefore, ACWA Power has a rich experience in this field, especially for health and safety measures.
Asatulla Djamilov, Leader of community Will the Project offer employment opportunities for local experts?	***Sh.Onarkulov*** Yes, of course. The Project will offer employment opportunities both during construction and operational phases. This means, there will be a chance for skilled and unskilled workforce to get a job. We will closely collaborate with local administration in order to provide job opportunities for local residents. Moreover the local khokimiyat is working on preparing the list of local companies and workforce that can be considered during the construction and operation of the plant.

Furthermore, during the discussion Mr. Onarkulov explained the technical and operational process of ACWA CCGT and how effective it will be for energy production. In addition, he mentioned that the aim of Project is not only the construction of CCGT, but it means close collaboration with local authorities and communities at least for 25 years. Moreover it was stressed out several times that ACWA POWER will be a neighbour not a business entity and local community should take an active part on monitoring the execution of the project.

Mr. Muzaffar Khomidjonov – Deputy Mayor of Bayavut district asked if it possible to provide a banner with the information on project so that it can be presented in the district khokimiyat building as well as on the site so that people can have information on the project. Mr. Onarkulov answered that it is indeed possible and will be done after the Presidential Resolution.

Mr. Onarkulov underlined, that ACWA Power Syrdarya 1500 MW CCGT is the first Independent Power Plant in Uzbekistan.

Overall, local community was interested very much in Project. Participants expressed their positive opinions regarding the Project, especially for employment opportunities.

It is important to highlight, that participants of meeting were glad to hear that the project involves measures for minimising the impact on environment and reducing the pollution.

APPENDIX R-2– MINUTES MEETING AT SHIRIN TOWN

MINUTES OF MEETING

Public consultation in Shirin town

To assist 5 Capitals in conducting ESIA baseline surveys for Uzbekistan CCGT project, on May 28, 2020, Juru Energy (Juru) arranged and held public consultations with the people from Directly Affected Communities (DAC) living in Shirin town, Syrdarya region. These communities are closest to the project site with potential ecological influence from the project. Meeting agenda included discussion of issues related to the environmental impact from the project. Summary of the consultations is provided below.

Stakeholder group:	Directly Affected Communities
Number of participants from local community	15 participants, including 7 City council deputies
Representatives of local administration	Mr. Shukur Tojibayev – Mayor Mr. Javokhir Urolov – Head of investment department
Representatives of the Project	Mr.Sherzod Onarkulov – "ACWA Power Syrdarya LLC" Miss Umida Rozumbetova – Juru Energy Mr. Aziz Shoraimov – Juru Energy Mr. Abdullo Adkhamov – Juru Energy
Meeting language:	The Uzbek language
Date:	**28.05.2020**
Start time:	**12:10**
End time:	**14:00**
Method of engagement:	formal letter-invitation to the local municipality on 27.05.2020
Venue:	Conference hall of Shirin town administration
Used materials and visual aids	Project presentation

I. Agenda for meeting

1. General overview of the CCGT construction:
   - Purpose, nature and scale of construction
   - Timeline and schedule of construction

2. Impacts of CCGT
   - Positive (e.g., opportunities for new job placements, cheaper electricity and etc)
   - Negative (noise, air pollution, and etc.)
   - Measures for negative impact mitigation
   - Safeguard measures (that will be taken to reduce impact on environment and communities)

3. Discussions

1. The meeting was moderated by mayor of Shirin town Mr. Shukur Tojibayev, who introduced ACWA Power and Juru teams to the participants. Mayor also briefly described the ongoing works in expanding construction of industrial facilities in Shirin town.

Starting the public consultation on behalf of ACWA Power, Mr. Sherzod Onarkulov congratulated the local community with Eid al-Fitr and expressed condolences over the Sardoba tragedy.

Then he briefed the participants on the goals and main objectives of the project as well as the timeline of the project. He underlined that construction of ACWA CCGT with a total capacity of 1500 MWt was a part of national reforms implemented in the energy sector of Uzbekistan.

Mr. Onarkulov mentioned about that there will be used the latest modern technologies of the world class both during the construction and operational phases. And for this reason, the efficiency coefficient of CCGT will be more than 60%.

He also said that on August, 2020 there will be official opening ceremony for construction works on the allocated land. The whole construction process will start on September/October, 2020.

2. Following the opening speech, Ms. Umida Rozumbetova (Juru) gave the project presentation where she explained the main project features and details, including:

1. Geographical location;
2. Planned technology type;
3. Positive and possible negative impacts of the project;
4. On-going activities at the current stage of the project;
5. Measures for mitigation of negative impact.

3. Q&A session followed the presentation, where local community asked questions related to the socio-economic impact from the project on the district. Affected farmers were mainly concerned about the compensation for the losses of agricultural crops.

Question	Answer
Mr. Shukur Tojibayev: You mentioned that new Project is going to be much efficient in comparison with existing Syrdarya TPP for energy production as well for economising fuel. Could you please tell us how much fuel will be economised while the operation phase of the Project?	Sh.Onarkulov: We know that existing Syrdarya TPP consumes 4,5 billion m³ of gas per year. ACWA Power Syrdarya 1500 MW CCGT and the projected plant meant to be built within the framework of IFC project with the capacity of 1500 MW which will have alike technology in total are expected to consume around 3 billion m³ of gas per year.
Mr. Shukur Tojibayev: What kind of fuel will be used by Project?	Sh.Onarkulov: The Project will use natural gas and filter it out with Gas Treatment Facility. ACWA Power Syrdarya 1500 MW CCGT meets all international standards.
Mr. Shukur Tojibayev: What is the efficiency of boilers and where are they made?	Sh.Onarkulov: Boilers depend on main gas and steam turbines which are going to be either General Electrics or MHPS. After deciding on main components, we will think on boilers.
Mr. Normatov, deputy 1.Will ACWA Power Syrdarya 1500 MW CCGT have impact on infrastructure of our town?	Sh.Onarkulov: First of all, the local infrastructure is the direct responsibility of local municipality which means that local municipality usually has long term plans and schedule for the

2. Due to the rising speed of wind in our territory, do you plan to develop wind farms?	development of infrastructure. Therefore, the issues related to the infrastructure development first of all should be addressed to the Shirin town khokimiyat. We are discussing social projects with Ministry of Energy and our goal is to modernise local Collage of Energy which is a part of local infrastructure. We practise CSR in every country we operate. 2. ACWA Power is developing renewable energy projects. However, those projects are not located in Syrdarya region. Since those projects demand huge territory of land. Syrdarya region is geologically needed to be studied.
Z. Abduvakhidov: deputy mayor You mentioned that 75 hectares will be allocated for ACWA Power CCGT. Will ACWA Power build both of planned stations or only one of them?	Sh.Onarkulov: For now, ACWA Power signed with Government of Uzbekistan the agreement for construction of 1500 MW CCGT. The second CCGT Project will be developed by the winner of tender. 75 hectares are allocated for only ACWA Power Syrdarya 1500 MW CCGT
R.Dadabayeva: local resident I have two sons working in Tashkent city, if it is possible, we could provide you with local employees?	Sh.Onarkulov: We started cooperating with local authorities to help us to find local employees. ACWA Power is going to hire as many local people as possible based on their skills and capabilities.

Furthermore, during the discussion Mr.Onarkulov explained the technical and operational process of ACWA CCGT and how effective it will be for energy production. In addition, he mentioned that the aim of Project is not only the construction of CCGT, but it means close collaboration with local authorities and communities at least for 25 years. Moreover, it was stressed out several times that ACWA Power will be a neighbour not a business entity and local community should take an active part on monitoring the execution of the Project.

Mr. Onarkulov underlined, that ACWA Power Syrdarya 1500 MW CCGT is the first Independent Power Plant in Uzbekistan.

Overall, local community was interested very much in Project. Participants expressed their positive opinions regarding the Project, especially for employment opportunities.

It is important to highlight, that participants of meeting were glad to hear that the project involves measures for minimising the impact on environment and reducing the pollution.

APPENDIX R-3– MINUTES MEETING AT SHIRIN TOWN TARGETING VULNERABLE GROUPS

MINUTES OF MEETING

Public consultation in Shirin town

To assist 5 Capitals in conducting ESIA process for Uzbekistan CCGT Project, on June 5th, 2020, Juru Energy (Juru) arranged and held public consultations with the people from Directly Affected Communities (DAC) living in Shirin town, Syrdarya region. Meeting agenda included discussion of issues related to the environmental and social impact from the project. Summary of the consultations is provided below.

In order to determine the venue and inform participant on upcoming meeting Juru sent official request to Shirin town administration. To organize public consultation Juru collaborated with department on socio-economic affairs. This department contacted by phone with unemployed people and invited them for a meeting.

Consultation was performed with vulnerable groups; youth, unemployed and low-income families.

Vulnerable groups were identified by following criteria:

- Youth – age criteria. According to the Law "On State youth policy" (dated 1991 and amended in 2016), young generation in age group of 16 up to 31 are considered as youth.
- Unemployed – persons aged from sixteen years, which do not have paid work or occupation (in accordance with Law "About employment of the population" dated 1998, amended in 2019).
- Low income families – households whose income is low, relative to other households of the same size (in accordance with Law "About employment of the population" dated 1998, amended in 2019)

Stakeholder group:	Vulnerable groups – youth, unemployed people, low income families
Number of participants from local community	30 participants
Representatives of local administration	Mrs. Nasiba Alimova – deputy mayor of Shirin town Mr. Al-Farobiy Khusanov – director of College of Energy
Representatives of the Project	Mr.Sherzod Onarkulov – "ACWA Power Sirdarya LLC" Ms Umida Rozumbetova – Juru Energy Ms. Dinara Omonova– Juru Energy Mr. Abdullo Adkhamov – Juru Energy
Meeting language:	The Uzbek language
Date:	05.06.2020
Start time:	10:15
End time:	11:40
Method of engagement:	formal letter-invitation to the local municipality on 01.06.2020
Venue:	Conference hall of School #3, Shirin town
Used materials and visual aids	Power point presentation "ACWA Power Syrdarya 1500 MW CCGT: Independent Power Plant"

I. Agenda for meeting

General overview of the CCGT construction:
- Purpose, nature and scale of construction
- Timeline and schedule of construction

Impacts of CCGT
- Positive (e.g., opportunities for new job placements, stable electricity and etc)
- Negative (noise, air pollution, and etc.)
- Measures for negative impact mitigation
- Safeguard measures (that will be taken to reduce impact on environment and communities)

Discussions

The meeting was moderated by deputy mayor of Shirin town Mrs. Nasiba Alimova, who introduced ACWA Power and Juru Energy teams to the participants. The Deputy mayor emphasized that this meeting was organized in order to provide information to young people, the unemployed, as well as low-income families, about the planned Project.
Starting the public consultation on behalf of ACWA Power, Mr. Sherzod Onarkulov briefed the participants on the goals and main objectives of the Project as well as the timeline of the project. He underlined that construction of ACWA CCGT with a total capacity of 1500 MWt was a part of national reforms implemented in the energy sector of Uzbekistan.

Mr. Onarkulov mentioned that there will be used the H-class GT which is a latest modern technology of the world class both during the construction and operational phases. And for this reason, the efficiency coefficient of CCGT will be more than 60%.

He also said that on August, 2020 the official opening ceremony for construction works on the allocated land is scheduled. The whole construction process will start on September/October, 2020.

Furthermore, Mr. Onarkulov underlined that in a framework of the Project it is planned to modernise and enlarge the curricula of College of Energy in Shirin town, in order to educate and prepare specialists who can work at the newly constructed CCGT plants throughout the Republic of Uzbekistan.

Mr. Onarkulov underlined, that ACWA Power Syrdarya 1500 MW CCGT is the first Independent Power Plant in Uzbekistan.

Following the opening speech, Ms. Umida Rozumbetova (Juru) gave the project presentation where she explained the main project features and details, including:

Geographical location;
Main and associated facilities of the project
Planned technology type;
Positive and possible negative impacts of the project;
On-going activities at the current stage of the project;
Measures for mitigation of negative impact.

GRM: contact details for sending feedbacks, suggestions, inquires and compliance

Q&A session followed the presentation, where local community asked questions related to the socio-economic impact from the project on the district. Young and unemployed people were mainly concerned about the employment opportunities and specific requirements for job applications.

Question	Answer
B.Sultanov - teacher in College of Energy of Shirin town 1) What is the total size of land allocated for Project construction? 2) Could you tell about the efficiency of the Project?	Sh.Onarkulov: 1) There are 75 ha of land plot is allocated for the construction of CCGT as well as 10 ha for the new switchgear. The land allocated for the Project belongs to the T.Latipov WCA and Shirin FVAF. Previously these lands were used by farmers for cultivation of agricultural crops. 2) The efficiency of planned CCGT is expected to be more than 60% due to the H-class GT technology and equipment that will be used for the construction of Project.
B.Sultanov - teacher in College of Energy of Shirin town You said that land was previously used for agricultural purposes. What will happen with farmers who are going to lose their lands?	Urolov Javohir – deputy head of investment department of Shirin town khokimiyat: First of all, all farmers got written notification that their lands are going to be returned to the reserve fund of local administrations. According to the Land Code of the Republic of Uzbekistan all the lands belong to the State, therefore the government has the right to return the land if necessary. Besides, farmers will be able to collect the grain harvest for 2020 within June, and all of them will get compensation if they are eligible in accordance with the current legislation of the Republic of Uzbekistan. The issues of compensation will be closely worked with the developer.
J.Urolov - head of investment department in Shirin town administration The construction and operation of each industrial facility involves an investment in the region. Do you plan to establish other industrial facilities that will provide technical support to the Project, i.e., plant for production of technical details to the CCGT and etc.?	Sh.Onarkulov: As I mentioned before, we aim to construct the CCGT by using the latest technologies, manufactured in USA and Japan. Nowadays, these two countries are the ones that produce highly efficient and environmentally friendly technologies. Unfortunately, there are no local manufacturers or service providers which can provide technical support for CCGT. It worth noting that there is no such manufacturers or service providers not

	only in Uzbekistan but in whole Central Asian region as well. Moreover, during the first years of CCGT operation it will be necessary to involve some foreign specialist, because such modern technologies will be applied first time in Uzbekistan. That is why, we are highly motivated to enlarge the curricula of the College of Energy in order to prepare highly qualified specialist among the youth of Shirin town.
S.Mukhtdinov - leader of Youth union branch in Shirin town How many work places are planned to open during the construction phase and what are the main requirement for the jobs that will be offered while operation phase?	Sh.Onarkulov: The exact number of work –places that will be created is not fixed yet but for the same scale projects around maximum of 3000 workers will be needed during the peak load of the construction phase. As for the operation phase we will need highly qualified specialist with good knowledge of English language. A specialist with good knowledge in the energy sector will not be able to communicate and work without knowledge of English. and conversely, a person who speaks English will not be able to understand the technical process. Therefore, language skills and knowledge in the field of energy are going to be the main criteria during the selection process.

Furthermore, during the discussion the young people were interested in new programs, that are going to be added to the main curricula of College of Energy and admission processes. While answering to the questions of participants Mr. Onarkulov mentioned that the aim of Project is not only the construction of CCGT, but it means close collaboration with local authorities and communities at least for 25 years. He also mentioned that ACWA POWER's aim is to become a part of the local community. Moreover, it was stressed out several times that ACWA Power is planning to become a so-called neighbour and part of the local community. Therefore, the local community should take an active part on monitoring the execution of the Project.

Photos from meeting

БИЛАН МУЛОҚОТ УЛУГВОР
МАҚСАДЛАРИМИЗГА
ГУВЧИ ОЙДИН ЙЎЛДИР

ЛАН МУЛЮКОТ УЛУГЛОР
АКСАЛЛАРИМИЗГА
ВЧИ ОЙДИН БУЛДИР

Official request

Juru Energy

Suite 1, First Floor, 41 Chalton Street, London, NW1 1JD, UK
+44 207 859 4028
+44 207 691 9406
info@juruenergy.com

№ UZB-ACWA-CCGT-20/20/18

1.06.2020

Хокимияту города Ширин,
Сырдарьинской области.

Компания ACWA Power при помощи ООО «ACWA Power Sirdaryo» (Ташкент) заключила 25-летнее соглашение о покупке электроэнергии с АО «Национальные электрические сети Узбекистана» на разработку газовой турбины с комбинированным циклом мощностью 1500 МВт (ПГУ). Проект будет расположен примерно в 0,3 км к северо-востоку от города Ширин, напротив существующей нефтегазовой теплоэлектростанции мощностью 3000 МВт (Сырдарьинская ТЭС).

Исходя из требований, установленных действующим законодательством, ACWA Power должна сдать в Государственный комитет Республики Узбекистан по экологии и охране окружающей среды (регулирующий орган) отчет об оценке воздействии на окружающую среду (ОВОС), и получить экологическую лицензию до начала проекта. Вследствие этого, в рамках ОВОС корпоративные экологические и социальные консультанты ACWA Power «5 Capitals Environmental & Management Consulting» (Дубай, ОАЭ) назначили Juru Energy (Ташкент, Узбекистан) для проведения необходимых экологических и социальных исследований, а также сбор данных, включая представление ОВОС регулирующему органу.

В рамках проекта ОВОС Juru Energy планирует проведение консультаций с местными жителями. В связи с этим, просим Вас оказать содействие в организации встречи с представителями молодежи и временно безработных жителей, а также с пожилыми людьми и малообеспеченными семьями 5 мая 2020 года.

Учитывая условия карантинных мер, действующих по всей территории Республики Узбекистан, и избежать большого количества скопления людей, просим Вас организовать отдельно встречу с представителями молодежи и временно безработных людей и отдельно встречу с пожилыми людьми и малообеспеченными семьями.

Хушнуджон Рахимберганов

Директор

LONDON, UK
JURU ENERGY LIMITED
COMPANY No. [illegible]

Исполнитель: У Розуметова
Тел.: +99871 202 04 40
Моб.: +99893 348 75 23

Translation

№ UZB-ACWA-CCGT-20/20/17

20.05.2020

To Shirin town administration
of Syrdarya region

ACWA Power through "ACWA Power Sirdarya LLC (Tashkent)" has entered into a 25-year Power Purchase Agreement with JSC National Electric Networks of Uzbekistan for the development of a 1500MW gas fired Combined Cycle Gas Turbine (CCGT). The project will be located approximately 0.3km northeast of the city of Shirin opposite the existing 3000MW oil/gas Thermal Power Plant (Sirdarya TPP).

According to the Uzbekistan law under the State Committee of the Republic of Uzbekistan for Ecology and Environmental Protection (regulator), ACWA Power is required to obtain an Environmental license before the commencement of the project. Therefore, as part of the Environmental Impact Assessment (EIA), ACWA Power's corporate Environmental & Social Consultants '5 Capitals Environmental & Management Consulting' (Dubai, UAE), have appointed Juru Energy (Tashkent, Uzbekistan) to conduct certain environmental & social surveys and data collection, including submission of the EIA to the regulator.

As part of the ESIA, Juru Energy is assisting 5 Capitals in consulting with affected people to share the aviable information about the Project as well as receive their feedbacks or comments.

Considering the above, we kindly seek your support in arranging consultations with youth and low-income families on 5th of June, 2020.

Thank you very much for your assistance and we look forward to your response.

Yours Sincerely,

Director
Signed/ stamped

For further information please contact: Umida Rozumbetova

Phone.: +99871 202 04 40
Mob.: +99890 348 75 23

Attendance list

05.06.2020 кил куни Шарин шахрида "Juru Energy" консалтинг компанияси вакиллари билан учрашувга таъриф буюрган фуқаролар РЎЙХАТИ

№	Ф.И.Ш	Яшаш манзили (МФЙ номи)	Туғилган йили	Норасмий машғулоти	Фарзандлари сони	Имзо
1	Рустамова Рушана	М.Улуғбек	1991 йил	Ишсиз	1	
2	Қаюмшина Рўзагул	М.Улуғбек	1995 йил	Ишсиз	0	
3	Мустафоқулов Умун	М.Улуғбек	1991 йил	Ишсиз	2	
4	Ахмбекова Феруза	М.Улуғбек	1995 йил	Ишсиз	1	
5	Рустамов Ахмад	М.Улуғбек	2020	Ишсиз	0	
6	Қаюмов Сирожиддин	М.Улуғбек	1991 йил	Ишсиз	1	
7	Абдуғаттарова Замира	М.Улуғбек	1998 йил	Ишсиз	0	
8	Каххорова Ғозиб	А.Темур МФЙ	1993 йил	Ишсиз	0	
9	Исмон Нодирбек Баходир ўғли	А.Темур МФЙ	06.12.1998	Ишсиз	0	
10	Акбарова Гулноз Бахром қизи	А.Темур МФЙ	20.07.1990	Ишсиз	2	
11	Рўзиев Улуғбек Умид ўғли	А.Темур МФЙ	28.10.1997	Ишсиз	0	
12	Хусайинов Шахбоз	Дустлик МФЙ	01.10.1998	Ишсиз	0	
13	Абдуллаханова Муяссар	Дустлик МФЙ	11.07.1967	Ишсиз	0	
14	Абдуллаева Мадина Усон қизи	Дустлик МФЙ	21.06.1989	Ишсиз	0	
15	Тошпулатова Гулноза Фатхулло қизи	Дустлик МФЙ	1995	Ишсиз	1	
16	Валибаев Мирзо Андреевич	Дустлик МФЙ	18.08.1993	Ишсиз	2	
17	Бокиханова Нигуфар	Дустлик МФЙ	02.02.1999	Ишсиз	0	
18	Эгамова Умида Абдухолик қизи	Дустлик МФЙ	23.12.1992	Ишсиз	1	
19	Эгамова Зилола Абдуғаппар қизи	Дустлик МФЙ	07.06.1996	Ишсиз	0	
20	Ахмонова Нодира Ахмад қизи	Дустлик МФЙ	09.03.2000	Ишсиз	0	
21	Ахмбекова Азиза	Нуробод	18.06.1992	Ишсиз	0	
22	Мирзаев Дилшод	Фарход	18.09.1991	Ишсиз	0	
23	Мустафоқулов Умун	Фарход	29.06.1991	Ишсиз	1	
24	Умарова Мохинур	Фарход	17.12.1990	Ишсиз	1	
25	Орлов Юрий	Фарход	27.05.1996	Ишсиз	0	
26	Нигматханова Гулнора	Нуробод	13.05.1990	Ишсиз	3	
27	Якубов Азиз Маъруф ўғли	Нуробод	21.08.1995	Ишсиз	1	
28	Ахмбекова Мавзуна	Нуробод	29.09.1992	Ишсиз	2	
29	Норматова Нозокат	М.Улуғбек	31.05.1991	Ишсиз	2	
30	Шарипатова Шохида	Фарход	09.04.1990	Ишсиз	2	
31	Шокирова Дониёр	Фарход	01.07.1995	Ишсиз	3	
32	Ким Виталий	Фарход	04.02.1992	Ишсиз	0	
33	Климова Екатерина Владимировна	Нуробод	10.04.1990	Ишсиз	0	
34	Абдуллаев Фаёзхўжа	М.Улуғбек	1997	Ишсиз	0	
35	Шарипова Русалина	М.Улуғбек	06.10.1994	Ишсиз	0	
36	Абдураимова Наилёя	Нуробод	22.01.1992	Ишсиз	1	
37	Ан Кристина	М.Улуғбек	17.12.1993	Ишсиз	1	
38	Мажлисова Севара	М.Улуғбек	20.06.1990	Ишсиз	2	

Translation

Attendance list

№	Full name	Name of living community	Date of birth	Occupation	Number of children	Signature
1	Rustamova Rushana	M.Ulugbek	1991	unemployed	1	
2	Qoryog'diyeva Rozigul	M.Ulugbek	1995	unemployed	-	
3	Mustofoqulov Uchkun	M.Ulugbek	1991	unemployed	2	signed
4	Azizbekova Feruza	M.Ulugbek	1995	unemployed	1	signed
5	Rustamov Ahmad	M.Ulugbek	2000	unemployed	0	signed
6	Qoqonov Sirojitdin	M.Ulugbek	1991	unemployed	1	signed
7	Abdugapparova Zamira	M.Ulugbek	1998	unemployed	0	signed
8	Qaxxorov Golib	A.Temur	1996	unemployed	0	signed
9	Isaev Nodirbek Bakhodir ugli	A.Temur	08.12.1996	unemployed		signed
10	Akbarova Gulkhayo Bakhrom kizi	A.Temur	20.07.1990	unemployed	2	
11	Ruziev Ulugbek Umid ugli	A.Temur	28.10.1997	unemployed	0	signed
12	Xusanov Shakhboz	Dustlik	01.10.1996	unemployed	0	signed
13	Abdunomonova Muazzam	Dustlik	11.07.1997	unemployed	0	signed
14	Abduganieva Madina Usan kizi	Dustlik	21.06.1995	unemployed	0	signed
15	Toshpulatova Gulhida Fathulla kizi	Dustlik	1995	unemployed	1	
16	Valebnaya Maria Andreevna	Dustlik	18.08.1993	unemployed	2	signed
17	Bojigitova Nilufar	Dustlik	02.02.1999	unemployed	0	
18	Egamova Umida Abduholiq kizi	Dustlik	23.12.1992	unemployed	1	signed
19	Egamova Zilola Abduholiq kizi	Dustlik	07.06.1996	unemployed	1	signed
20	Alijonova Nodira Akmal kizi	Dustlik	09.02.2000	unemployed	0	
21	Aliboyeva Aziza	Nurabod	18.08.1992	unemployed	0	signed
22	Mirzayev Dilshod	Farkhod	18.02.1991	unemployed	0	signed
23	Mustafakulov Uchkun	Farkhod	29.08.1991	unemployed	1	signed
24	Umarova Mokhinur	Farkhod	17.12.1995	unemployed	1	signed

25	Orlov Yuriy	Farkhod	27.06.1996	unemployed	0	signed
26	Nigmatzyanova Gulnora	Nurabod	13.05.1990	unemployed	3	signed
27	Yakhyoyeva Aziza Maruf kizi	Nurabod	21.08.1995	unemployed	1	signed
28	Azizbekzoda Mavzuna	Nurabod	29.09.1990	unemployed	2	signed
29	Normatova Nazokat	M.Ulugbek	31.05.1991	unemployed	2	signed
30	Shermatova Shoira	Farkhod	09.04.1990	unemployed	2	signed
31	Shokirova Dinara	Farkhod	01.07.1995	unemployed	3	signed
32	Kim Vitaliy	Farkhod	04.02.1992	unemployed	0	signed
33	Klimova Ekaterina Vladimirovna	Nurabod	10.04.1990	unemployed	0	signed
34	Abdullayev Fayzillo	M.Ulugbek	1997	unemployed	0	signed
35	Sharipova Ruhsatoy	M.Ulugbek	08.10.1994	unemployed	0	
36	Ashuralieva Nasiba	Nurabod	22.01.1992	unemployed	1	signed
37	An kristina	M.Ulugbek	17.12.1993	unemployed	1	
38	Movlanova Sevara	M.Ulugbek	20.06.1990	unemployed	2	signed

APPENDIX R-4– MINUTES MEETING FROM ZOOM CONFERENCE CALL WITH WOMEN IN BAYAVUT DISTRICT

MINUTES OF MEETING

Public consultation in Bayavut district – video conference via Zoom

To assist 5 Capitals in conducting ESIA baseline surveys for Uzbekistan CCGT project, on July, 2nd, 2020, Juru Energy (Juru) arranged and held public consultations with the people from Directly Affected Communities (DAC), i.e., with women living in Bayavut district, Syrdarya region. Meeting agenda included discussion of issues related to the environmental and social impact from the project. Summary of the consultations is provided below.

Considering the restrictions in Republic of Uzbekistan due to the COVID-19 and following the EBRD briefing note on Stakeholders engagement (PR 10) suggestions this meeting was arranged via Zoom video conference. In order to determine the venue and inform participant on upcoming meeting Juru consulted with the administration of Bayavut district and district branch of Women committee in order to ask assistance for arranging venue and inform participants.

Stakeholder group:	Directly Affected Communities – women
Number of participants from local community	8 women from Sarmich community and Julangar communities of Bayavut district
Representatives of local administration	Mr. Rustam Kurbanov – Head of investments department
Representatives of the Project	Mr. Sherzod Onarkulov – ACWA Power Sirdarya LLC (Tashkent) Ms. Umida Rozumbetova – Juru
Meeting language:	Uzbek
Date:	02.07.2020
Start time:	10:45
End time:	11:50
Method of engagement:	Request via phone call to the Bayavut district administration Phone consultations with district branch of Women Committee on the organization of video conference via Zoom
Venue:	Conference hall of school 36
Used materials and visual aids	Power point presentation “ACWA Power Syrdarya 1500 MW CCGT: Independent Power Plant”

I. Agenda for meeting

1. General overview of the CCGT construction:
   - Purpose, nature and scale of construction
   - Timeline and schedule of construction

2. Impacts of CCGT
   - Positive (e.g., opportunities for new job placements, cheaper electricity and etc)
   - Negative (noise, air pollution, and etc.)

- Measures for negative impact mitigation
- Safeguard measures (that will be taken to reduce impact on environment and communities)

3. Discussions
4. GRM: contact details for sending feedbacks, suggestions, inquires and compliance

1. Starting the public consultation on behalf of ACWA Power, Mr. Sherzod Onarkulov provided general background and description of the Project. He informed meeting participants about signed agreements between ACWA Power and Ministry of Energy on 5th of March as well as with Ministry of Investments and Foreign Trade on 6th of March for construction and operation of new ACWA Power Sirdarya 1500 MW CCGT in Syrdarya region. The total investments for this Project are 1,2 billons USD. It also was underlined that there will be used H-class GT modern technologies. Mr. Onarkulov also mentioned that Project assumes zero discharge of technical water to canal, and reduced air emissions.

Then he briefed the participants on the goals and main objectives of the project as well as the timeline of the project. He underlined that construction of ACWA Power Sirdarya 1500 MW CCGT was a part of national reforms implemented in the energy sector of Uzbekistan.

Furthermore, Mr. Onarkulov mentioned that ACWA Power has started the process for reconstruction the building of College of Energy in Shirin town. Besides, in order to educate and prepare specialists who can work at the newly constructed CCGT plants throughout the Republic of Uzbekistan ACWA Power prosed 4 new specializations to the existing curricula of College of Energy, that is currently under the revision of Ministry of Higher and secondary specialized education.

Following the opening speech, Ms. Umida Rozumbetova (Juru) gave the project presentation where she explained the main project features and details, including:

Geographical location;

Planned technology type;

Positive and possible negative impacts of the project;

On-going activities at the current stage of the project;

Measures for mitigation of negative impact.

GRM: contact details for sending feedbacks, suggestions, inquires and compliance

2. Q&A session followed the presentation, where participants of the meeting asked questions related to the socio-economic impact, i.e., about employment opportunities.

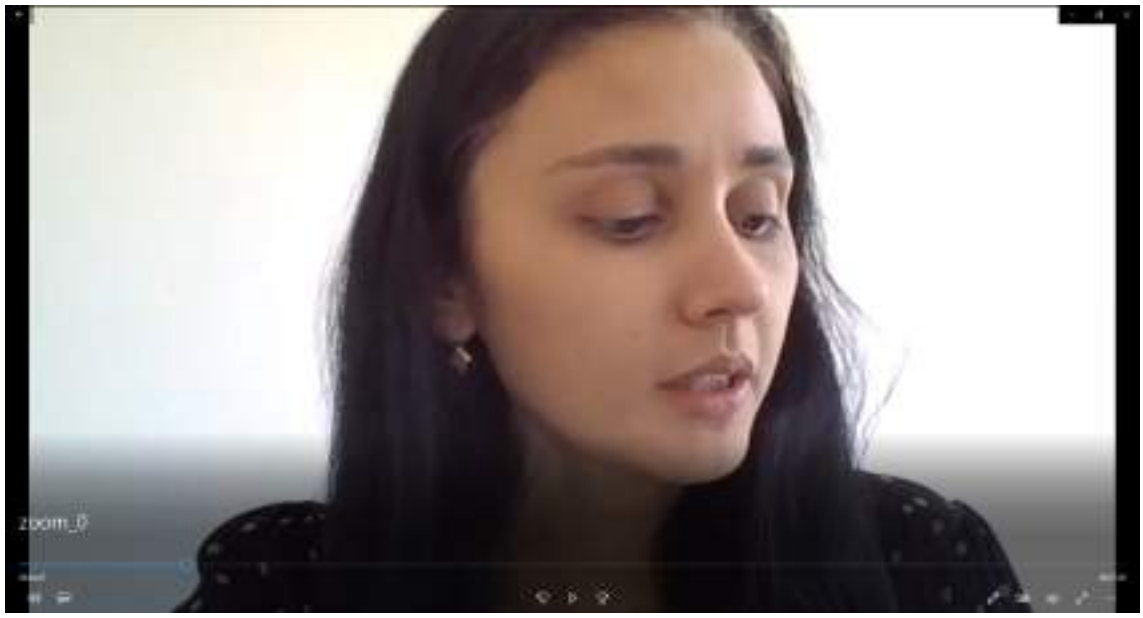
Question	Answer
Isroilova Odina, unemployed:	***Sh.Onarkulov***

How Project may assist for unemployed women in Bayavut district?	In terms of employment, Project will offer equal job opportunities for women and men, based on their skills and qualifications, during the construction as well as operation phases of the Project.
Khasanova Laylo, unemployed You mention about reconstruction work of College of Energy, as well as expansion of the College's curricula. My question is whether the graduates of this College will be supplied with job places after its graduation?	***Sh.Onarkulov*** Thanks for a question. Of course, we aim to educate female and help them to become a specialist in the field of energy. Our proposed program for four new specialisations in College of Energy will be conducted in English. We expect that female graduates of this program will be able to work in ACWA Power Sirdarya 1500 MW CCGT as well as in other similar future Projects that may start all around the Uzbekistan. Active involvement of women to the energy sector is one of main aims of the Project as well as part of reforms for provision of equal rights and opportunities for women of the Government of Uzbekistan.

It is important to highlight, that participants of meeting were glad to hear that the project involves measures for mitigating and managing environmental and social impacts.

Annex 1

Photos from the meeting (extracts from Zoom video conference)



Translation

1. Kurbanova Gulnora (employee of district branch of Women's committee) – - signed
2. Tashmatova Sabriniso (employee of district branch of Women's committee) –- signed
3. Ikromova Odina (teacher)– local resident
4. Abdukodirova Dilorom (teacher) – local resident
5. Xasanova Laylo (teacher) – local resident
6. Alinulova Gulhayo (unemployed) – signed
7. Rahimkulova Muazzam (unemployed)- local resident
8. Ikromova Yulduz (unemployed) – signed

Annex 2

Attendance list

“ACWA Power” компанияси ҳамда “Juru Energy” компанияси томонидан ўтказилган видео кўргазмада иштирок этган хотин-қизлар рўйхати

№	Ф.И.Ш	Имзоси
1	Курбонова Гулноза	
2	Тожибаева Собрияхон	
3	Исроилова Ойна	
4	Абдуқодирова Дилфуза	
5	Ғаппарова Лайло	
6	Аминулова Гулжаҳон	
7	Рафиқулова Шуҳратхон	
8	Исроилова Юлдуз	
9		
10		

APPENDIX R-5– LETTER FROM AGENCY OF SANITARY & EPIDEMIOLOGY (MINISTRY OF HEALTH)

O`ZBEKISTON RESPUBLIKASI
SOG`LIQNI SAQLASH VAZIRLIGI
HUZURIDAGI SANITARIYA-
EPIDEMIOLOGIK OSOYISHTALIK
AGENTLIGI

100097. Toshkent, Bunyodkorko`chasi.46-uy.
Telefon: 71 276-59-28. Fax:71 276-59-28
e-mail: kancelyariyaresdsenm@minzdrav.uz

AGENCY OF SANITARY AND
EPIDEMIOLOGICAL WELL-BEING
UNDER THE MINISTRY OF
HEALTH OF THE REPUBLIC OF
UZBEKISTAN

46, Bunyodkor str., Tashkent, 100097
Phone: 71 276-59-28. Fax: 71 276-59-28
e-mail: kancelyariyaresdsenm@minzdrav.uz

26.06.20 № 04-8/7034

22.06.2020 № UZB-ACWA-CCGT-20/20/37ga

JURU ENERGY LIMITED
ДИРЕКТОРУ РАХИМБЕРГАНОВУ Х.

Агентство санитарно-эпидемиологического благополучия при Министерстве здравоохранения рассмотрело Ваше обращение и при этом установило следующее:

1. корпоративные экологические и социальные консультанты ACWA POWER “5 Capitals Environmental&Management Consulting” в рамках ОВОС назначили JURU ENERGY для проведения необходимых экологических и социальных исследований, а также сбор данных, необходимых для подготовки документа по процедуре ОВОС;

2. министерство здравоохранения Республики Узбекистан просят оказать содействие в представлении информации, которая может быть необходима для включения в процесс ОВОС.

Следует отметить, что любые экологические и социальные исследования в рамках ОВОС проводятся в соответствии со стандартной программой. Результаты подобных исследований послужат в последующем основой как для начала финансирования проекта, так и для разработки проектов ЗВОС.

Агентство санитарно-эпидемиологического благополучия при МЗ РУз выражает готовность сотрудничать с JURU ENERGY в рамках ОВОС после оформления соответствующего документа (Договора/Соглашения) на проведение отдельных компонентов экологических и социальных исследований при наличии конкретного технического задания для сектора здравоохранения и условиях оплаты за фактически выполненный объем работы.

Первый заместитель директора Б.Ж. Курбанов

Исп. Ли Т.Б.
Тел. 276 75 92

Unofficial translation by Juru Energy

Agency of sanitary and epidemiological well-being

under the Ministry of Health of the republic of Uzbekistan

26.06.20 №04-8/4034

22.06.2020 № UZB-ACWA-CCGT-20/20/37

To: Juru Energy Limited

Director Rakhimberganov Kh.

The Agency for Sanitary and Epidemiological Well-Being under the Ministry of Health reviewed your letter and would like to inform on followings:

1. ACWA Power's corporate Environmental & Social Consultants '5 Capitals Environmental & Management Consulting', have appointed Juru Energy to conduct certain environmental & social surveys and data collection;
2. The Ministry of Health of the Republic of Uzbekistan has forwarded the letter of Juru Energy to Agency and asked to assist in providing relevant information for national EIA.

It should be noted that any environmental and social studies in the framework of the EIA should be carried out in accordance with the standard program. The results of such studies will serve as a basis for both the project financing and the development of national EIA.

The Agency for Sanitary and Epidemiological Welfare under the Ministry of Health of the Republic of Uzbekistan is ready to cooperate with JURU ENERGY for preparing and submitting national EIA by signing Agreement and determining scope of work for environmental and social aspects as well as agreeing on payment for these works.

Signed by

First deputy director:

B.J.Kurbanov

APPENDIX R-6– PROJECT BROCHURES & LEAFLETS

Kutilayotgan ijobiy ta’sirlar

- Elektr energiyasini ishlab chiqarishni kengaytirish;
- Yangi ish o’rinlari barpo etilishi(loyihaning qurilishi va ishlashi jarayonida);
- Shirin shahridagi Energetika kollejida texnik tayyorgarlikni oshirish bo'yicha o'quv dasturlarining tashkil etilishi;
- Xalqaro, milliy va mintaqaviy ahamiyatga ega bo’lgan tabiiy hududlarga ta’sir ko’rsatmaslik;
- O’simlik va hayvonot dunyosiga, ajratilgan qishloq xo’jaligi maqsadlarida foydalaniladigan yerlarga maksimal darajada salbiy ta’sir ko’rsatmaslik;
- Yuqori xavfsizlik va nazorat choralari tufayli tuproq va yer osti suvlarining ifloslanishini oldini olish;
- Havoga chiqariladigan gaz emissiyalarini nazorat qilish maqsadida eng yangi va xalqaro standartlarga jovob beradigan texnologiyalar qo’llanilishi;
- Xavfli materiallar, chiqindilar va va shu kabi moddalarni saqlashni qat’iy nazorat qilinishi;
- Kanalga tozalangan kanalizatsiva va yomg’ir suvlaridan tashqari texnik suv tashlanmasligini nazorat qilinishi;
- Manfaatdor tomonni jalb qilish rejasi va shikoyat qilish mexanizmi orqali jamoalar bilan doimiy muloqotni yo’lga qo’yilishi.

Ehtimoli bo’lgan salbiy ta’sirlar va yechimlar

Qurilish jarayonida

- Odatda qurilish jarayonida kelib chiqadigan muammolarga (masalan, chang, shovqin, yorug'lik, transport, bug’ hosil bo’lishi va h.k) milliy va ilg’or xalqaro amaliyotga muvofiq yechim topiladi;
- Ishchilar soni va oqimi kopayishi Madaniy va ijtimoiy ahamiyatga ega bo’lgan obyektlarga ta’sirini kamaytirish;
- Elektrostantsiyani qurish uchun yer olish
jarayonida iqtisodiy ko’chish mas-alalari;
- Aholi salomatligi va xavfsizligi uchun potensial xavf-xatar, uni baholash va rejalashtirish orqali xavfsizlikni hisobga olgan holda boshqarilishi.

Loyiha faoliyat ko’rsatishi davomida

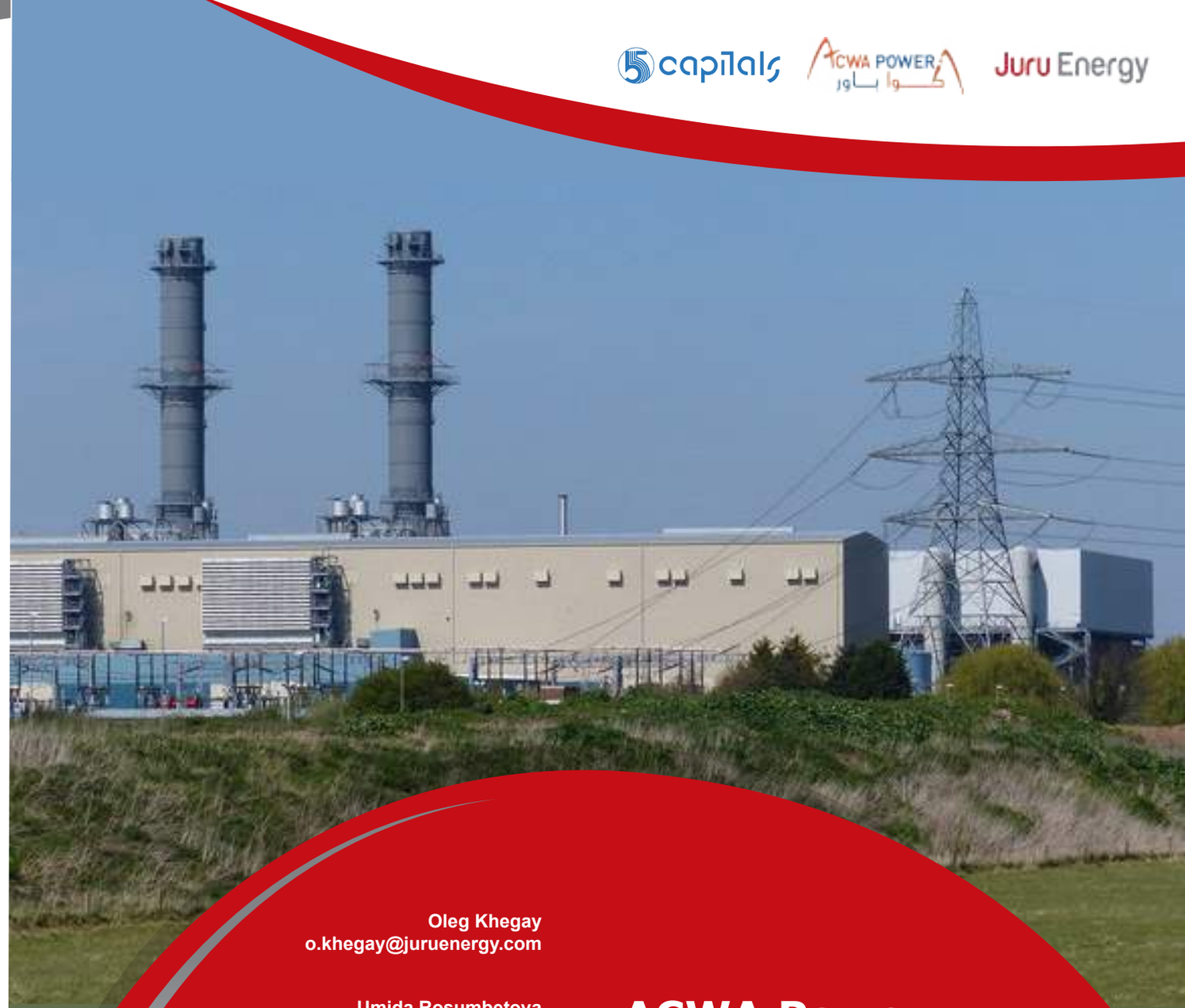
- Loyihaning xavoni NOx,CO ni bilan ifloslanishi, Evropa Ittifoqi va O'zbekiston ifloslanish standartlarga mos ravishda monitoring qilinishi;
- Tozalangan vodoprvod suvini nazorat ostida Janubiy Mirzacho’l kanaliga qaytarilishini monitoring qilish;
- Shovqin (uzluksiz gumburlash) o'zbek standartlariga va JSST standartlariga rioya qilish orqali boshqarish;
- Favqulotda vaziyatlar mahalliy hokimiyat organlari va tegishli manfaatdor tomonlar bilan kelishilgan holda boshqariladi. Bundan tashqari, sanitariya himoya zonasi, ifloslanishi manbai va turar-joy maydoni o'rtasidagi maydon mahalliy aholi uchun eng yaqin >500m masofada bug’-gaz qurilmasi atrofida tashkil etiladi.

Shikoyatlarni ko'rib chiqish mexanizmi. Loyiha va savollar haqida qo'shimcha ma'lumot olish uchun telefon yoki elektron pochta orqali biz bilan bog'laning. Bu mutlaqo bepul va shaffof.

Project Description

The Government of the Republic of Uzbekistan, in order to modernize the power supply system and increase production of electricity, plans to build new combined cycle gas turbine (CCGT) Thermal Power Plant and an switchgear substation 500/220 kV in cooperation with ACWA Power.

Realisation of this Project is a part of wide modernisation in the energy sector of Uzbekistan that will allow to increase energy production as well reduce the fuel consumption. In addition, Project will beneficial for environment and local society.



Oleg Khegay
o.khegay@juruenergy.com

Umida Rosumbetova
u.rozumbetova@juruenergy.com

Sherzod Onarkulov
sonarkulov@acwapower.com

For the further information, feedback and inquiries please contact us (+998) 71 202 04 40

ACWA Power Syrdarya 1500 MW CCGT Independent Plant

Expected positive impacts

- Increased production of electricity;
- Employment opportunities (during construction and operation phases);
- Training programs to enhance technical training in the College of Energy in Shirin city
- No direct impact on protected areas of international, national and regional significance;
- Minimum effect to flora and fauna as existing land is managed farmland and not natural habitats;
- Best practice control measures to prevent pollution to soil, ground and surface water;
- Decreased air emissions per unit of energy generated - due to the wider modernisation strategy;
- Strict control of storage for hazardous materials, waste, wastewater;
- Zero liquid discharge to the canal, except treated sanitary and rainfall water.
- Ongoing dialogue with communities through a Stakeholder Engagement Plan and provision of a grievance mechanism.

Possible negative impacts and solutions

Temporary Construction

- Typical construction phase impacts (i.e. dust, noise, lighting, traffic, visual amenity, spills etc) managed in accordance to Uzbek regulation and international good practice with monitoring.
- Worker influx including workers from other regions and countries. Managed to minimise cultural and social disruptions.
- Economic displacement due to land take but with planned livelihood restoration.
- Potential health and safety risks for the community managed through risk assessment and planning with site-based security.

Operation

- Project air emissions of NOx, CO complying with EU and Uzbekistan pollution standards with continuous monitoring.
- Discharges of treated sanitary water to YG canal managed, with monitoring.
- Operational noise (continuous humming) managed through compliance with Uzbek standards and WHO standarts.
- Potential emergency situations to be managed through suitable equipment and emergency response planning in coordination with local authorities and relevant stakeholders. Furthermore, Sanitary Protection Zone, an area between the source of pollution and residential area, will be established around the CCGT with a >500m distance to nearest to communities.

Grievance mechanism. For the further information regarding the Project, feedbacks as well as for inquiries please contact us via phone or email. It is absolutely free of charge, transparent and without any retribution.

UMUMIY QUVVATI 1500 MVT BO'LGAN ACWA BUG' GAZ QURILMASI MUSTAQIL ELEKTR STANTSIYASI

Ushbu bug' gaz loyihasini amalga oshirish O'zbekistonda energetika sohasini isloh qilish tadbirlaridan biri xisoblanadi. Buning natijasida energiya ishlab chiqarilishi kopayadi va yoqilg'ini tejash imkoni paydo bo'ladi. Bundan tashqari, loyiha atrof-muhit va mahalliy aholiga ijobiy ta'sir qiladi.

Qo'shimcha ma'lumot va savollar uchun iltimos, biz bilan bog'laning
(+998) 71 202 04 40

Oleg Khegay
o.khegay@juruenergy.com

Umida Rosumbetova
u.rozumbetova@juruenergy.com

Sherzod Onarkulov
sonarkulov@acwapower.com

UMUMIY MA'LUMOT

- **Mazkur loyiha O'zbekistonda elektr energiyasini ishlab chiqarish tizimini keng modernizatsiyalashning bir qismidir;**
- **Umumiy maydoni: 75 gektar (podstansiya bilan);**
- **Suv iste'molini kamaytirish va kanalga sanoat chiqindi suvlarini nolga tushirish uchun sovutish moslamalari;**
- **Quvvat bloklariga 2 ta gaz turbinasi, 2 ta issiqlikni tiklash bug' generatorlari va 1 ta bug' turbinasi kiradi;**
- **Elektrostantsiyaning samaradorligi >60 % bo'ladi;**
- **Yoqilg'i: faqat tabiiy gaz.**

EKOLOGIK TA'SIR

- **Tuproq, yer osti va yer usti suvlarining ifloslanishini oldini olish bo'yicha eng zamonaviy amaliy nazorat tadbirlari;**
- **O'zbekiston uchun hosil bo'lgan energiya chiqindilarining kamayib ketishiga hissa qo'shish;**
- **Mavjud yer xo'jaliklarining o'simlik va hayvonot dunyosiga minimal ta'sir ko'rsatadi;**
- **Xalqaro, milliy va mintaqaviy ahamiyatga ega muhofaza qilinadigan hududlarga ta'sir qilinmaydi;**
- **Sanitariya va yog'ingarchilik suvidan tashqari kanalga ortiqcha ifloslangan suv quyilmaydi.**

IJTIMOIY TA'SIR

- **Mahalliy aholi uchun bandlik imkoniyatlari (qurilish va ishlash bosqichlarida);**
- **Madaniy va arxeologik ahamiyatga ega obyektlarga ta'siri yo'q;**
- **Elektr energiyasi ishlab chiqarishni ko'paytiradi.**

ACWA Power Syrdarya 1500 MW CCGT Independent Plant

Broad modernization in energy sector of Uzbekistan include putting this CCGT Project into realization. As an aftermath energy production will increase as well as reduction of fuel consumption. Moreover, local society and enviroment will get immense benefits from this Project.

For the further information, feedback and inquiries please contact us
(+998) 71 202 04 40

Oleg Khegay
o.khegay@juruenergy.com

Umida Rosumbetova
u.rozumbetova@juruenergy.com

Sherzod Onarkulov
sonarkulov@acwapower.com

GENERAL INFORMATION

- This Project is a part of broad modernization of power generation system of Uzbekistan
- Total area: 75 hectares (including substation)
- Cooling by cooling tower units to reduce water consumption and zero discharge of industrial wastewater to canal
- Power blocks will include 2 gas turbines, 2 heat recovery steam generators, and 1 steam turbine
- The efficiency of the plant will be >60%
- Fuel: natural gas only

ENVIROMENTAL IMPACTS

- Best practice control measures to prevent pollution to soil, ground and surface water
- Contribution to decreased air emissions per unit of energy generated for Uzbekistan
- Minimum effect to flora and fauna as existing land is managed farmland
- Zero impact on protected areas of international, national and regional significance
- Zero liquid discharge to the canal, except treated sanitary and rainfall water

SOCIAL IMPACTS

- Employment opportunities for local people (during construction and operation phases)
- No impact on objects of cultural and archeological importance
- Increased production of electricity

Loyiha Haqida Ma’lumot

O’zbekiston Respublikasi hukumati elektr ta'minoti tizimini modernizatsiya qilish va elektr energiyasini ishlab chiqarishni ko’paytirish maqsadida ACWA Power bilan hamkorlikda yangi bug’-gaz turbinali elektr stantsiyasi va 500/220 kV elektr uzatish podstansiyasini qurishni rejalashtirmoqda.

Ushbu loyiha O’zbekistonda energetika sohasini isloh qilishning bir qismi bo’lib, energiya ishlab chiqarishni kengaytirga va yoqilg’ini tejash imkonini beradi. Bundan tashqari, loyiha atrof-muhit va mahalliy aholi uchun ijobiy ta’sir ko’rsatadi

Oleg Khegay
o.khegay@juruenergy.com

Umida Rosumbetova
u.rozumbetova@juruenergy.com

Sherzod Onarkulov
sonarkulov@acwapower.com

Qo'shimcha ma'lumot va savollar uchun iltimos, biz bilan bog'laning (+998) 71 202 04 40

UMUMIY QUVVATI 1500 MVT BO’LGAN ACWA BUG’ GAZ QURILMASI MUSTAQIL ELEKTR STANTSIYASI

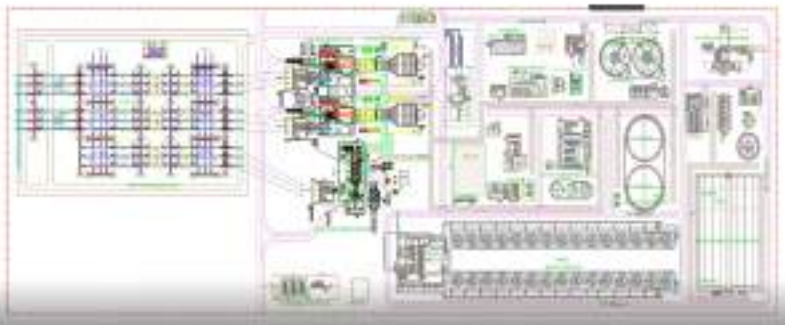
APPENDIX R-7–POWER POINT USED DURING CONSULTATION MEETINGS

ACWA POWER
UMUMIY QUVVATI 1500 MVT BO'LGAN
ACWA BUG' GAZ QURILMASI
MUSTAQIL ELEKTR STANTSIYASI
5 capitals
Juru Energy
zoom_0

LOYIHANING ASOSIY XUSUSIYATLARI

- **Yoqilg'i:** tabiiy gaz;
- **Quvvat bloki va uskunalar** - ushbu bosqichda elektr bloklariga 2 ta gaz turbinasi, 2 ta issiqlikni qaytaruvchi bug' generatori va 1 ta bug' turbinasi kiradi;
- **Elektrostantsiyaning samaradorligi** > 60% ni tashkil qiladi;
- **Sovutish tizimi** - yopiq pastadirli sovutish suvi tizimi va ochiq pastadirli sovutish tizimi;
- **Suv ta'minoti:** Barcha suv ta'minoti faqat Janubiy Mirzacho'l kanalidan amalga oshiriladi. Sovutish minorasining quyi oqimini, qozonning pasayishini va kondensatorning pasayishi oqimlarini demineralizatsiya tizim hamda bug'lanish hovuzi tufayli kanalga texnik suv qayta tashlanmaydi. Faqat tozalangan sanitariya va yomg'ir suvlari tashlanadi.

LOYIHANING NAZARDA TUTILGAN BOSH REJASI



Eslt: yakuniy tarzib holi tasdiqlanmagan va berilgan chizma o'zgartirilishi mumkin

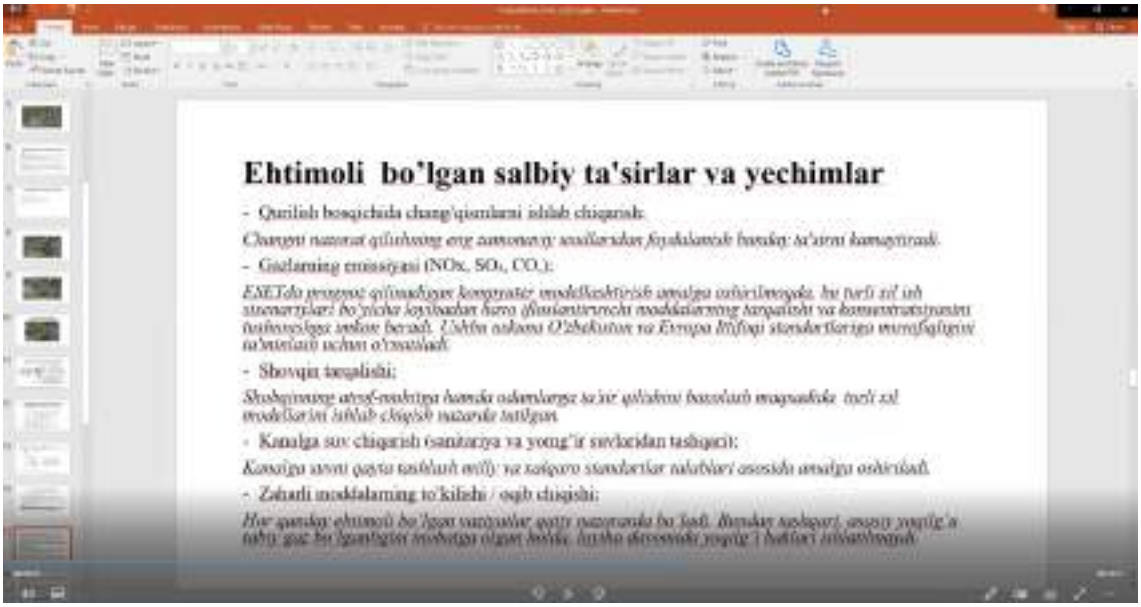
MAVJUD 500kV va 220kV ELEKTR TARMOQLAR

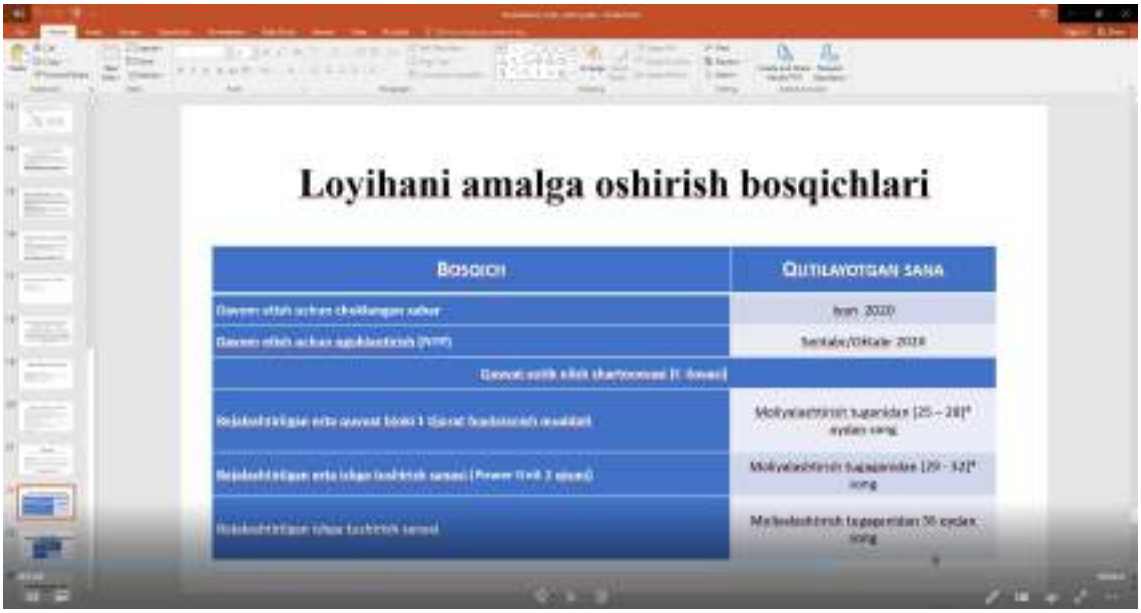
KUTILAYOTGAN IJOBIY TA'SIRLAR

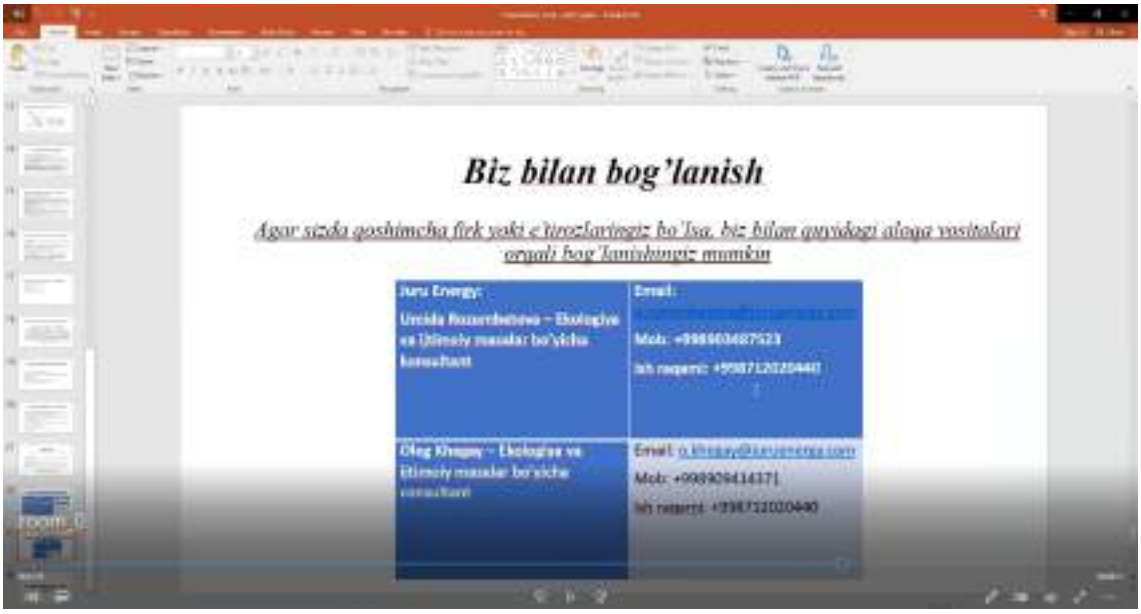
- Elektr energiyasini ishlab chiqarishni ko'paytirish;
- Ishga joylashish imkoniyatlari (loyihaning qurilishi va ishlashi jarayonida);
- Xalqaro, milliy va mintaqaviy ahamiyatga ega bo'lgan tabiiy hududlarga ta'sir ko'rsatilmaydi;
- O'simlik va hayvonot dunyosiga minimal darajada ta'sir qiladi, chunki ajratilgan yerlar qishloq xo'jaligi maqsadlarida foydalaniladi;
- Yuqori xavfsizlik va nazorat choralari tufayli tuproq va yer osti suvlarining ifloslanishi kutilmaydi;
- Havoning ifloslanishi pasayadi;

Havoga chiqariladigan gaz emissiyalarini nazorat qilish maqsadida eng yangi va xalqaro standartlarga javob beradigan texnologiyalar qo'llanilishi kutilmoqda. Gaz emissiyalar cheklovlari O'zbekistonning ekologik hamda xalqaro standartlar asosida nazorat qilinadi.

- Xavfli materiallar, chiqindilar va va shu kabi moddalarni saqlashni qat'iy nazorat qilish;
- Kunalga texnik xizmat tashkilotmaydi, tozalangan kanalizatsiya va yomg'ir suvlaridan tashqari.


Ehtimoli bo'lgan salbiy ta'sirlar va yechimlar
- Qurilish bosqichida chang'ganishni oldini chiqarish:
Changni namoyat qilishning eng zamonaviy usullaridan foydalanish hamda ta'sirni kamaytiradi.
- Gazlarning emissiyasi (NOx, SO2, CO2):
EIETda prognoz qilinadigan kompyuter modellashtirish amalga oshirilmoqda. Bir turli xil ish stsenariylari bo'yicha loyihadan havo ifloslantiruvchi moddalarning tarqalishi va konsentratsiyasini taxminlarga imkon beradi. Ushbu axborot O'zbekiston va Evropa Ittifoqi standartlariga muvofiqligini ta'minlash uchun o'rganiladi.
- Shovqin tarqalishi:
Shahrimizning atrof-muhitga hamda aholimizga ta'sir qilishini baxolash maqsadida turli xil modellarini ishlab chiqish nazarda tutilgan.
- Kanalga suv chiqarish sanitariya va yong'in suvlaridan tashqari:
Kanalga suvni qayta tozalash milliy va xalqaro standartlar talablari asosida amalga oshiriladi.
- Zaharli moddalarning to'kilishi / oqib chiqishi:
Har qanday ehtimoli bo'lgan vaziyatlar qayta nazoratda bo ladi. Bundan tashqari, asosiy yoqilg'a tabiiy gaz bo lganligini inobatga olgan holda, ko'zda ekvivalent yoqilg i hollari aniqlanmadi.


Loyihani amalga oshirish bosqichlari
Bosqich
Qo'llanilayotgan sana
Ravon o'tish uchun chidlangan zahar
Iyun 2020
Ravon o'tish uchun ajratilgan (NYP)
Sentabr/Oktabr 2020
Qayta ochik o'tish shartnomasi (t. davri)
Rejalashtirilgan erta qayta ishga tushirish muddati
Rejalashtirilgan erta ishga tushirish sanasi (Power Unit 2 qismi)
Rejalashtirilgan ishga tushirish sanasi


Biz bilan bog'lanish
Agar sizda qoshimcha fikr yoki e`tirozlaringiz bo`lsa, biz bilan quyidagi aloqa vositalari orqali bog`lanishingiz mumkin
Juru Energy:
Email:
Mob: +998903487523
Ish raqami: +998712020440
Oleg Kreppy – Ekologiya va ijtimoiy masalar bo'yicha
Email: o.kreppy@juruenergy.com
Mob: +998909414171
Ish raqami: +998712020440

APPENDIX R-8–CONSULTATIONS WITH FARMERS OVER THE PHONE

Summary of consultations with farmers

The land allocated for the construction of ACWA CCGT is located in Shirin town, which is currently used by farmers for cultivating agricultural crops. In period of January-February, 2020, administrations of Bayavut district and Shirin town terminated land lease agreements with farmers. According to the data collected from Syrdarya region administration, construction of ACWA CCGT will have an impact on the land of 10 farmers.

In order to assess the level of impact and potential future income losses of local farmers, to assist the EIA process undertaken by 5 Capitals, Juru Energy carried out consultations with 8 out of 10 farmers. It was impossible to contact 2 farmers as one of them do not use phone and mobile number of another farmer was switched off.

Due to the lockdown caused by COVID-19 pandemic, consultations were conducted via individual phone interviews. We collected personal information of farmers as well as details of their farms. At the beginning of the interview, farmers were informed that these consultations are absolutely voluntarily, and farmers are not obliged to answer to the proposed questions. Upon their consent, all farmers 8 were interviewed over phone calls, while the remaining 4 farmers asked for arranging an official meeting after the lockdown period ends.

Agenda for consultations was specifically designed to address issues related to:

- Land use (i.e., purposes of land use, timeline of land use, income from farming, etc.);
- Legal aspects, such as notification on the termination of land lease agreement, land valuation and compensation process, presence of agricultural crops on farms at the moment;
- Future plans for the affected farms following the loss of land;
- Existing sites that have cultural importance.

Consultations were performed between 22 April – 1 May, 2020. Duration of each phone call ranged from 20 to 45 minutes, during which farmers responded to 15 questions designed for the interview. All consultations were conducted in Uzbek language.

Land use

So far, Juru Energy has contacted and interviewed 8 farmers. The farmers are represented by middle-aged and elderly people. For further details please refer to Annex 1.

All interviewed farmers responded that the farming is the single source of their income. Furthermore, given the large size of their farms, farmers used to engage their relatives as well as their families for planting and growing crops. In average, there were at least 3 families which benefited from farming activities. Majority of the farmers mentioned lack of people in their families who can be considered as

vulnerable, except one farmer who mentioned that his daughter has II grade physical disability.

Regarding the total annual income from farming, the majority of interviewed farmers preferred not to disclose the income amount. However, they stated that the income received from farming is sufficient to cover all their daily expenses. Owners of two farms, Mavlon Eshbek and Mamurov Khamidjon, shared their income information, with stated average annual incomes of 278 million and 50 million Uzbek sums, respectively.

During the consultations, each farmer was asked to share the total size of the farm as well as the size of land that must be returned back to the reserve fund of local district administration. The detailed information is given in Annex 2. According to the collected data, 3 out of 8 farmers are obliged to return the whole farm land, while the other 5 farms – only part of it.

Farmers have been using these lands for cultivating agricultural crops for more than 5 years. For exact timeline please refer to Annex 2. If farmers move to another land, it will take at least 3-5 month cultivating vegetable crops, and 3-5 years for fruit trees.

Regarding the purpose of land use, all 8 farmers responded that until now the land has been used solely for agricultural crops. There are no records of land use for other purposes. At the moment 7 out of 8 farms are planted with crops, including vegetables (potato, wheat, tomato, cotton), fruit trees as well as decorative trees. Details of planted crops in farms is given in Annex 3. Some farmers provided photos of planted crops (attached in the report).

Farms are equipped with pathways for crossing the land and movement from one farm to another. In addition, there are no paved roads for transport. . Gas pipeline crosses the farm Joniqul.

Legal aspects

7 out of 8 farmers received neither written nor verbal notification about early termination of their land lease agreement. Only one farm owner (Mavlon Eshbek) confirmed receipt of written notification on December, 2019. On January, 2020, the administration of Bayavut district arranged a meeting with farmers to announce termination of land lease agreements, followed by issuance of formal order on land return.

Until now local administration has not yet performed the land valuation. As a result, compensation process has not started yet. Farmers are extremely worried about this, as the majority of them still have agricultural crops on the farms. In case compensation is not offered, farmers will be left at risk to lose the income for the next few months. During the calls, all farmers asked to inform them about when and how the compensation process will be performed.

None of the 8 farmers have yet been offered another plot of land to resume farming.

At the moment, all interviewed farmers stated their land was not under pending or ongoing legal action with other parties.

Future plans for the affected farms following the loss of land

Consultations also aimed to identify whether the farmers possess other qualifications or skills to continue working in another industry/sector following the loss of land. 3 out of 8 farmers had higher education diploma, yet they expressed their intention to invest compensation money into a different business. The remaining majority responded that they plan to resume farming on another land, because they don't see opportunities in other sectors.

Existing cultural sites

When asked "Are there known places of cultural/archaeological heritage on the Project site, specifically on your farm land?" all farmers responded that there are no sites on their farm that may present cultural importance.

Annex 1

Information about farmers

№	Farm	Farmer's name	Age/ nationality	Date and time of consultations	Method of consultation/ Contact details
1	"Mamurov Khamidjon"	Ma'murov Khamidjon Owner of the farm	43 Uzbek	22.05.2020 14:50- 15:30	Individual call/ +99899 470 45 08
2	"Usmon bobo avlodlari"	Radjabov Otamurod Owner of the farm	66 Uzbek	22.04.2020 16:35- 17:05	Individual call/ +99897 247 33 47
3	"Salimjon dalasi"	Usmonov Salimjon Owner of the farm	53 Tadjik	23.04.2020 17:00- 17:35	Individual call/ +99891 503 75 73
4	Mavlon Eshbek	Jahongir Xatamov Owner of the farm	40 Uzbek	29.04.2020 11:20- 11:45	Individual call/ +99890 106 15 27
5	Dilbar Davronova	Yoldashev Bakhtiyor Owner of the farm	65 Uzbek	30.04.2020 12:10 – 12:40	Individual call/ +99897 245 07 55
6	Isroilova Qutbiniso	Isroilova Qutbiniso Owner of the farm	60: Uzbek	25.04.2020 15:30-16:00	Individual call/ +99899484 52 18
7	Fayzullayev Tojikul	Fayzullayeva Norgul (manager of the farm)	62 Uzbek	23.04.2020 14:35 – 15:20	Individual call/ +99890 109 22 58
8	Joniqul	Qodirqul Rustam Owner of the farm	65 Uzbek	1.05.2020 11:10 – 11:45	Individual call/ +99893 329 10 82
9	Sportchilar	Did not respond			+99893 321 44 32
10	Asilbek sonmas orzulari	Does not use phone			

Annex 2

Information on land use period, total size of farm and size of returned land

№	Farm	Period of land use	Total size of farm land	Returned land
1	"Mamurov Khamidjon"	Since 2006	9 ha	9 ha
2	"Usmon bobo avlodlari"	Since 2010	34 ha	34 ha
3	"Salimjon dalasi"	Since 2015	12 ha	4 ha
4	Mavlon Eshbek	Since 2010	110 ha	8 ha
5	Dilbar Davronova	Since 2005	4 ha	4 ha
6	Isroilova Qutbiniso	Since 2006	11 ha	7 ha

7	Fayzullayev Tojikul	Since 2006	12,5 ha	6 ha
8	Joniqul	Since 2020	115 ha	10 ha

Annex 3

Information about existing crops on the farms

№	**Farm**	**Types and number of existing crops on land which is returned back to administration**
1	“Mamurov Khamidjon”	9 ha – 2600 fruit trees and vegetable crops
2	“Usmon bobo avlodlari”	34 ha – no crops
3	“Salimjon dalasi”	4 ha – 1920 fruit trees
4	Mavlon Eshbek	8 ha – planted with cotton
5	Dilbar Davronova	4 ha. On the 3 ha there are 70 of fruit trees, 1000 decorative trees, besides on the 1 ha there are some potato, tomato, and wheat crops
6	Isroilova Qutbiniso	7 ha – 700 of decorative trees, 1550 of fruit trees
7	Fayzullayev Tojikul	6 ha – 1500 of fruit trees
8	Joniqul	10 ha - wheat

Photos from farm “Isroilova Qutbiniso”

Photos from farm “Mamurov Khamdjon”

APPENDIX R-9–OFFICIAL RESPONSE TO GRIEVANCES RECEIVED

Ref №1		
1	**Фамилия Исм Шариф (агар мурожаатчи номаълум (аноним) бўлиш истагини билдирган бўлса кўрсатинг)**	**Ф.И.Ш. (агар мумкин бўлса):** Уринбаев Анваржон Рахмонқулович **Жинси:** Эркак **Ёши:** 51 **Манзил:** Жулангра маҳалласи, Боявут тумани, Сирдарё вилояти **Ишлаш жойи:** вақтинча ишсиз **Мен шахсий маълумотларимни кўрсатилишини истамайман:** -
2	**Алоқа маълумотлари (мурожаатга жавоб бериш усулини аниқлаш учун)**	**Уяли алоқа:** +998933795533 **Факс:** - **Email:** - **Бошқа (ёзинг):** +
3	**Мурожаатга қандай шаклда жавоб олиш**	**Телефон орқали:** + **Оғзаки жавоб:** - **Email:** - **Қабул қилди:** Умида Розумбетова
4	**Мурожаат мақсади**	**Шикоят қилиш:** - **Фикр/таклиф билдириш:** - **Маълумот сўраш:** + **Бошқа (ёзинг):** -
5	**Мурожаат қабул қилинган сана**	**Сана:** 09.09.2020 **Соати:** 18.30
6	**Мурожаат мазмуни**	Менинг исмим Анваржон Уринбоев Мен Жулангар маҳалласида истиқомат қиламан. Бизнинг маҳалламизда ишчилар сони кўп. Аҳоли билан ўтказилган учрашувларда Лойиҳа вакиллари қурилиш жараёнида ишга кириш имконияти бўлади деб таъкидлаганидилар. Мен 4 даражали темирчи (слесарь) ман. Олдин Сирдарё ИЭСда ишлаганман. Аммо, ИЭСда айлик маоши камлиги учун. Россия Федерациясида ишлаганман. Хозирги кунда иш изламяпман. Сизларга қуйдаги саволлар бўйича мурожаат қилмоқчи эдим: - Лойиҳани куриш жараёнида темирчи (слесарь) керак бўладими? - Қурилиш ишларини қачон бошланади?
7	**Мурожаат қабул қилинганлиги тўғрисида маълумот**	Ҳурматли Анваржон Уринбоев, Сизнинг мурожаатингиз қабул қилинди ҳамда кўриб чиқиш учун юборилди. Мурожаатингизга икки, ёки бир, ҳафта ичида жавоб йўлланади. Мурожаатингизга жавобни ёзма равишда олишингиз мумкин. Мурожаат бўйича хабарларни сизга ўз вақтида етказиб турамиз.

		Хамкорлигингиз учун миннатдорчилик билдирамиз. ***Ушбу хабарнома телефон орқали мурожаат эгасига Умида Розумбетова томонидан 2020 15 сентябрь куни етказилди.***
8	**Мурожаатга жавоб**	1. Шартли иш бошлаш Хабарномаси 2020 йил Октябрь ойга режалаштирилган. Иш бошлаш Хабарномаси эса камида бир ёки икки ой давомида эълон қилинади (Ноябрь/Декабрь) Пудратчи Лойиҳа учун зарур бўлган жадвални янгилаганидан кейин ушбу маълумотлар тасдиқланади. 2. Лойиҳа қурилиши давомида малакали ва малакаси йўқ ишчи куч талаб этилади. ACWA Power-га тақдим этилган ишчилар рўйхати Пудратчига ишчиларни малакаси ҳамда Лойиҳа талабларидан келиб чиққан ҳолда кўриб чиқиш учун тақдим қилинади.

Жавоб Ева Кимоно (5 Capitals) ***томонидан тайёрланди***

Сана: 16.09.2020

Жавоб Умида Розумбетова (Juru Energy) ***томонидан етказилди***

Сана: 17.09.2020

LONDON, UK
JURU ENERGY LIMITED
COMPANY No.

APPENDIX S- CONSULTATION LETTERS SUBMITTED TO THE MINISTRY OF HEALTH

Juru Energy

Suite 1, First Floor, 41 Chalton Street, London, NW1 1JD, UK
+44 207 859 4028
+44 207 691 9406
info@jurueenergy.com

№UZB-ACWA-CCGT-20/20/19

02.05.2020

Ministry of Health of the Republic of Uzbekistan

ACWA Power through “ACWA Power Sirdarya LLC (Tashkent)” has entered into a 25 year Power Purchase Agreement with JSC National Electric Networks of Uzbekistan for the development of a 1500MW gas fired Combined Cycle Gas Turbine (CCGT). The project will be located approximately 0.3km northeast of the city of Shirin opposite the existing 3000MW oil/gas Thermal Power Plant (Sirdarya TPP) (see Appendix 1).

According to the Uzbekistan law under the State Committee of the Republic of Uzbekistan for Ecology and Environmental Protection (regulator), ACWA Power is required to obtain an Environmental license before the commencement of the project. Therefore, as part of the Environmental Impact Assessment (EIA), ACWA Power’s corporate Environmental & Social Consultants ‘5 Capitals Environmental & Management Consulting’ (Dubai, UAE), have appointed Juru Energy (Tashkent, Uzbekistan) to conduct certain environmental & social surveys and data collection, including submission of the EIA to the regulator.

In particular, the project should address on sanitation and hygiene standards as required by the national legislation. The article 2.5 of the State Sanitary Rules SanPiN No. 0350-17 dated 25.10.2017 “On sanitary norms and rules for the protection of ambient air in residential areas of the Republic of Uzbekistan” requires establishment of a Sanitary Protection Zone (SPZ) for any industrial facility which is a potential source of air pollution. Chapter 6 of the Rules states that thermal power plants (TPP) with an equivalent electric capacity of 600 MW and above, operating on gas and gas-oil fuel are categorised as Class II with a preliminary SPZ size of 500m.

In order to comply with all SPZ requirements during project implementation, we seek your kind assistance to provide answers to the questions enclosed in Appendix No. 2.

Thank you very much for your assistance and we look forward to your response.

Yours Sincerely,

Director

For the further information please contact:

Umida Rozumbetova

Phone: +99871 202 04 40
Mob.: +99890 348 75 23

Appendix No. 1 to the letter № UZB-ACWA-CCGT-20/20/19 dated on 02.06.2020

Appendix No. 2 to the letter № UZB-ACWA-CCGT-20/20/19 dated on 02.06.2020

Questions:

1. As shown on the map in Appendix 1, the Project includes the construction of 500/220 kV switchgear. Should SPZ boundary account for the substation as well?
2. According to Chapter 6 of SanPiN No. 0350-17 Class II industrial facilities are required to establish a preliminary SPZ size of 500m. Can you please clarify and provide, if any, specific requirements and guidelines on the measurement of SPZ for Class II facilities?
3. Will farmers located in the SPZ territory be able to continue with their agricultural activities during the project operation?
4. If they can still be able to conduct agricultural activities in the SPZ what are the requirements that must be met by the project?
5. We welcome any additional comments in regards to the project and the application of the SPZ

Suite 1, First Floor, 41 Chalton Street, London, NW1 1JD, UK
+44 207 859 4028
+44 207 691 9406
info@juruenergy.com

№ UZB-ACWA-CCGT-20/20/27

17.06.2020

Директору Агентсва санитарно-эпидемиологического благополучия Министерства Здравоохранения Республики Узбекистан Б.И.Алматову

Уважаемый Бахром Ибрагимович!

Компания ACWA Power посредством ООО «ACWA Power Sirdarya» (Ташкент) заключила 25-летнее соглашение о покупке электроэнергии с АО «Национальные электрические сети Узбекистана» на разработку газовой турбины с комбинированным циклом мощностью 1500 МВт (ПГУ) Проект будет расположен примерно в 0,3 км к северо-востоку от города Ширин, напротив существующей теплоэлектростанции мощностью 3000 МВт (Сырдарьинская ТЭС).

Исходя из требований, установленных действующим законодательством. ACWA Power должна сдать в Государственный комитет Республики Узбекистан по экологии и охране окружающей среды (регулирующий орган) отчет об оценке воздействии на окружающую среду (ОВОС), и получить экологическую лицензию до начала проекта. Вследствие этого, в рамках ОВОС корпоративные экологические и социальные консультанты ACWA Power «5 Capitals Environmental & Management Consulting» (Дубай, ОАЭ) назначили Juru Energy (Ташкент, Узбекистан) для проведения необходимых экологических и социальных исследований. а также сбор данных, включая представление ОВОС регулирующему органу

В частности, проект должен учитывать санитарно-гигиенические стандарты. как того требует национальное законодательство. Статья 2.5 Государственных санитарных правил СанПиН № 0350-17 от 25 10.2017 г. «О санитарных нормах и правилах охраны атмосферного воздуха в жилых районах Республики Узбекистан» требует создания санитарно-защитной зоны (СЗЗ) для любого промышленного объекта, который является потенциальным источником загрязнения воздуха. Глава 6 гласит, что тепловые электростанции (ТЭС) с эквивалентной электрической мощностью 600 МВт и выше, работающие на газе, относятся к классу II с предварительным размером СЗЗ 500 м На данном этапе разработке Проекта утверждено предварительное расположение дымовых труб высотой 60 метров, которые являются основным источником загрязнения. Расположение дымовых труб может измениться в ходе строительства.

В связи с вышеизложенным. просим Вас дать заключение по данному вопросу.

Хушнуджон Рахимберганов

LONDON, UK
JURU ENERGY LIMITED
COMPANY No 9672085

Директор

Исполнитель. У.Розумбетова, Тел. +99871 202 01 40 Моб.. +99890 318 75 23

Приложение No. 1 к письму от 17.06.2020 № UZB-ACWA-CCGT-20/20/27

Источник	Координаты
Дымовая труба №1 (высота 60 метр)	40.235790° 69.111027°
Дымовая труба №2 (высота 60 метр)	40.235564° 69.111638°
Подстанция	40.241666° 69.116337°

Juru Energy

Приложение No. 2 к письму от 17,06,2020 № UZB-ACWA-CCGT-20/20/27

1. Как показано на карте в приложении 1, Проект включает в себя и постройку подстанции. Должна ли быть предусмотрена Санитарно -защитная зона и для территории подстанции?

2. Предусмотрены ли специальные требования при замерах установленных 500 метров для Санитарно - защитной зоны?

3. На территории, предусмотренной для СЗЗ расположены фермерские хозяйства. Смогут ли фермеры продолжать вести сельскохозяйственную деятельность в СЗЗ?

4. Если фермеры все еще могут вести сельскохозяйственную деятельность в СЗЗ, какие требования должны быть выполнены проектом?

5. Мы приветствуем любые дополнительные комментарии в отношении проекта и применения СЗЗ.

Juru Energy

Juru Energy

Suite 1, First Floor 41 Chalton Street, London NW1 1JD UK
+44 207 859 4028
+44 207 691 9406
info@jurueneregy.com

№UZB-ACWA-CCGT-20/20/26

16.06.2020

Сирдарё вилояти Боявут тумани Санитария-эпидемиология хизматига

Ҳабарингиз бор, ACWA Power компанияси (Дубаи, БАА) "ACWA Power Сирдарё" МЧЖ орқали умумий қуввати 1500 МВт бўлган бўғ газ қурилмасини қуриш мақсадида "Ўзбекистон Миллий электр тармоқлари" ОАЖ билан 25 йиллик шартнома тузди. Лойиҳага ажратилган ер майдони Сирдарё вилоятининг Ширин шаҳрида жойлашган (1-илова).

Амалдаги қонунчиликка биноан, ушбу лойиҳани куриш ишларидан олдин Ўзбекистон Республикаси Экология ва атроф мухитни муҳовафаза қилиш давлат қўмитаси томонидан лойиҳани амалга ошириш учун рухсатнома олиш лозим. Шунга мувофиқ, ҳалқаро ва миллий стандартларга асосан лойиҳанинг атроф муҳитга экологик ва ижтимой таъсирлари тўғрисида хисобот (ОВОС) тайёрлаш мақсадида ACWA Power компанияси ҳалқаро маслаҳатчи сифатида "5 Capitals атроф-муҳит ва менеджмент" бўйича консалтинг компанияси (Дубаи, БАА) ҳамда маҳаллий маслаҳатчиси сифатида "Juru Energy" (Тошкент, Ўзбекистон) компаниясини йўллаган.

Хусусан, 2017 йил 25 октябрдаги "СанПиН"нинг 0350-17-сонли Давлат санитария қоидаларининг 2.5 моддасида "Ўзбекистон Республикасининг турар-жой массивларида атроф-мухит хавосини мухофаза қилиш қоидаларига" асосан Санитария Мухофаза Зонаси (СМЗ) ташкил этиш талаби мавжуд.

Шу муносабат билан, Сиздан, умумий қуввати 1500 МВт бўлган бўғ-газ қурилмаси учун Санитария Мухофаза Зонасини ташкил этишда амалий ёрдам беришингизни сўраймиз.

Ҳурмат билан ,

Директор

Хушнуджон Рахимберганов

LONDON, UK
JURU ENERGY LIMITED
COMPANY No 9677085

Исфочи У Розумбетова

Тел: +99871 232 04 40
Моб: +99890 348 75 23

16.06.2020 даги №UZB-ACWA-CCGT-20/20/26- сонли хатга 1-Илова

Манба	Координатлар
Дымовая труба №1 (мури) (узунлиги 60 метр)	40 235790° 69 111027°
Дымовая труба №2 (узунлиги 60 метр)	40.235564° 69 111638°
Подстанция	40 241666° 69 116337°

Juru Energy

16.06.2020 даги №UZB-ACWA-CCGT-20/20/25- сонли хатга 2-Илова

Саволлар:

1. 1-иловада кўрсатилганидек, Лойиҳа доирасида 500/220 kV электр узатиш подстанциясини қуришни режалаштирилган. Санитар химоя зонаси ушбу подстанция учун ҳам ўлчаниши лозимми?

2. СанПин № 0350-17, 2 боби 6-бўлимига биноан саъноат объектлари олдидан 500 метр Санитар химоя зонаси ташкил этиш белгиланган. Ушбу Санитария химоя зонасини ўлчаш жараёни бўйича белгиланган кўрсатмаларни аниқлаб бера оласизми?

3. Санитария химоя зонаси ҳудудида жойпашган фермер хўжаликлар ўз фаолиятини давом этира оладиларми?

4. Агар фермерлик хўжаликлари ўз фаолиятини давом эттирса, улар қандай қоида ёки мажбуриятларга риоя қилиши керак бўлади?

5. Лойиҳа учун Санитария химоя зонасини белгилашда қўшимча ва таклифларингизни беришингизни сўраймиз

Juru Energy

Juru Energy Limited. Company No. 9577085 VAT No. GB 211079825 Address: Suite 1, First Floor, 41 Chalton Street, London, NW1 1JD, UK

O`ZBEKISTON RESPUBLIKASI
SOG`LIQNI SAQLASH VAZIRLIGI
HUZURIDAGI SANITARIYA-
EPIDEMIOLOGIK OSOYISHTALIK
AGENTLIGI

100097, Toshkent, Bunyodkorko`chasi,46-uy,
Telefon: 71 276-59-28. Fax:71 276-59-28
e-mail: kancelyariyaresdsenm@minzdrav.uz

AGENCY OF SANITARY AND
EPIDEMIOLOGICAL WELL-BEING
UNDER THE MINISTRY OF
HEALTH OF THE REPUBLIC OF
UZBEKISTAN

46, Bunyodkor str., Tashkent, 100097
Phone: 71 276-59-28. Fax: 71 276-59-28
e-mail: kancelyariyaresdsenm@minzdrav.uz

25.08.20 № 04-8/4809

_____ № _____ ga

Директору Кампании
«JURU ENERGY LIMITED»
Рахимберганову Хушнуджону

Агентство санитарно-эпидемиологического благополучия в соответствии с Вашим письмом за № UZB-ACWA-CCGT-20/20/27 от 17.06.2020 г. касательно санитарно-гигиенических стандартов по созданию санитано-защитных зон для промышленных предприятий, в соответствии с поставленными Вами вопросами, сообщает следующее.

В соотвествии с трбованиями СанПиН 0350-17 «По охране атмосферного воздуха населенных мест Республики Узбекистан» предприятия, учреждения, организации и др., независимо от форм собственности, вопросы создания и обеспечения санитарно-защитных зон должны предусматривать уже на стадии размещения, затем проектирования и затем уже в ходе строительства новых, реконструкции (техническом перевооружением) и при эксплуатации существующих предприятий, сооружений и других объектов, являющихся источниками загрязнения атмосферного воздуха. При этом, выбор площадки для строительства объектов осуществляется уже на стадии ТЭО (ТЭР).

В соотвествии с п.2.8 вышеназванного СанПиНа «Предприятия, их отдельные здания и сооружения с технологическими процессами, источниками выделений в атмосферу вредных и неприятно пахнущих веществ, а также являющихся источниками внешнего шума выше установленными нормами уровней для жилой застройки, не следует размещать с наветренной стороны для ветров преобладающего направления по отношению к жилой застройке.

Размещение предприятий с технологическими процессами, не выделяющими в атмосферу производственные вредности, с процессами, не создающими уровней внешнего шума и других вредных факторов, превышающих установленные нормы для жилой застройки, не требующих железнодорожных подъездных путей, допускается в пределах жилых районов.

Площадки для застройки предприятий должны выбираться с учетом аэроклиматической характеристики и рельефа местности, прямого солнечного облучения и естественного проветривания, а также с учетом условий рассеивания в атмосфере производственных выбросов и условий туманообразования».

В соотвествии с пунктами 2.16. «СЗЗ или какая-либо ее часть не могут рассматриваться как резервная территория предприятия и использоваться для расширения промышленной площадки».

Согласно п.2.17. В границах санитарно-защитной зоны и на территории промплощадок **запрещается размещать**:

- предприятия пищевой промышленности, а также по производству посуды, тары, оборудования т.д. для пищевой промышленности, склады готовой продукции, предприятия по производству воды и напитков для питьевых целей,
- комплексы водопроводных сооружений;
- оптовые склады продовольственного сырья и пищевых продуктов;
-жилые здания, детские дошкольные учреждения, другие образовательные учреждения;
- коллективные или индивидуальные дачные и садово-огородные участки;
-спортивные сооружения, парки, лечебно-профилактические и оздоровительные учреждения общего пользования.

Таким образом, по санитарно-гигиеническим требованиям ферерская деятельность не ограничена, однако, существуют еще и ветеринарно-санитарные требования. А значит Вам целесообразно по Вашим 3 и 4 вопросам получить дополнительные разъяснения у Вет.комитета.

По вопросу, касающемуся подстанции, то согласно п.3 примечания к п.6.2 класса III «Для электроподстанций размер санитарно-защитной зоны устанавливается в зависимости от типа (открытые, закрытые) и мощности на основании расчетов физического воздействия на атмосферный воздух, а также результатов натурных измерений».

Зам.директор **Б.И.Алматов**

Исп.:Миршина О.П.
Т-н:276-75-92

Unofficial translation

From: Agency of Sanitary and Epidemiological Wellbeing under the Ministry of Health of the Republic of Uzbekistan

25.08.20 №04-8/4809

To: Director "Juru Energy Ltd"

Khushnudjon Rakhimberganov

The Agency for Sanitary and Epidemiological Wellbeing in response to your letter No. UZB-ACWA-CCGT-20/20/27 dated June 17, 2020 regarding sanitary and hygienic standards for the establishment of Sanitary Protection Zones for industrial enterprises, would like to inform on followings.

In accordance with the requirements of SanPiN 0350-17 "For the protection of atmospheric air in populated areas of the Republic of Uzbekistan" enterprises, institutions, organizations, etc., regardless of the form of ownership, the establishment and provision of Sanitary Protection Zones should be provided at the stage of planning, then design and final establishment should take place then already during the construction of Project reconstruction (technical re-equipment) and during the operation of existing enterprises, structures and other objects that are sources of air pollution. At the same time, the selection of a site for the construction of facilities is carried out already at the stage of feasibility study.

In accordance with paragraph 2.8 of the above-mentioned SanPiN "Enterprises, their separate buildings and structures with technological processes, sources of emissions into the atmosphere, harmful and unpleasant smelling substances, as well as sources of external noise above the established norms for levels for residential buildings, should not be placed on the windward side for winds prevailing in relation to residential buildings.

The location of enterprises with technological processes that do not emit industrial hazards into the atmosphere, with processes that do not create levels of external noise and other harmful factors that exceed the established standards for residential buildings that do not require railway access roads, is allowed within residential areas.

The sites for the development of enterprises should be selected taking into account the climate conditions and terrain, direct solar irradiation and natural ventilation, as well as taking into account the conditions of dispersion in the atmosphere of industrial emissions and the conditions of fogging".

In accordance with paragraph 2.16. "The SPZ or any part of it cannot be considered as a reserve territory of the enterprise and used to expand the industrial site."

According to paragraph 2.17. It is prohibited to place within the boundaries of the sanitary protection zone and on the territory of industrial sites:

- food industry enterprises, containers, equipment, etc. for the food industry, warehouses for finished products, enterprises for the production of water and drinks for drinking purposes;

- complexes of water supply facilities;

- wholesalers of food raw materials and food products;

Unofficial translation
- residential buildings, preschool institutions, others

- educational institutions;

- collective or individual countryside houses and garden plots;

- sports facilities, parks, medical and preventive and health-improving institutions of general use.

Thus, according to sanitary and hygienic requirements, farming activities are not restricted, however, there are also veterinary and sanitary requirements. This means that it is advisable for you to get additional clarifications from the Veterinary Committee on your questions 3 and 4.

Regarding the switchgear, according to clause 3 of the note to paragraph 6.2 of class III "For electrical substations, the size of the sanitary protection zone is established depending on the type (open, closed) and capacity based on calculations of the physical impact on the atmospheric air, as well as the results full-scale measurements".

Signed by

Deputy director

B.I.Almatov

APPENDIX S-1–CONSULTATION LETTER SUBMITTED TO VETERINARY COMMITTEE & THEIR RESPONSE

ОБЩЕСТВО С ОГРАНИЧЕННОЙ ОТВЕТСТВЕННОСТЬЮ

JURU ENERGY CONSULTING

100077, Tashkent, M.Ulugbek region, Chust Street, house # 10.
TIN: 303454532, BIC: 00974 Bank: «Kapitalbank» A/N: 20208000600502375001

№UZB-ACWA-CCGT-20/20/43
03.09.2020

Государственный комитет ветеринарии Республики Узбекистан

Компания ACWA Power посредством ООО «ACWA Power Sirdarya» (Ташкент) заключила 25-летнее соглашение о покупке электроэнергии с АО «Национальные электрические сети Узбекистана» на разработку газовой турбины с комбинированным циклом мощностью 1500 МВт (ПГУ). Проект будет расположен примерно в 0,3 км к северо-востоку от города Ширин, напротив существующей теплоэлектростанции мощностью 3000 МВт (Сырдарьинская ТЭС). Территория, выделенная для Проекта, является сельскохозяйственной и в настоящий момент используется фермерами (приложение №1).

В соответствии с существующим законодательством, для реализации данного Проекта было получено положительное заключение Государственного Комитета по экологии и охране окружающей среды по Проекту Заявления о Воздействия на Окружающей Среды (ПЗВОС) 13 июля, 2020 года №01-01/10-08-969.

Помимо этого, Проект должен отвечать санитарно гигиеническим стандартам, а именно главе 2,5 СанПиН № 0350-17 от 25.10.2017 г. «О санитарных нормах и правилах охраны атмосферного воздуха в жилых районах Республики Узбекистан», требует создания санитарно-защитной зоны (СЗЗ) для любого промышленного объекта, который является потенциальным источником загрязнения воздуха. Глава 6 гласит, что тепловые электростанции (ТЭС) с эквивалентной электрической мощностью 600 МВт и выше, работающие на газе, относятся к классу II с предварительным размером СЗЗ 500 м.

Мы получили от мнение Агентства санитарно-эпидемиологического благополучия Министерства Здравоохранения Республики Узбекистан относительно данного вопроса 28 августа текущего года № 048/4809. Агентство утверждает, что согласно СанПиН № 0350-17 от 25.10.2017 г. «О санитарных нормах и правилах охраны атмосферного воздуха в жилых районах Республики Узбекистан» фермерская деятельность не запрещена в Санитарно защитной зоны. Однако, Агентство посоветовало учесть, ветеринарные и санитарные требования.

Учитывая вышеизложенное, просим Вас оказать содействие в получении информации на вопросы согласно приложению №2 к данному письму.

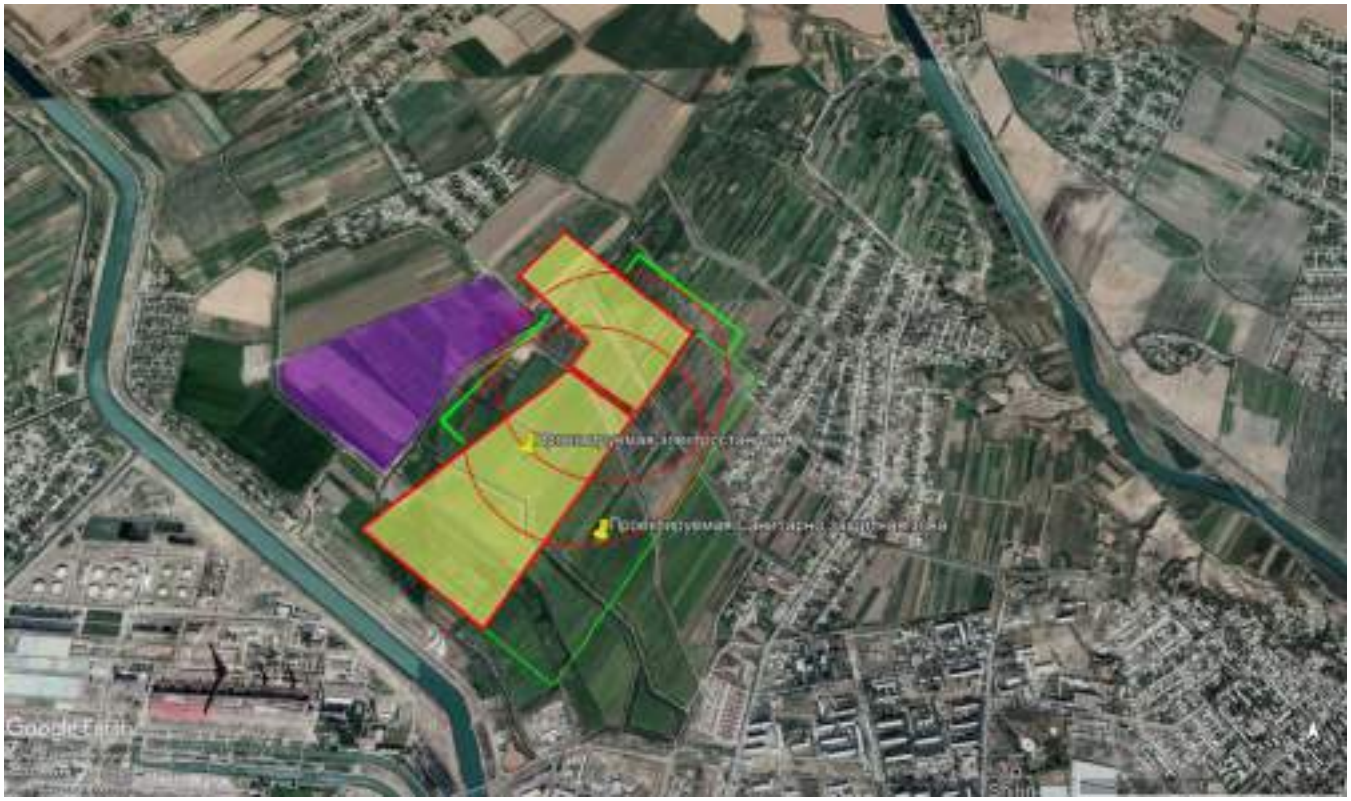
Выражаем свою благодарность за сотрудничество!

Джахангир Якубов

Директор

Исполнитель:
Гулчехра Нематуллаева
Тел: +99871 202 04 40
Моб: +99897 4459504

Приложение No.1
к письму № UZB-ACWA-CCGT-20/20/43 от 03.09.2020



Приложение No.2
к письму № UZB-ACWA-CCGT-20/20/43 от 03.09.2020

1. На данный момент предполагается, что в Санитарно Защитную Зону проекта войдут 4 участка земель местного военного отделения, а также 4 фермерских хозяйств. На данных участках земли выращивают сельскохозяйственные культуры, а также имеются фруктовые и декоративные деревья. Смогут ли фермеры, продолжать свою деятельность в Санитарно Защитной Зоне.
2. Если фермеры все еще могут вести сельскохозяйственную деятельность в СЗЗ, какие требования должны быть выполнены проектом?
3. Мы приветствуем любые дополнительные комментарии в отношении проекта и применения СЗЗ

Unofficial translation

O'ZBEKISTON RESPUBLIKASI
VETERINARIYA VA CHORVACHILIKNI
RIVOJLANTIRISH DAVLAT QO'MITASI
100123, Toshkent sh. Kichik halqa yo'li ko'chasi 21 a-uy,
Tel.: +998 71 202 12 00, e-mail: info@vetgov.uz
www.vetgov.uz

STATE COMMITTEE OF VETERINARY
AND LIVESTOCK DEVELOPMENT
OF THE REPUBLIC OF UZBEKISTAN
21a, Kichik khalka youli Str., Tashkent, 100123
Tel.: +998 71 202 12 00, e-mail: info@vetgov.uz
www.vetgov.uz

20 20 y. «11» 09 №03/19-101 «___» _____ 20___ г.

"JURU ENERGY CONSULTING"
масъулияти чекланган жамияти
(Тошкент ш., М.Улугбек тумани, Чуст кўчаси, 10-уй.)

Ветеринария ва чорвачиликни ривожлантириш давлат қўмитаси Сизнинг 2020 йил 3 сентябрдаги UZB-ACWA-CCGT-20/20/43-сон хатингизни ўрганиб чиқиб, қуйидагиларни маълум қилади.

Мурожаатингиздаги қайд этилган масалалар Ўзбекистон Республикасининг "Ветеринария тўғрисида"ги Қонунига мувофиқ давлат ветеринария хизматининг ваколатига кирмаслигини ҳамда "Жисмоний ва юридик шахсларнинг мурожаатлари тўғрисида"ги Қонунининг 25-моддасига мувофиқ тегишлилиги юзасидан муносабат билдириш учун мурожаатингизни Қишлоқ хўжалиги вазирлигига юборилганлигини маълум қиламиз.

Раис ўринбосари **А.Акбаров**

Unofficial translation

2020.11.09 №03-19-101

“JURU ENERGY CONSULTING” Ltd

(10A Chust Str., Mirzo Ulugbek district,Tashkent, Uzbekistan)

State Committee of Veterinary and Livestock Development having considered your letter No. UZB-ACWA-CCGT-20/20/43 dated September 3, 2020, informs the following.

Based on the Law of the Republic of Uzbekistan "On veterinary" we inform you that issues mentioned in your letter are not in the competence of the state Veterinary Committee. In accordance with article 25 of the law "On appeals of individuals and legal entities", we forwarded your appeal to the Ministry of Agriculture to obtain more detailed response.

Signed

Deputy chairman

A.Akbarov