Nur Bukhara Solar PV

Environmental & Social Impact Assessment:

Volume III - Technical Appendices

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Content:

Technical appendix 1:
Preliminary permit register

Preliminary Permit Register

Permit / Required Activity	Permit Title	Issuing Authority	Implementing Law	Responsible Party for Obtaining License
Pre-construction				
Construction activities	Construction Permit	Khokimiyats of Project region	• Resolution of the Oliy Majlis of the Republic of Uzbekistan "On the list of activities for which a license is required" No. 222-II of 12.05.2001; • Resolution of the Cabinet of the Republic of Uzbekistan No. 54 of 02/25/2013. Appendix 1 "Regulations on the procedure for granting land plots in populated areas for the implementation of urban planning activities of design and registration of construction objects, as well as the acceptance into operation of objects"	Masdar
Construction activities	The Positive Conclusion of SEE for the national EIA report (Stage I and/or Stage II)	MNR	• Law «On Nature Protection» (1992); • Law of the Republic of Uzbekistan "On Ecological Expertise" (2000); and • Regulations "On the State Environmental Expertise" (SEE), approved by the Resolution of Cabinet of Ministers No. 541 "On further improvement of the environmental impact assessment mechanism' (2020).	Masdar
Construction activities	Cultural Heritage Clearance	Ministry of Culture of Uzbekistan	• Law on the Protection and Use of Cultural Heritage Objects (2001)	Masdar
			-	

Permit / Required Activity	Permit Title	Issuing Authority	Implementing Law	Responsible Party for Obtaining License
Pre-construction activities	Ecological permits Permission of the MNR to obtain rare and endangered plant species listed in the Red Book of the Republic of Uzbekistan from the natural environment Approval of the Protocol of pre-construction surveys and relocation by MNR)	MNR	• Law «On Nature Protection» (1992); • Law "On the Protection and use of flora" No. 409 dated 21.09.2016 • Law "On the Protection and use of wildlife" No. 408 dated 19.09.2016	Masdar
Pre-commissioning				
Construction activities	The Positive Conclusion of SEE for the national EIA report (Stage III)	SCEEP	- Law «On Nature Protection» (1992); - Law of the Republic of Uzbekistan "On Ecological Expertise" (2000); and - Regulations "On the State Environmental Expertise" (SEE), approved by the Resolution of Cabinet of Ministers No. 541 "On further improvement of the environmental impact assessment mechanism' (2020).	EPC contractor

Technical appendix 2:
Canal Set back &Health Protection Zone national approvals;
National EIA positive conclusion

O'ZBEKISTON RESPUBLIKASI
SUV XO'JALIGI VAZIRLIGI
Amu-Buxoro mashina kanalidan foydalanish boshqarmasiga qarashli Amu-Buxoro mashina kanali Olot tuman boshqarmasi

МИНИСТЕРСТВО
ВОДНОГО ХОЗЯЙСТВА
РЕСПУБЛИКИ УЗБЕКИСТАН
Алатское районное управление
Аму-Бухарского машинного канала при
Управлении эксплуатации
Аму-Бухарского машинного канала

БУХОРО ВИЛОЯТ ОЛОТ ШАХРИ, ОЛОТ ШОХ КЎЧАСИ-172 УЙ
ТЕЛЕФОН/ФАКС 8 365 34-21-349. 34-21-305
Х/Р 10001086006204704240217000 2, МАРКАЗИЙ БАНК ТОШКЕНТ Ш.
ХКМ Ш.Б.Б. КОД:00014 ИНН:201365616 ХХТУТ:22100

№172 STREET OLOT CITY BUKARA REGION
TEL(FAX): 8 365 34-21-349. 34-21-305
THE BILL: 10001086006204704240217000 2, CENTRAL BANK TASHKENT CITI
CODE: 00014. NR: 201365616. CODE CAREER: 22100.

«19» 05 2023 й. № 76

"JURU Energy Consulting" МЧЖ директори Ж.Исмаиловга

Сизнинг 04.05.2023-йилдаги №GEC-OUT-23-164 сонли хатингизга жавобан шуни ёзиб маълум киламизки, тасарруфимиздаги Аму-Бухоро-1 ва Аму-Бухоро-2 насос станциялари сув чикариш каналлар магистрал канал хисобланиб, ушбу каналларнинг сув утказиш кобилияти 140-170 м3/секундни ташкил килади.

Сиз келтирган сабаб ва таклифларни урганиб чикиб куйидагиларни маълум киламиз.

Юкорида айтганимиздек ушбу каналлар магистрал каналлар булганлиги сабабли доимий равишда назорат килиниб тозалаш таъмирлаш-тиклаш ишлари олиб борилади.

Рахбарлигингиз остида курилаётган объект "Ахамият"ли объект хисобланиб келгусида курикланувчи объектлар сирасига киргандан сунг каналларнинг доимий равишда назорат килиниб, тозалаш таъмирлаш-тиклаш ишларини олиб боришда турли тускинликлар булмаслиги учун каналларнинг инспекторлик йулларни лойиха буйича ушлаб туриш ва зарар етказмаслик шарти билан каналнинг максимал сув сатхи(АБК-2 г.в. 234.5)да киргок отметкасидан 70 метр узокликда чегара худудини белгилашингизга рухсат берилади.

АБМК Олот туман бошкармаси:- **Ш.Б.Дурматов**

Баж.Ф.Атоков
Тел: 65 34-21-775

O‘ZBEKISTON RESPUBLIKASI
SOG‘LIQNI SAQLASH VAZIRLIGI HUZURIDAGI
SANITARIYA-EPIDEMIOLOGIK OSOYISHTALIK
VA JAMOAT SALOMATLIGI QO‘MITASI
SANITARY-EPIDEMIOLOGICAL WELFARE AND PUBLIC HEALTH COMMITTEE
UNDER THE MINISTRY OF HEALTH OF THE REPUBLIC OF UZBEKISTAN

100097, Toshkent shahri, Chilonzor tumani, Bunyodkor ko‘chasi, 46-uy
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2023 йил “28” июль
12/20-10432 - сон

“JURU ENERGY CONSULTING”
масъулияти чекланган жамият директори
Ж.Исмаиловга

Санитария-эпидемиологик осойишталик ва жамоат саломатлиги қўмитаси Сизнинг 2023 йил 27 июлдаги JEC-OUT-23-325-сон хатингиз бўйича қуйидагиларни маълум қилади.

“Юқори кучланишдаги электр узатиш тармоқлари яқинида яшовчи аҳолини ҳавфсизлигини таъминлаш бўйича санитария қоидалари ва меъёрлари тўғрисида”ги 0236-07-сон санитария қоидалари, нормалари ва гигиена нормативларининг 4.3-бандига мувофиқ, қуввати 250 MVt бўлган электр узатиш тармоқлари учун санитария-ҳимоя зонаси 250 метрда кам бўлмаслиги белгиланганлигини билдирамиз.

Бошлиқ ўринбосари **Н.Атабеков**

Ижрочи: Ж.Туйчиев
Тел.: +99878 888 01 01 (025)
ID: 476127
Сана: 28.07.2023

Berilgan xulosa reestrda ko‘rinmasa haqiqiy hisoblanmaydi

O‘ZBEKISTON RESPUBLIKASI EKOLOGIYA, ATROF-MUHITNI MUHOFAZA QILISH VA IQLIM O‘ZGARISHI VAZIRLIGI
DAVLAT EKOLOGIK EKSPERTIZASI MARKAZI

100170, Toshkent shahri, Mirzo Ulug`bek tumani, Sayram ko`chasi, 15-uy. Tel: 71-203-00-22.
Veb-sahifa: https://www.ecoekspertiza.uz, elektron pochta: info@ecoekspertiza.uz

DAVLAT EKOLOGIK EKSPERTIZASI XULOSASI

TARTIB RAQAM : 04-01/11-08-1570

HUJJAT TURI : Atrof-muhitga ta'sir to'g'risidagi ariza

Davlat ekologik ekspertizasi buyurtmachisi: JURU ENERGY CONSULTING **ga berildi.**
STIR: 303454532
Davlat ekologik ekspertizasi obyekti: Buxoro viloyati Olot tumani **da joylashgan**
Loyiha ishlab chiquvchi nomi: OOO "JURU ENERGY CONSULTING"
STIR: 303454532
Davlat ekologik ekspertizasi mas’ul eksperti: Tusheva Larisa Gennadyevna

O‘zbekiston Respublikasi Vazirlar Mahkamasining 2020-yil 7-sentabrdagi 541-son qarori bilan tasdiqlangan 1-ilovaga muvofiq, ushbu davlat ekologik ekspertizasi obyekti **atrof-muhitga ta’sir ko‘rsatishning 2-Toifa bandiga mansub.**

O‘tkazilgan davlat ekologik ekspertizasi natijasi: **Ijobiy xulosa**

Davlat ekologik ekspertizasi xulosasining matnli ilovasi: varaqda

Davlat ekologik ekspertizasi xulosasi:

Berilgan sana : 22.08.2023

Amal qilish muddati : 21.08.2026

Ekologik ekspertiza obyektining ekologik talablarga muvofiqligi, joylashuv nuqtalari koordinatalari, atrof-muhitni muhofaza qilish chora-tadbirlari, bajarilishi shart bo‘lgan talablar va boshqalar to‘g‘risida ilovada keltirilgan O‘zbekiston Respublikasi ekologiya, atrof-muhitni muhofaza qilish va iqlim o‘zgarishi vazirligining Davlat ekologik ekspertiza markazi va filiallarining ekspert xulosasi ushbu davlat ekologik ekspertizasi xulosasining ***ajralmas qismi hamda unda belgilangan talablar*** *bajarilishi shart hisoblanadi.*

Izoh: Buyurtmachi tomonidan davlat ekologik ekspertizasi xulosasida nazarda tutilgan ekologik talablarga rioya etilmaganda, davlat ekologik ekspertizasi xulosasi qonunchilikda belgilangan tartibda bekor qilinadi.

Bosh direktor
G.A.Muxamedov

Номер специальной формы :

Давлат экологик экспертизаси хулосасига илова

Berilgan xulosa reestrda ko'rinmasa haqiqiy hisoblanmaydi

Государственная экологическая экспертиза
Экспертное заключение

Объект:	Оценка воздействия на окружающую среду строительства солнечной фотоэлектростанции «Нур Бухара Салар» мощностью 250 МВт с сопутствующей аккумуляторной системой накопления энергии (BESS) в Алатском районе Бухарской
Заказчик:	ООО "JURU ENERGY CONSULTING"
ИНН	303454532
Категория	1 категория 32 пункт, ПКМ РУз № 541 от 07.09.2020 г.)
Разработчик:	ООО "JURU ENERGY CONSULTING"
Эксперт:	Tusheva Larisa Gennadyevna

Генеральному директору ООО «JURU ENERGY CONSULTING» ИСМАИЛОВУ Ж.Ш.

копия: Управлению экологии, охраны окружающей среды и изменения климата Бухарской области

На государственную экологическую экспертизу представлены материалы второго этапа оценки воздействия на окружающую среду строительства солнечной фотоэлектростанции «Нур Бухара Салар» (СФЭС) мощностью 250 МВт с сопутствующей аккумуляторной системой накопления энергии (BESS) в Алатском районе Бухарской области.

Материалы ЗВОС (II этап) разработаны на основании анализа результатов и рекомендаций заключения Государственной экологической экспертизы на проект ЗВОС № 04-01/11-08-1066 от 06.06.2023 г..

Выполнение *второго этапа* экологического сопровождения проекта строительства солнечной фотоэлектростанции «Нур Бухара Салар» – Заявления о воздействии на окружающую среду, было вызвано необходимостью проведения дополнительных изысканий, связанных с отсутствием аргументированных мероприятий по предотвращению необратимых негативных последствий воздействия на окружающую среду и здоровье граждан при проведении строительства.

В материалах проекта ЗВОС отсутствовали:

- гидрогеологическое заключение района расположения проектируемого объекта;
- мероприятия по сохранению биоразнообразия (растительности, птиц, рептилий,

млекопитающих и рыб), включенных в международный Красный список МСОП

и в Красную книгу Узбекистана;

- не представлен анализ характера перелёта и местообитания местных и перелётных птиц и соответствующие мероприятия;
- не определена санитарно-защитная зона объекта строительства;
- не представлена технология сухой очистки солнечных панелей и др.

Основанием для реализации строительства солнечной фотоэлектростанции (ФЭС) «Нур Бухара Салар» являются: Постановление Министерства энергетики Республики Узбекистан № 03-28-147 от 09.01.2023 г.; соглашение о закупке электроэнергии между иностранным предприятием ООО «NUR BUKHARA SOLAR PV» и АО «Национальные электрические сети Узбекистана»; Закон Республики Узбекистан «Об использовании возобновляемых источников энергии» №ЗРУ-539 21.05.2019 г. и др.

Площадь строительства составит 668 га, площадь размещения аккумуляторов (BESS) – 3,66 га.

Проектная территория расположена в юго-западной части пустыни Кызылкум (пустыня Сундукли). На севере проходит автомобильная дорога R78. Рассматриваемый участок граничит с двумя крупными оросительными каналами с севера, востока и юга - Аму-Бухарской ирригационной системой (АБИС). Расстояние до канала составляет от 70 м до 250 м. Представлена справка Министерства водного хозяйства Республики Узбекистан № 76 от 19.05.2023 г., согласно которой водоохранная зона канала составляет
70 м. К западу на расстоянии 1 км расположен заболоченный водоем, образованный поступлением воды из дренажного канала. На участке имеются остатки демонтированных опор, оставшихся от ЛЭП, которая пересекала участок в центральной его части.

Согласно представленной справке АО «O`ZTRANSGAZ» №47-01-22/544 от 17.04.2023 г., и справке ООО «HUDUDGAZ BUXORO» GAZ TA'MINOTI FILIALI № 30-02-15-226/1860 от 11.04.2023 г., подземные и наземные газопроводы на проектируемой территории отсутствуют.

Ближайшая жилые постройки пос.Кирлишон, расположены с северо-западной стороны от рассматриваемого участка на расстоянии 10 км; пос.Кулчовлар – в 11 км. Шесть домохозяйств, которые считаются частью пос. Кирлишон, расположены в 400 м к северу от участка ФЭС. Согласно представленному письму Службы санитарно-эпидемиологического благополучия и общественного здоровья Министерства здравоохранения Республики Узбекистан № 12/20-10432 от 28.07.2023 г., размер санитарно-защитной зоны (СЗЗ) для ФЭС проектной мощностью 250 МВт составляет 250 м.

В соответствии с требованиями «Положения о порядке проведения общественных слушаний проектов оценки воздействия на окружающую среду», приложение № 3 к постановлению Кабинета Министров № 541 от 07.09.2020 г., до начала строительства ФЭС ООО «JURU ENERGY CONSULTING» было проведено общественное слушание при участии заинтересованных сторон: жителей пос. Кирлишон и пос.Кулчовдур, инспектора по контролю в сфере экологии и охраны окружающей среды Алатского района Бухарской области, представителя хокимиата Алатского района, где жителей близлежащих домов ознакомили с основными направлениями, целями и возможными экологическими последствиями строительства ФЭС. В результате проведения общественного слушания было принято решение об общественной поддержке намечаемой деятельности на рассматриваемой территории (представлен протокол и фотоматериалы от 18.04.2023 г.).

Особенности окружающей среды в районе расположения участка

Анализ климатических характеристик рассматриваемого района показал, что высокие температуры в теплое время года, засушливость района и песчаные почвы указывает на предрасположенность участка строительства к пылеобразованию. При этом, часто повторяющиеся слабые ветры не способствуют переносу пыли на далекие расстояния от места проведения работ.

Согласно представленному гидрогеологическому заключению от 04.08.2023 г., в геологическом отношении участок сложен из супеси и суглинков, подстилаемых кварцевыми песками эолового происхождения. Согласно представленной справке Министерства горнодобывающей промышленности и геологии Республики Узбекистан №03-1250 от 11.05.2023 г., в радиусе 500 м от границ проектируемого объекта работы по добыче полезных ископаемых не проводятся.

Временные водотоки, колодцы на проектной территории отсутствуют. Грунтовые воды залегают по территории СФЭС на глубине 2,5 - 3,5 м с амплитудой колебания 0,5-1,0 м. На расстоянии 8 км от проектируемой ФЭС находится озеро Денгизкуль, которое является охраняемой природной территорией, где расположен орнитологический государственный заказник.

Проектная территория представляет собой ландшафт с мелкобугристыми и грядово-бугристыми закрепленными и полузакрепленными песками с типичной псаммофильной кустарниковой растительностью. В настоящее время территория проектируемой ФЭС используется в качестве пастбища ООО «OLOT QORAKO'LCHILIK» (письмо Комитета по развитию шелково-шерстяной промышленности при Министерстве сельского хозяйства Республики Узбекистан №1-1/319 от 15.05.2013 г.).

В зоне строительства ФЭС было выделено 18 видов растений, птиц и животных, из которых 15 видов включены в международный Красный список и 18 видов в Красную книгу Республики Узбекистан.

Согласно представленной справке инспекции по контролю в сфере экологии и охраны окружающей среды Алатского района Бухарской области на рассматриваемой территории произрастают саксаул 1140000 ед., черкез – 382800 ед. Следует отметить, что при зачистке растительного покрова на площади 668 га будет затронут комплекс псаммофильных кустарников, а также редкие виды растений, в частности кандым мягкий и кандым Маттея. С целью снижения негативного воздействия при проведении строительных работ на состояние флоры проектной территории предусматривается провести сбор и релокацию семян редких видов кандымов в подходящие места произрастания. В соответствии с требованиями ст.17 Закона Республики Узбекистан «Об охране и использовании растительного мира» №ЗРУ-409 от 21.09.2016 г., **действия (бездействие), которые могут привести к сокращению численности или нарушению среды произрастания редких и находящихся под угрозой исчезновения видов дикорастущих растений, не допускаются.**

Пустынными видами животных, включенных в Красную книгу Республики Узбекистана являются серый варан, песчаный удавчик, длинноиглый еж, среднеазиатская (степная) черепаха. Согласно ст. 24, 27 Закона Республики Узбекистан **«Об охране и использовании животного мира»** № ЗРУ-408 от 19.09.2016 г., основными требованиями по охране и использованию животного мира и среды его обитания являются: сохранение видового разнообразия и целостности сообществ и популяций диких животных в состоянии естественной свободы; сохранение среды обитания, мест размножения и путей миграции животных и др. При размещении, проектировании и строительстве предприятий, транспортных магистралей, линий электропередач и связи и других объектов, совершенствовании существующих и внедрении новых технологических процессов, **должны предусматриваться и осуществляться мероприятия по сохранению среды обитания, мест размножения и путей миграции диких животных, а также обеспечиваться неприкосновенность участков, представляющих особую ценность в качестве среды обитания диких животных.**

Согласно исследованиям, проведенным в апреле 2023 г., на проектной территории на песчаниках с кустарниковой растительностью гнездятся следующие виды птиц: пустынный сорокопут, пустынная славка, буланый вьюрок, скотоцерка, хохлатый жаворонок. В прибрежной растительности (деревья и кустарники) вдоль АБИС гнездятся туркестанский тювик (Accipiter badius), бухарская синица.

Расположенные к западу от участка два небольших водоема, образованные поступлением воды из дренажного канала, представляют собой характерные солончаковые водно-болотные местообитания, поросшие тростниковыми зарослями и тамариксами, где обитают варакушка, тугайный соловей, камышовая овсянка.

Наиболее чувствительными видами птиц, на которые сказывается негативное воздействие проектируемого строительства, являются гнездящиеся виды, которые могут потерять гнездовую территорию. В ходе анализа самыми чувствительными были признаны дрофа-красотка мраморный чирок и савка. Исследования гнездования дрофы-красотки, проведенные в апреле 2023 года, не выявили гнездования на проектируемой территории. Это связано это с тем, что дрофа-красотка предпочитает открытые местообитания или сочетания открытых местообитаний с кустарниками. В связи с тем, что проектная территория преимущественно покрыта кустарниками, для гнездования дрофа-красотки рассматриваемая территория не подходит. Полевые исследования небольших водоемов, расположенных к западу от проектной территории, не подтвердили присутствия чирка и савки.

Земельный участок, на котором планируется построить ФЭС «Нур Бухара Солар» не входит в зону охраняемых природных территорий (справка Министерства экологии, охраны окружающей среды и изменения климата Республики Узбекистан №03-02/5-3473 от 03.08.2023 г.), при этом следует отметить, что в юго-западной, южной и северо-западной стороне от проектируемого участка расположено Алатское государственное лесное хозяйство. **В соответствии с требованиями ст. 37,50,51 Закона «О лесе»**
№ ЗРУ-475 от 16.04.2018 г., рубка древесных и кустарниковых насаждений на участках государственного лесного фонда при строительстве зданий, сооружений и коммуникаций, не вызванная производственно-технической необходимостью, **запрещается.**

Характеристика намечаемой деятельности

Основной вид деятельности планируемой СФЭС заключается в прямом преобразовании солнечного излучения в электрическую энергию и распределение полученной электроэнергии непосредственно в электросети района. Предполагаемый объём выработки электроэнергии при мощности СФЭС 250 МВт составляет до 372,7 млн. кВт.ч. в год.

Принцип работы солнечной ФЭС основан на фотоэлектрическом эффекте. Фотоэлектрический элемент (он же солнечный элемент) использует технологию преобразования солнечной энергии непосредственно в электричество.

Проектируемая фотоэлектрическая солнечная установка производит электрическую энергию из падающего солнечного излучения на фотоэлектрические панели, установленные на трекерах. Благодаря фотоэлектрическим инверторам постоянный ток будет преобразован в переменный, а трансформаторы (расположенные на электростанциях) повысят напряжение с низкого напряжения (НН) до среднего напряжения (СН). Затем выработанная энергия будет проведена через подземную сеть среднего напряжения (СН) 35 кВ на подстанцию 35/220 кВ. Проектом приняты струнные инверторы модели Sungrow SG320HX. Инверторы оснащены системой управления, позволяющей полностью автоматизировать работу ФЭС: отслеживание точки максимальной мощности (MPP), характеристики генерируемого сигнала, защита взаимосвязи максимальной и минимальной частоты.

В свою очередь проектная подстанция будет подключена к существующей OHTL "Karaku'l 500 SS" - "Hamza-2 SS". Системы хранения энергии с аккумуляторами (BESS) помогают справляться с неустойчивостью солнечной энергии и обеспечивают быстрый отклик системы питания на крупные колебания спроса, делая сеть более отзывчивой и снижая необходимость в строительстве резервных электростанций.

Основное экологическое преимущество реализации проекта - отсутствие выбросов загрязняющих веществ в атмосферу в процессе преобразования энергии солнца
в электрическую энергию.

Территория вокруг оборудования будет освобождаться от растительности и отделяться гравием с целью обеспечения пожарной безопасности. При строительстве СФЭС влияние на почвенный покров будет проявляться в нарушении структуры при рытье траншеи, котлованов, при механическом воздействии дорожно-строительной техник. Прокладке инженерных коммуникаций предшествует снятие 30 см плодородного слоя почвы и складирование его на площадке, не занятой под строительством. После завершения строительно-монтажных работ предусмотрено восстановление нарушенных земель в пределах рассматриваемого участка, благоустройство территории и озеленение участка.

Проектом предусмотрена дренажная система, позволяющая отводить дождевую воду за пределы фотоэлектрической установки. Дренажная система состоит из дренажной сети по периметру и еще одной внутренней дренажной сети в форме канавы на стороне внутренних дорог, где собирается сточная вода.

Проектом предусмотрено использование новых технологий автономной системы сухой очистки панелей (Automatic Robot Cleaning System) с использованием фотоэлектрического робота с автономной системой электропитания и системой управления.

Проектом предусмотрена автоматизированная система мониторинга.

В период проведения строительных работ на территории площадки будет работать 270 человек, из них 248 - рабочих и 22 - ИТР. Время поведения строительных работ 255 дней, по 8 часов в смену. Срок продолжительности строительства 19 месяцев.

Планируемая численность работающих при эксплуатации ФЭС составит 28 человек, в том числе: 3 – ИТР, 25 – рабочие. Режим работы ФЭС на период эксплуатации – круглогодичный.

Анализ воздействия намечаемой деятельности на окружающую среду

Основными источниками воздействия на окружающую среду *в период строительства* будут: строительная техника (экскаватор – 3 ед., автокран – 3 ед., автомобили бортовые – 2 ед., бульдозер – 1 ед., автосамосвал – 1 ед., каток дорожный - 1 ед., планировщик ГР180 – 1 ед., автопогрузчик – 1 ед., бетоновоз – 1 ед., сваебоечная машина - 1 ед., поливомоечная машина - 1 ед.).

Выброс загрязняющих веществ 7 наименований от 5 неорганизованных источников выбросов *в период строительства* составит 0,8432 т. Наибольший вклад в загрязнение атмосферного воздуха будет вносить оксид углерода (64,01%). Воздействие на атмосферный воздух загрязняющих веществ в период строительства будет иметь временный характер, максимальные концентрации загрязняющих веществ в приземном слое атмосферы по всем ингредиентам не превысят установленных квот.

Основными источниками воздействия на окружающую среду *в период эксплуатации* ФЭС будут: резервуар с дизельным топливом для работы аварийного дизель-генератора, силовые трансформаторы.

В соответствии с представленными материалами, *в период эксплуатации СФЭС* общий выброс загрязняющих веществ 2 наименований составит – 0,0017 т/год, в том числе: пары масла – 0,0017 т/год (99,99%), углеводороды (при хранении дизтоплива) 0,000001т/год (0,01%).

Анализ расчетов максимальных приземных концентраций загрязняющих веществ за пределами промплощадки не выявил превышения установленных норм (квот); по всем веществам концентрации не превысят 0,1 ПДК.

В период строительства будет использоваться вода на производственные нужды (полив территории с целью снижения пыления), хозбытовые нужды (питьевые). Источником водоснабжения на производственные нужды и хозбытовые нужды запланирована привозная вода из скважины и из ближайшего водовода.
При использовании воды на хозяйственно-питьевые нужды, необходимо обеспечить гигиенические требования к питьевой воде и контроль качества в соответствии
с O`zDst №950:2011 - Государственный стандарт Узбекистана – вода питьевая.

Общее водопотребление в период строительства СФЭС составит: 20713,75 м3/год, в том числе: на производственные нужды – 29089,5 м3/год; на хозбытовые нужды
1621,25 м3/год.

Производственные стоки отсутствуют. Сброс образующихся хозбытовых сточных вод объемом 1621,25 м3/год, планируется во временно установленный накопитель (септик) с последующим вывозом на ближайшие очистные сооружения.

Воздействие в период строительных работ имеет локальный и кратковременный характер.

В период эксплуатации объекта предусматривается использование воды на производственные и хозбытовые нужды и образование производственных сточных вод.

Источником водоснабжения при эксплуатации *СФЭС* является вода из проектируемой артезианской скважины.

Общее водопотребление в период эксплуатации *СФЭС* составит 1549,27 м³/год, в том числе: на хозяйственно-бытовые (питьевые нужды, душевые, влажная уборки помещений, нужды столовой) – 1284,07 м3/год, полив территории и зеленых насаждений - 265,2 м3/год.

На производственные нужды вода не используется. Безвозвратные потери (полив территории и зеленых насаждений) составляют 265,2 м3/год.

Общее водоотведение хозяйственно-бытовых стоков при эксплуатации СФЭС составит 1284,07 м3/год. Сброс хозбытовых стоков запланирован в выгребную гидроизолированную яму с последующим вывозом на ближайшие очистные сооружения.

Для сбора и водоотведения ливневых и талых вод с территории объекта проектом предусматривается система лотков и отстойника для осаждения ила с последующим использованием воды на полив территории.

В период *проведения строительства* будут образовываться отходы *IV и V класса опасности*, такие, как отходы бетона и железобетона; отходы песка и щебня; бой строительного кирпича; отходы сварочных электродов; тара из-под краски; загрязненный обтирочный материал (содержание масла менее 15%); строительный мусор; ТБО. Определены места складирования и способы утилизации.

В период эксплуатации объекта предусмотрено образование 15 видов отходов
в количестве 2483,2055 т/год, в том числе:

- *II класса опасности:* отработанное трансформаторное масло – 0,35 т/год, отработанные фотопанели – 652,984 т/год, подлежат сдаче на утилизацию специализированным предприятиям; отработанные аккумуляторы – 0,72 т/год, подлежат сдаче на переработку во «Вторчермет»;

- *III класса опасности*: отработанные автошины – 1,1 т/год, планируют сдавать на предприятия по переработке резины; лом цветных металлов – 0,2 т/год, подлежат сдаче на переработку во «Вторчермет»; отход пыли неорганической (в процессе очистки солнечных панелей методом продувки) – 1796,732 т/год; планируют вывозить в отработанные карьеры;

- *IV класса опасности:* загрязненный обтирочный материал (содержание масла менее 15%) – 0,05 т/год, отработанный силикагель – 0,035 т/год, твердые бытовые отходы (ТБО) – 0,75 т/год, мусор от уборки территории – 26,25 т/год подлежат вывозу на полигон ТБО; ил из отстойника - 2,31 т/год, планируют использовать при благоустройстве зеленой зоны промплощадки.

- *V класса опасности:* лом черного металла – 0,5 т/год, отходы сварочных электродов - 0,008 т/год, подлежат сдаче на переработку во «Вторчермет»; отработанные светодиодные лампы – 0,0265 т/год, планируют передавать на переработку специализированным предприятиям; макулатура - 0,035 т/год, подлежит сдаче в пункты приема вторсырья для переработки; пищевые отходы – 1,155 т/год планируют вывозить на корм скоту.

Воздействие на почвы и грунты в результате складирования отходов за пределами площадки не прогнозируется.

В материалах ЗВОС представлен анализ аварийной ситуации *в период строительства,* которая может возникнуть при проливе ГСМ от неисправной техники.
С целью предотвращения пролива ГСМ на незащищенные грунты, предусмотрено размещение и заправка техники на гидроизолированной площадке
с бетонированным зумпфом по периметру площадки.

В период функционирования СФЭС в материалах ЗВОС представлен анализ аварийных ситуаций, связанных с возникновением пожара на трансформаторе.
В результате пожара концентрации загрязняющих веществ на границе промплощадки превысят установленные нормы (квоты). Для предотвращения пожара проектом предусмотрены противопожарные мероприятия: установка пожарной сигнализации, системы противопожарного водоснабжения, противопожарные резервуары – 2 ед. и др.

Согласно представленным материалам, аварийные риски на фотоэлектрической станции мощностью 250 МВт на территории Алатского района Бухарской области после реализации проекта минимизированы, благодаря применению современной автоматизированной системы управления и контроля за процессом производства электрической энергии.

Проектом ЗВОС предлагается комплекс мероприятий, направленных на предотвращение загрязнения окружающей среды *на этапе строительства,* включающих: техническую рекультивацию нарушенных земель; исключение движения техники вне подъездных путей; использование оборудования с низким уровнем шума/вибрации; исключение проливов нефтепродуктов и др.

На этапе эксплуатации ФЭС предусматривается: исключение загрязнения грунтов и подземных вод в результате отсутствия сброса сточных вод на рельеф местности; установка улучшенной системы автоматики для слежения за производственным процессом, оснащение средствами пожарной сигнализации; организация бетонированной площадки для размещения на ней контейнеров для сбора отходов и их своевременный вывоз на ближайший полигон с целью исключения загрязнение почвенного и растительного покрова.

Выводы

Основными видами воздействия на окружающую среду при строительстве солнечной фотоэлектростанции «Нур Бухара Салар» мощностью 250 МВт с сопутствующей аккумуляторной системой накопления энергии (BESS) в Алатском районе Бухарской области являются: изъятие природных ресурсов (земельных, водных); загрязнение воздушного бассейна выбросами газообразных и взвешенных веществ; изменение рельефа территории; загрязнение территории землеотвода образующимися отходами и сточными водами.

Анализ характера воздействия работ показал, что масштабы существенного нарушения рельефа и недр обусловлены размерами площади строительно-монтажных работ, включающих расчистку строительной площадки, планировку рельефа, устройство подъездных дорог и т.д.

В соответствии с требованиями п.23 а), гл. 3 «Положения о государственной экологической экспертизе» приложение № 2 к постановлению Кабинета Министров № 541 от 07.09.2020 г., **разработать Заявление об экологических последствиях (заключительный этап процедуры оценки воздействия на окружающую среду), в котором ООО «JURU ENERGY CONSULTING» необходимо:**

- разработать нормативы всех видов воздействия (ПДВ, ПДО, ПДС) и природоохранные мероприятия, обеспечивающие снижение нагрузки на окружающую среду до нормативного уровня; уточнить расчеты выбросов загрязняющих веществ в атмосферный воздух, исходя из характеристик действительно установленного на объекте оборудования; рассмотреть возможность образования шлама от зачистки резервуара с дизельным топливом (для работы аварийного дизель-генератора), изношенной спецодежды, определить места временного размещения и способы утилизации;

- с целью соблюдения условий Концепции по охране окружающей среды Республики Узбекистан до 2030 года, утвержденной Указом Президента Республики Узбекистан №УП-5863 от 30.10.2019 г., **выявить приоритетные источники загрязнения атмосферного воздуха и предусмотреть оснащение их автоматическими системами мониторинга выбросов загрязняющих веществ в атмосферный воздух;**

- обеспечить контроль за техническим состоянием оборудования при ведении строительных работ на площадке; оборудование, применяемое на участке строительства, должно быть в исправном состоянии, чтобы не допускать утечки горюче-смазочных материалов;

- в целях сохранения природной среды и улучшения экологической обстановки, для уменьшения воздействия на атмосферный воздух **выхлопных газов строительной техники и механизмов**, следует предусмотреть необходимые природоохранные мероприятия, включающие оборудование бетонированной площадки для стоянки и обслуживания автотранспортных средств;

- обеспечить сброс хозяйственно-бытовых стоков по системе, исключающей возможность попадания загрязняющих веществ на почву, в грунты и затем в подземные воды; рассмотреть вопрос организации и внедрения системы локальной очистки хозбытовых сточных вод с последующим использованием при озеленении территории;

- в целях дальнейшего совершенствования системы управления деятельностью в сфере обращения с бытовыми и строительными отходами в соответствии с приложением №1, гл.2, п.4 постановления Кабинета Министров Республики Узбекистан № 40 от 28.01.2021 г. «О мерах по дальнейшему совершенствованию порядка проведения работ, связанных со строительными отходами», **все виды строительных отходов должны быть направлены на рациональное повторное использование, захоронение и переработку сборщиками отходов, либо переданы (отданы) другим юридическим лицам и индивидуальным предпринимателям, осуществляющим сбор, транспортировку, захоронение и (или) переработку этих отходов;**

- в целях сохранения чистоты грунтов и окружающей поверхности организовать бетонированную площадку для размещения на ней контейнеров для сбора отходов и их своевременный вывоз на ближайший полигон; заключить договор со специализированным предприятием для содержания ТБО на санкционированном полигоне);

- разработать и **получить «Разрешение на специальное водопользование или водопотребление» (РСВ)** для использования воды на технические нужды из проетируемой скважины в установленном законодательством порядке, в соответствии с «Административным регламентом оказания государственных услуг по выдаче разрешения на специальное водопользование или водопотребление» (приложение № 3), утвержденным постановлением Кабинета Министров Республики Узбекистан № 255 от 31.03.2018 г. Специальное водопользование или водопотребление без получения разрешения запрещается;

- разработать программу ведения мониторинга за состоянием окружающей природной среды в районе расположения объекта в соответствии с Приложением № 1 к Постановлению Кабинета Министров Республики Узбекистан № 737 от 05.09.2019 г. «Положение о мониторинге окружающей природной среды
в Республике Узбекистан»;

- обеспечить проведение технической и биологической рекультивации нарушенных земель при строительстве СФЭС.

Государственная экологическая экспертиза проекта показала, что представленные материалы в достаточной степени **соответствуют** требованиям природоохранного законодательства, предъявляемым к первому этапу оценки воздействия на окружающую среду.

Министерство природных ресурсов Республики Узбекистан **согласовывает** Заявления о воздействии на окружающую среду (II этап) строительства солнечной фотоэлектростанции «Нур Бухара Салар» мощностью 250 МВт с сопутствующей аккумуляторной системой накопления энергии (BESS) ООО «JURU ENERGY CONSULTING» в Алатском районе Бухарской области **при выполнении природоохранных мероприятий, предусмотренных проектом ЗВОС и указанных в заключении.**

Согласно п.26, гл.3, п.47, гл. 6, и п. 57, гл. 7 «Положения о государственной экологической экспертизе», утвержденного постановлением Кабинета Министров Республики Узбекистан № 541 от 07.09.2020 г., **заказчик несёт ответственность за достоверность и правдивость представленных на государственную экологическую экспертизу документов и сведений;** заключение государственной экологической экспертизы о допустимости реализации проекта имеет юридическую силу в течение трех лет, в случае неосуществления проектируемых работ за этот период или изменений проектных решений следует разработать заново проект ЗВОС и представить на государственную экологическую экспертизу в установленном законодательством порядке; **действие заключения государственной экологической экспертизы прекращается в случаях: несоблюдения заказчиком указанных в заключении государственной экологической экспертизы требований, и иных случаях в порядке, установленном законодательством.**

Заключение государственной экологической экспертизы о допустимости реализации проекта не подменяет и не отменяет необходимость получения соответствующих разрешительных документов в установленном законодательством порядке.

Управлению природных ресурсов Бухарской области следует взять под контроль:

- выполнение требований природоохранного законодательства ООО «JURU ENERGY CONSULTING» при строительстве солнечной фотоэлектростанции «Нур Бухара Салар» мощностью 250 МВт с сопутствующей аккумуляторной системой накопления энергии (BESS) в Алатском районе, предусмотренных проектом на территории с географическими координатами:

1. 39.339984°C, 64.077816°B; 2. 39.339792°C, 64.078330°B;

3. 39.339992°C, 64.078454°B; 4. 39.339860°C, 64.079314°B;

5. 39.339122°C, 64.079302°B; 6. 39.339112°C, 64.080304°B;

7. 39.338434°C, 64.080293°B; 8. 39.338408°C, 64.083069°B;

9. 39.339050°C, 64.083083°B; 10.39.340051°C, 64.099009°B;

11.39.338983°C, 64.104780°B; 12.39.305355°C, 64.071730°B;

13.39.310628°C, 64.059351°B;

- осуществление экологического мониторинга состояния окружающей среды
в районе строительства СФЭС;

- проведение технической и биологической рекультивации нарушенных земель;

- своевременный вывоз отходов с проверкой документации, подтверждающей предусмотренные проектом методы их утилизации; заключение договора со специализированным предприятием для своевременного вывоза ТБО и содержания отходов на санкционированном полигоне.

На стадии разработки ЗЭП требуется провести обследование участка строительства СФЭС и прилегающих территорий на предмет реализации проектных решений и заложенных в проекте ЗВОС природоохранных мероприятий; результаты обследования представить в форме акта, заверенного представителем Управления экологии, охраны окружающей среды и изменения климата Бухарской области и руководителем предприятия.

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

Генеральный директор **Г.Мухамедов**

Исп. Тушева Л.
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Technical appendix 3:
Scoping Report

Nur Bukhara Solar PV

Environmental & Social Impact Assessment:

Scoping Report

Consulting Firm:

Juru Energy

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Juru's Project Manager	Nicola Davies
Juru's Project Director	Jushkinbek Ismailov

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Version	Date	Description	Author	Reviewer	Approver
1.0	31.03.2023	E&S Scoping Report – Draft	Various	Marianne Lupton	Nicola Davies
1.1	03.05.2023	E&S Scoping Report – Final	Various	Marianne Lupton	Nicola Davies

Disclaimer

The Environmental and Social Assessment Report: Scoping report (the "Report") has been prepared by Juru Energy. Whilst the information contained in the Report reflects the current status, Juru Energy makes no representation or warranty, express or implied, as to the accuracy of the information set forth in this Report and accepts no liability for any information that may have been misstated or omitted.

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Abbreviations

Acronym	Term
AC	Alternating Current
AoA	Analysis of Alternatives
AoI	Area of Influence
AP	Action Plan
CBD	Convention on Biological Diversity
CBO	Community Based Organisations
CHA	Critical Habitat Assessment
CHS	Community Health and Safety
CSR	Corporate Social Responsibility
DC	Direct Current
EHS	Environment, Health and Safety
EIA	Environmental Impact Assessment
EMP	Environmental Management Plan
EPC	Engineering, Procurement, and Construction
EPRP	Emergency Preparedness and Response Plan
ESIA	Environmental and Social Impact Assessment
ESMP	Environmental and Social Management Plan
ESMS	Environmental and Social Management System
GHG	Greenhouse Gas
GIIP	Good International Industry Practice
GIS	Geographical Information System
HR	Human resources
IFC	International Finance Corporation
ILO	International Labour Organisation
IP	Indigenous peoples
IUCN	International Union for Conservation of Nature
LRF	Livelihood Restoration Framework
NCR	Non-compliance report
NGO	Non-Governmental Organisation
NTS	Non-Technical Summary
O&M	Operation and Maintenance
OHL	Overhead lines
OHS	Occupational Health and Safety
OPEX	Operating Expenditures
PM	Particulate Matter
POPs	Persistent organic Pollutants
PPA	Power Purchase Agreement
PPE	Personal Protective Equipment
PRs	Performance Requirements
PS	Performance Standards
PV	Photovoltaic
RAP	Resettlement Action Plan
RoW	Rights of Way
RPF	Resettlement Policy Framework
SEP	Stakeholder Engagement Plan
SIA	Social Impact Assessment
SWMP	Site Waste Management Plan
TMP	Traffic Management Plan
ToR	Terms of Reference
UN	United Nations

Acronym	Term
UNFCCC	United Nations Framework Convention on Climate Change
USTDA	United States Trade and Development Agency
WBG	World Bank Group
WHO	World Health Organisation
WMP	Waste Management Plan

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1 Introduction

1.1 Background

Abu Dhabi Future Energy Company PJSC ("Masdar") has been awarded by the Ministry of Energy, Government of Uzbekistan, to design, build, finance, construct, commission and operate, maintain and transfer (DBFOMT) the Nur Bukhara Solar photovoltaic (PV) Project with a capacity of 250 MWA and 63 MW/126 MWh Battery Energy Storage System ("Project"). The Project will be designed to meet national regulations and international standards. The Project will be implemented through a long-term, i.e., 25 years power purchase agreement (a "PPA") between Nur Bukhara Solar PV LLC Foreign Enterprise and JSC National Electric Grid of Uzbekistan ("NEGU").

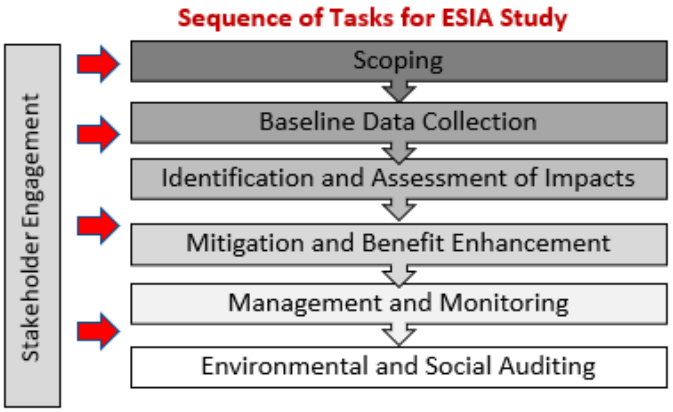
The Project will support Uzbekistan to:

- Reduce energy dependence on carbon-based fuels.
- Meet renewable energy targets.
- Reduce greenhouse gas emission rates.

Masdar has appointed Juru Energy Ltd. (JE or the ESIA Consultant) to perform an Environmental and Social Impact Assessment (ESIA) for the Project. The ESIA will be developed in accordance with the requirements of the International Finance Corporation (IFC) Performance Standards (PSs), and with reference to EBRD Environmental and Social Policy 2019 (ESP 2019) Performance Requirements (PRs) and the Equator Principles.

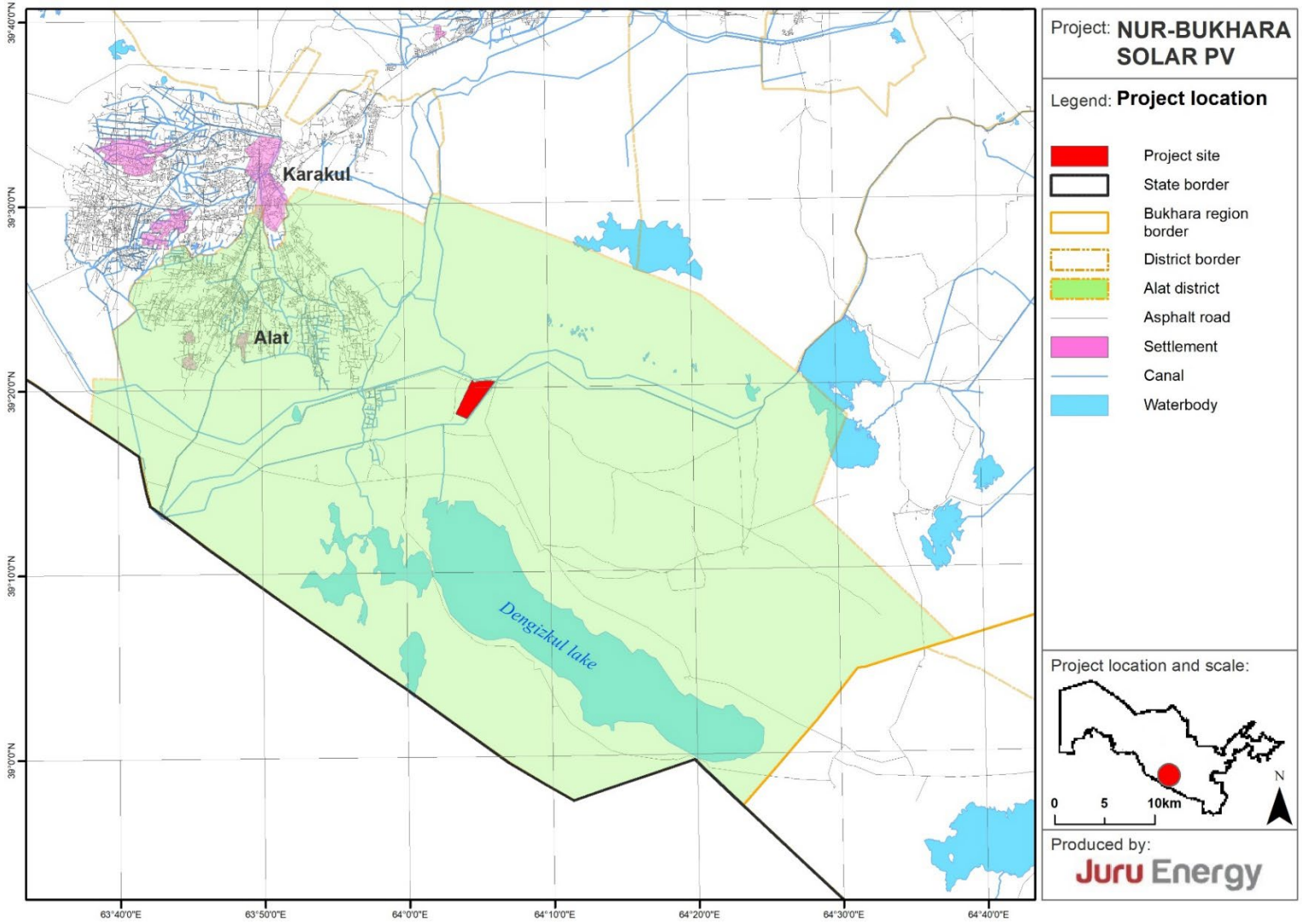
The Project will be required to undergo a separate national environmental impact assessment (EIA) process, which JE will perform and submit as a separate document to the Ministry of Environment for approval. The sequence of steps for the EIA and ESIA study is presented in Figure 2. This report presents the findings of the scoping phase activities.

Figure 1: ESIA process - sequence of steps (source: Juru Energy)



The Site covers approximately 691 Ha of land in the Alat District of the Bukhara region of the Republic of Uzbekistan. It is located 24 km southeast of Alat city, close to the border with Turkmenistan, which at the closest point lies around 25 km southeast of the Site. The proposed Site is flat and is surrounded by the Amu-Bukhara canal to the North, South and East. The regional road R78 runs alongside the northern boundary of the site. The location of the Project is illustrated in Figure 2.

Figure 2: Project location



1.2 Purpose of this report

The purpose of this scoping report is to identify the potential positive and negative environmental and social (E&S) issues and impacts related to the pre-construction, construction, operation and decommissioning of the Project, and to inform project stakeholders of the proposed terms of reference for further assessment during the ESIA process, as defined in the ESIA terms of reference (Chapter 7).

The scoping report includes a preliminary identification of the Project area of influence (AOI), a description of the E&S regulatory framework applicable to the Project and stakeholder mapping to inform and facilitate meaningful public engagement and review.

This scoping process has been informed by primary data collection and review of secondary date including:

- A site visit to the Project area undertaken between 2nd and 3rd March 2023;
- Consultation with representatives of the affected public, government agencies, local authorities and other organisations;
- Review of existing documentation and earlier studies for other related projects in the region; and
- Review of relevant regional and strategic environmental and social assessments or studies of relevance to the Project.

1.3 Project proponent

MASDAR

Mission "To be a global clean energy developer, with a reputation of being the partner of choice. We meet the needs of clients and communities alike"

Masdar's mission is to develop, invest in and deliver high-quality, sustainable and economically viable clean energy projects locally and globally. Masdar will develop the Nur-Bukhara Solar PV Project and Battery Storage. Masdar has over a decade of experience as a renewable energy developer and investor. Masdar invests in and contributes to innovative global projects, including large, utility-scale renewable energy power plants, community grid projects, and individual solar home systems. It is active across 40 countries and has developed some of the world's most significant solar and wind energy projects. Masdar has invested or committed to invest in renewable energy projects with a gross capacity of over 20 GW. In Uzbekistan, Masdar has 100 MW utility-scale PV solar plant in operation and another 1,600 MW of projects under various stages of development i.e. financial closing and construction.

1.4 ESIA team and project contact information

Juru Energy Consulting Ltd. will perform the ESIA study. The team of JE specialists involved in the Project is presented in Table 1.

JURU ENERGY CONSULTING LLC, UZBEKISTAN

Name: Viktoriya Filatova, Zilola Kazakova

Address: 10A, Chust Str., Tashkent, Uzbekistan, 100077

Email: esia_alat_spp@juruenergy.com

Phone: +998 90 515 03 92

Table 1: ESIA Team

Name	Position
Nicola Davies	Project Manager & Environmental Expert
Caleb Gordon	International Biodiversity Expert
Marianne Lupton	International Social Specialist
Viktoriya Filatova	Local Environmental Specialist
Anna Ten	Local Biodiversity Expert
Zilola Kazakova	Local Social/Resettlement Specialist
Timur Abduraupov	Local Herpetologist
Natalya Beshko	Local Botanist
Abdulhoshim Turgunov	National EIA Expert

1.5 Structure of the scoping report

The scoping report is structed as follows:

- Chapter 2: Applicable national legislation and international standards.
- Chapter 3: Description of the Project, its scope, alternatives considered and justification.
- Chapter 4: Overview of the environmental and social baseline conditions.
- Chapter 5: Assessment of the potential environmental and social impacts to be studied as well as a justification for those impacts scoped out during the scoping process.
- Chapter 6: Stakeholder mapping (as obtained during the scoping phase of stakeholder engagement).
- Chapter 7: ESIA terms of reference (TOR) and work programme.
- References
- Annex A: Scoping notification leaflet (English and Uzbek)
- Annex B: Project grievance form
- Annex C: Biodiversity survey methodology and work plan
- Annex D: Preliminary permit register
- Annex E: Information about protected areas

1.6 ESIA structure and schedule

The ESIA will contain the following volumes:

- Volume I: Non-Technical Summary (English, Uzbek)
- Volume II: ESIA Main Report (English, Russian)
- Volume III: ESIA Technical Appendices and Supporting Documents (originating language)
- Volume IV: Environmental and Social Management Plan (ESMP) (English, Russian)
- Volume V: Livelihood Restoration Plan (LRP) (English, Uzbek)
- Volume VI: Stakeholder Engagement Plan (SEP) (English, Uzbek)

Table 2 sets out the ESIA schedule.

Table 2: Project ESIA Schedule

Activity / key milestone	Week commencing
Scoping site visit	March 2023
Final scoping report and SEP and LRP	March 2023
Baseline studies and desktop collection	March/April 2023
Public hearing (national EIA)	10 April 2023
Submit National EIA to regulator	08 May 2023
Public consultation meetings	15 May 2023
Draft ESIA (all volumes and supporting information)	29 May 2023
Final LRP	29 May 2023
Final ESIA report (all volumes and supporting information)	26 June 2023
LRP Implementation	June/July 2023
Financial Close	August 2023
Notice to Proceed	August 2023

2 Policy, Legislative and Institutional framework

This section sets out the Uzbek and Lender framework applicable to the Project.

2.1 Uzbekistan regulatory context

2.1.1 Relevant government ministries

Key organisations with responsibility for environmental management in Uzbekistan are:

- Cabinet of Ministers of the Republic of Uzbekistan (COM);
- Ministry of Natural Resources (MNR)[1]; and
- The Center for State Ecological Expertise, which is under the MNR.

The Cabinet of Ministers of the Republic of Uzbekistan governs the executive body in the Republic of Uzbekistan following the Constitution of the Republic of Uzbekistan (Article 98), and the Law of the Republic of Uzbekistan "On the Cabinet of Ministers of the Republic of Uzbekistan" (new edition of 2019). The COM exercises the following main functions:

- Implements measures on rational use and protection of natural resources;
- Coordinates the work of state bodies on joint conducting of natural protection events;
- Implements a large-scale ecological program of national and international importance; and
- Takes measures to eliminate the consequences of accidents and disasters as well as natural disasters.

Ministry of Natural Resources (MNR) is the main regulating body of state administration on environmental protection issues. The primary responsibilities of the MNR include ensuring the implementation of a unified state policy on environmental safety, environmental protection, and the use and reproduction of natural resources; and enforcing state control over the compliance of ministries, state committees, departments, enterprises, institutions, and organisations, as well as individuals, with respect to the use and protection of land, mineral resources, water, forests, flora and fauna, and atmospheric resources. Structurally, the MNR consists of the central unit (located in Tashkent), regional units (oblast) and local (district) units.

The Center for State Ecological Expertise: The Center for State Ecological Expertise's activities are directly related to the evaluation of materials for EIA and the issuance of documents determining compliance with environmental requirements for planned or executed business and other activities, as well as determining the admissibility of the implementation of the object of environmental expertise.

Due to the cross-cutting nature of sustainable development and the environment, virtually all other state bodies have some responsibility towards them. Other stakeholders that are relevant to the Project are listed below.

- Ministry of Energy of the Republic of Uzbekistan;
- Ministry for Emergency Situations of the Republic of Uzbekistan;
- Ministry of Health of the Republic of Uzbekistan;

1 Ministry of Natural Resources was organised on a basis of State Committee of Environmental Protection of Uzbekistan by the Presidential Decree of January 25 2023 No. UP-14 "On priority organizational measures for the effective establishment of the activities of the Republican Executive Authorities"

- Ministry of Poverty Reduction and Employment;
- Ministry of Water Management of the Republic of Uzbekistan;
- Ministry of Agriculture of the Republic of Uzbekistan;
- Cadastre Agency under the Ministry of Economy and Finance of the Republic of Uzbekistan;
- Forestry Agency under the Ministry of Natural Resources of the Republic of Uzbekistan;
- Hydrometeorological Service Agency (Uzhydromet) under the Ministry of Natural Resources of the Republic of Uzbekistan;
- Inspection of Mining, Geology and Industrial Safety Control (Kontekhnazorat) under the Ministry of Mining Industry and Geology of the Republic of Uzbekistan; and
- Ministry of Internal Affairs of the Republic of Uzbekistan.

2.2 Green Energy Policy

2.2.1 Uzbekistan's Green Economy Strategy

At the 26th session of the United Nations Framework Convention on Climate Change (COP26), held in November 2021, under the Paris Agreement, the Republic of Uzbekistan announced the adoption of additional obligations to reduce greenhouse gas emissions per unit of gross domestic product by 2030 by 35 percent compared to 2010 levels.

Uzbekistan aims to achieve this through the implementation of the Uzbekistan's Green Economy Strategy Uzbekistan's "Strategy for transition to a green economy in the period of 2019-2030" was approved by the Resolution of the President of the Republic of Uzbekistan dated 04.10.2019 No. PP-4477 (the "Resolution").

This Resolution was adopted to ensure fulfilment of obligations under the Paris Agreement on climate change signed by Uzbekistan on April 19, 2017, as well as the implementation of the Action Strategy for five priority areas of development of the Republic of Uzbekistan in 2017-2021 as follows:

- improving energy efficiency of the economy and rational consumption of natural resources through technological modernization and development of financial mechanisms;
- inclusion in priority areas of public investment and spending of green criteria based on international best practices;
- assistance in the implementation of pilot projects in the areas of transition to Green economy through the development of mechanisms of state incentives, public-private partnership and cooperation with international financial institutions;
- development of a system of training and retraining of personnel related to labor market in green economy;
- taking measures to mitigate the negative impact of environmental disaster in the Aral Sea region;
- strengthening international cooperation in the field of "green" economy, also through the conclusion of bilateral and multilateral agreement.

Specific target indicators include:

- Reduction of emissions of greenhouse gas per unit of gross domestic product (GDP) by 10 per cent of the 2010 level;
- Doubling energy efficiency indicators and a decrease in the carbon intensity of GDP;

- Further development of renewable energy sources, with coverage of more than 25 per cent of the total volume of electricity generation;
- providing access to modern, affordable and reliable power supply to 100% of the population and sectors of the economy

In 2002, the Decree of the President of the Republic of Uzbekistan, dated December 2, 2022 ON MEASURES TO IMPROVE THE EFFECTIVENESS OF REFORMS AIMED AT THE TRANSITION OF THE REPUBLIC OF UZBEKISTAN TO A "GREEN" ECONOMY UNTIL 2030 was issued to improve measures taken to ensure “green” and inclusive economic growth as part of the Strategy outlined above. This also sought to further expand the use of renewable energy sources and resource saving in all sectors of the economy. Considering the renewable energy sector specifically the goal is “increasing the production capacity of renewable energy sources up to 15 GW and bringing their share in the total volume of electricity production to more than 30 percent”.

The new law also states that from January 1, 2024, within the framework of investment projects for the construction of new solar and wind power plants with a capacity of more than 1 MW, an electric energy storage system with a capacity of at least 25 percent of the installed capacity of these stations will be introduced without fail.

2.3 Environmental Law

2.3.1 Constitution of Uzbekistan

The constitution of Uzbekistan has the following provisions relating to environmental aspects:

- Article 49: It is the duty of citizens to protect the historical, spiritual and cultural heritage of the people of Uzbekistan. Cultural monuments shall be protected by the state;
- Article 50: All citizens shall protect the environment;
- Article 53: All forms of ownership of citizens is under protection of state;
- Article 54: No property shall inflict harm to the environment; and
- Article 55: Land, subsoils, flora, fauna, and other natural resources are protected by the state and considered as resources of national wealth subject to sustainable use.

2.3.2 Law on Nature Protection, 1992 as Amended in 2021

This law is the key national environmental law for the protection of the environment and the sustainable use of resources and the right for the population to a clean healthy environment.

This law states legal, economic, and organizational basis for the conservation of the environment and the rational use of natural resources. Article 24 of this law states that the State Environmental Expertise (SEE) is a mandatory measure for environmental protection, preceded to decision making process. In addition, the law prohibits the implementation of any Project without approval from SEE.

It should be noted that Article 53 of this law confirms that if an international treaty concluded by the Republic of Uzbekistan establishes rules other than those provided for by the legislation of the Republic of Uzbekistan on nature protection, the rules of the international treaty shall be applied, except in cases where the legislation of the Republic of Uzbekistan establishes stricter requirements.

2.3.3 Law on Environmental Control, 2013 as Amended in 2022

The main objectives of this law include:

- Prevention, detection and suppression of violation of legislative requirements relating to environmental protection and rational use of natural resources.
- Monitoring the state of the environment, identifying situations that can lead to environmental pollution, irrational use of natural resources, pose a threat to the life and health of citizens.
- Determination of compliance with environmental requirements of any ongoing economic development activities.
- Ensuring compliance with the rights and legitimate interests of legal entities and individuals performing their duties in relation to environmental protection and sustainable use of natural resources.

The Article 7 of this law states that, the objects of environmental control are:

- Land, its subsoil, waters, flora and fauna, and atmospheric air;
- Natural and man-made sources of impact on the environment; and
- Activities, action or inaction that may lead to pollution of the environment and irrational use of natural resources, create a threat to the life and health of citizens.

2.4 National Environmental Impact Assessment (EIA)

According to the list of activities subject to state ecological expertise, which is established by the Resolution of Cabinet of Ministers No. 541 "On further improvement of the environmental impact assessment mechanism' (2020), power-generating facilities are categorized as follows depending on the level of impact on the environment[2]:

- Thermal, photovoltaic, wind power and other power-generating facilities with a capacity of 300 MW or higher – Category I (high risk);
- Thermal power plants and other power-generating facilities with a capacity of 100 MW to 300 MW – Category II (medium risk);
- Thermal, photovoltaic, wind power, and other power-generating facilities with less than 100 MW capacity – Category III (low risk).

This Project will be categorized as Category II.

The national EIA will be performed by JE in parallel to the ESIA process following the process outlined below. Compliance with national requirements and a positive Environmental Approval are pre-requisites to compliance with Lender requirements. The main regulatory body for national EIA in Uzbekistan is the Ministry of Natural Resources (MNR) of the Republic of Uzbekistan.

The MNR performs its activities on the basis of the following legal acts:

- Presidential Decree of January 25 2023 No. UP-14 On priority organizational measures for the effective establishment of the activities of the Republican Executive Authorities;
- Presidential Decree of April 21, 2017 No. UP-5024 "On improving the system of public administration in the field of ecology and environmental protection";
- Resolution of the President of the Republic of Uzbekistan of April 21, 2017 No. PP-2915 "On measures to ensure the organization of the activities of the State Committee of the Republic of

2 Under the Resolution of Cabinet of Ministers of Uzbekistan No 541, all economic activities are classified into one of four categories of environmental impact: Category I (high risk), Category II (medium risk), Category III (low risk) and Category IV (local impact).

Uzbekistan on Ecology and Environmental Protection";

- Resolution of the Cabinet of Ministers of the Republic of Uzbekistan dated January 15, 2019 No. 29 "On Approving the Provision on the State Committee of the Republic of Uzbekistan on Ecology and Environmental Protection";
- Resolution of the President of the Republic of Uzbekistan dated October 3, 2018 No. PP-3956 "On measures to ensure the organization of the activities of the State Committee of the Republic of Uzbekistan on Ecology and Environmental Protection";
- Decree of the President of the Republic of Uzbekistan, dated 30.12.2021, №-76 "On measures for environmental protection and organization of activities of state bodies in the field of environmental control";
- Resolution of the Cabinet of Ministries of the Republic of Uzbekistan dated October 7, 2020. No.541 "On measures for the further improvement of environmental impact assessment"; and
- other laws and by-laws related to nature protection.

The national EIA procedure is regulated by:

- Law of the Republic of Uzbekistan "On Ecological Expertise" (2000); and
- Regulations "On the State Environmental Expertise", approved by the Resolution of Cabinet of Ministers No. 541 "On further improvement of the environmental impact assessment mechanism' (2020).

The Resolution specifies the legal requirements for EIA in Uzbekistan. According to the Resolution, the State Environmental Expertise (SEE) is a type of environmental examination carried out by specialized expert divisions to set up the compliance of the planned activities with the environmental requirements and determination of the permissibility of the environmental examination object implementation.

The state unitary enterprise "The Center of the State Environmental Examination" of the MNR, carries out the state environmental examination of EIA of the objects of economic activity classified as categories I and II of environmental impact (high and medium risk).

The state unitary enterprise "The Center of the State Environmental Examination" of the Republic of Karakalpakstan, or the relevant regions performs the state environmental examination of EIA of the objects of economic activity classified as categories III and IV of environmental impact (low risk and local impact).

For this Project the SEE will be performed by the Centre of State Environmental Examination.

National EIAs in Uzbekistan consist of three stages to obtain the Environmental Approval:

- Stage I - Preliminary EIA report – initial and mandatory stage;
- Stage II – Statement on Environmental impacts is a non-mandatory stage and can be skipped if local regulator is satisfied with assessment provided in Preliminary EIA report.
- Stage III – Statement on Environmental Consequences - is the final stage and output that should be prepared and submitted to the regulator after completing construction/reconstruction works and before the commissioning of the project.

The intention for this project is to submit a Stage 1 Preliminary EIA report that fully meets the needs of MNR for decision by MNR as to whether a Stage II submission is required.

Alignment of ESIA and National EIA report

Stage I Preliminary EIA report - The Preliminary EIA report must contain following information:

- the state of the environment prior to the implementation of the planned activities,

- the population of the territory, land development, analysis of environmental features;
- situational plan with an indication of the geographical coordinates of the object in question,
- available recreational areas, settlements, irrigation, land-improvement facilities, farmland,
- power lines, transport, water, gas pipelines and other information about the area;
- the envisaged (planned) main and auxiliary objects, used equipment, technologies,
- the use of natural resources, materials, raw materials, fuel, analysis of their impact on the environment (both during construction and operation phases);
- expected emissions, discharges, wastes, their negative impact on the environment and ways to minimize them (both during construction and operation phases);
- storage and disposal of waste (both during construction and operation phases);
- analysis of alternatives to the planned or ongoing activities and technological solutions from the standpoint of nature conservation, taking into account the achievements of science, technology and best practices;
- organizational, technical, technological solutions and measures that exclude negative environmental consequences and reduce the impact of the object of examination on the environment;
- analysis of emergency situations (with an assessment of the likelihood and scenario of preventing their negative consequences);
- forecast of environmental changes and environmental consequences as a result of the implementation of the object of examination;
- environmental measures to prevent the negative effects of the implementation of the object of examination;
- results of public hearings.

It is necessary to highlight, that based on changes in local regulation, public hearings must be conducted in accordance with the procedure indicated in the law, represent all environmental impact assessments (to be justified by calculations) for construction and operation phases (if applicable).

Stage II Statement on Environmental impacts – during this phase additional information is provided in relation to key issues e.g. where specific modelling or impact assessment has been required. It is possible the outputs of the finalized EIA process could be communicated at Stage I which may negate the need for additional information to be provided (under Stage II) thus streamlining the approval process and the issue of permits for construction.

The Statement on Environmental impacts should include:

- assessment of environmental problems of the selected site based on the results of engineering and geological surveys, models and other necessary studies;
- environmental analysis of technology in relation to identified problems of the site;
- results of public hearings; and
- reasoned studies of environmental measures to prevent the negative effects of the implementation of the object of examination.

Stage III Statement on Environmental Consequences is the final stage of the SEE process and shall be carried out prior to the commissioning of the project. The report describes in detail the changes in the project made as a result of the analysis of the SEE during the first two stages of the EIA process, the comments received during public hearings, the environmental standards applicable to the project in relation to waste generation,

water discharge, air emissions, and the environmental monitoring requirements related to the project, as well as the main conclusions.

2.5 Applicable E&S Legislation and Standards

2.5.1 Environment

The following Laws are relevant to the Project:

- The Law of the Republic of Uzbekistan "On Water and Water Use" (1993) as amended in 2022;
- The Law of the Republic of Uzbekistan "On Ecological Expertise" (2000) as amended in 2021;
- The Law of the Republic of Uzbekistan "On Atmospheric Air Protection" (1996, amended on 21.04.2021);
- The Law of the Republic of Uzbekistan "On Protection and Use of Vegetation" (1997) as amended in 2016;
- The Law of the Republic of Uzbekistan "On Protection and Use of the Wildlife" (1997) as amended in 2016;
- The Law of the Republic of Uzbekistan "On Protected Natural Reserves" (2004) as amended in 2022;
- The Law of the Republic of Uzbekistan "On Wastes" (2002) as amended in 2021;
- The Law "On the sanitary and epidemiological well-being of the population" (2015) as amended in 2021;
- The Resolution of the Cabinet of Ministries of the Republic of Uzbekistan №.541 "On further improvement of the environmental impact assessment mechanism' (2020) as amended in 2022;
- The Resolution of Cabinet of Ministries of the republic of Uzbekistan №.820 "On measures to further improve the economic mechanisms for ensuring nature" (2018) as amended in 2021;
- The Resolution of the Cabinet of Ministers of the Republic of Uzbekistan No 14. "On approval of the regulation on the procedure for the development and agreement of projects with environmental standards" (2014) as amended in 2022; and
- Resolution of Cabinet of Ministers of Republic of Uzbekistan No.95 "On approval of general technical regulations of environmental safety" (2020) as amended in 2022.

2.6 Applicable National Environmental Standards

Uzbekistan has a large set of specific standards that refer to emissions, effluent discharge, and noise standards, as well as standard to handle and dispose specific wastes ranging from sewage to hazardous wastes. The following summarizes these laws and standards along with other international best practice standards. The ESIA will compare all standards and recommend 'project standards' to be followed.

2.6.1 Air Quality

National Standards – Air quality in Uzbekistan in measured against Maximum Permissible Concentrations (MPC) and Maximum Permissible Emissions (MPE).

Ambient Air Quality Standards, or MPCs, are established by SanPiN 0293-11 (May 16, 2011). According to the United Nations Environment Program (UNEP), Uzbek national ambient air quality standards meet World Health Organization (WHO) standards.[3] The MPCs relevant to the Project are show in Table 2**.**

Table 3: National Air Quality MPCs

Pollutant	**Uzbekistan MPC (mg/m^3)**			
	30 min	**24 Hour**	**Monthly**	**Annually**
Nitrogen Dioxide (NO_2)	0.085	0.06	0.05	0.05
Nitrogen Oxide (NO)	0.6	0.25	0.12	0.06
Sulphur Dioxide (SO_2)	0.5	0.2	0.1	0.05
Dust	0.15	0.1	0.08	0.05
Carbon Monoxide (CO)	5.0	4.0	3.5	3.0

Emission standards are stipulated by The Resolution of the Cabinet of Ministers of the Republic of Uzbekistan No. 14 of January 21, 2014 "On Approval of the Regulation on the Procedure for Developing and Coordinating Environmental Draft Projects". It states that the main criterion for establishing MPE are quotas for pollutants.

WBG and EU Standards – The World Bank Group (WBG) have established ambient air quality standards based on World Health Organization (WHO) guidelines, the EU has also established air quality guidelines. insert cross illustrates the guidelines. As part of the ESIA an assessment of the most stringent guidelines will be made and used as 'project standards'.

Table 4: EU Ambient Air Quality Guidelines

Pollutant	**Averaging Period**	**Objective**	**Concentration**	**Comment**
$PM_{2.5}$	Annual	Limit value	25 µg/m^3	
PM_{10}	24 Hour	Limit value	50 µg/m^3	Not to be exceeded more than 35 days per year
PM_{10}	Annual	Limit value	40 µg/m^3	
NO_2	Hourly	Limit value	200 µg/m^3	Not to be exceeded more than 18 hours per year
NO_2	Annual	Limit value	40 µg/m^3	
SO_2	Hourly	Limit value	350 µg/m^3	Not to be exceeded more than 24 hours per year

3 https://wedocs.unep.org/bitstream/handle/20.500.11822/17141/Uzbekistan.pdf?sequence=1&isAllowed=y

Pollutant	Averaging Period	Objective	Concentration	Comment
SO_2	24 hour	Limit value	125 µg/m^3	Not to be exceeded more than 3 days per year
CO	Maximum daily 8 hour mean	Limit value	10 mg/m^3	

Table 5: WHO Ambient Air Quality Guidelines

Pollutant	Averaging Period	Concentration
$PM_{2.5}$	24 hour	15 µg/m^3
$PM_{2.5}$	Annual	5 µg/m^3
PM_{10}	24 Hour	45 µg/m^3
PM_{10}	Annual	15 µg/m^3
NO_2	Hourly	200 µg/m^3
NO_2	Annual	10 µg/m^3
NO_2	24 hour	25
SO_2	24 hour	40 µg/m^3
CO	Maximum daily 8 hour mean	10 mg/m^3

2.6.2 Noise

National noise standards are set out in SanPIN No. 0331-16. Admissible noise level into the living area, both inside and outside the buildings is used to ensure the rules of acceptable noise levels for residential areas in Uzbekistan. These rules and regulations establish permissible noise parameters in residential, public buildings and residential buildings of populated areas created by external and internal sources, as well as general requirements for measurements, measurement methods and hygienic noise assessment at research sites. Evaluation of the sound level at the calculation point is performed for the day and night period of the day (from 7:00 to 23:00 hours and from 23:00 to 7:00 hours) and considers the maximum intensity of the sound source level during the half-hour period. Table 5 presents the permissible noise levels for the premises most relevant for the project.

Table 6: Noise limits from SanPiN No. 0331-16

Purpose of premises or territories	Time	SanPiN No. 0267-09
Territories adjacent to homes, clinics, dispensaries, rest homes, boarding houses, nursing homes, child care facilities, schools and other educational institutions, libraries.	From 7 am to 11 pm	55 dB(D)
	From 11 pm to 7 am	45 dB(A)

To meet WBG guideline requirements noise impacts should not exceed the levels presented in Table 6 or result in a maximum increase in background levels of 3 dB at the nearest receptor location off site.

Table 7: WBG Noise Level Guidelines

Receptor	**One-hour L_{aeq} (dBA)**	
	Daytime **07.00-22.00**	**Night-time** **22.00 – 07.00**
Residential; institutional; educational	55	45
Industrial; commercial	70	70

The levels are almost identical to WBG noise level guidelines which are based on the standards of the World Health organisation (WHO) with the exception of the periods where WBG standards are slightly more stringent defining night-time noise as applicable at 22:00 instead of 23:00 under national standards. As such IFC guideline limits will be used for the Project.

Workplace Noise - In order to protect the health of staff in the workplace Uzbekistan, utilizes the law (SanPiN) No. 0325-16. Sanitary Standards for Permissible Noise Levels at the Workplace. This standard provides acceptable noise levels for various types of work, the most relevant of which are listed in Table 7**.** In addition, the WBG provides noise limits for various working environments, which are also illustrated in Table 7**.**

Table 8: Working environment Noise Limits

Type of work, workplace	**SanPiN No. 0325-16**	**General EHS Guidelines of WBG**
Performance of all types of work at permanent workplaces in industrial premises and at enterprises operated since March 12, 1985	80 dB (A)	
Heavy industry		85 Equivalent Level Laeq, 8h
Light industry		50-65 Equivalent Level Laeq, 8h

* Laeq- equivalent average sound pressure level

2.6.3 Water Quality

Water resource management, allocation and use in Uzbekistan falls under the Ministry of Agriculture and Water Resources (MAWR), which oversees national authorities I.e. provisional and district departments of agriculture and water resources, and inter provincial and inter district canal management authority.

The COM Decree № 981 of December 11 2029 "Regulation on procedure of establishing water protection zones and sanitary protection zones for water bodies on the territory of the Republic of Uzbekistan" sets a water protection zone around water channels as follows:

- for channels with a capacity from 50 to 100 cubic meters of water per second — 50 — 70 meters;
- for channels with a capacity from 100 to 150 cubic meters of water per second — 70 — 100 meters;
- for channels with a capacity of more than 150 cubic meters of water per second — 100 — 150 meters.

For this Project the water protection zone around the canals adjacent to the north, east and southern boundary will be determined at the ESIA stage after official consultation with Alat District Amu Bukhara Main Canal Department which will be confirmed during the ESIA stage.

No temporary or permanent discharges to surface water bodies are envisaged and no work within or over the adjacent water bodies (canal and wetlands) is proposed, however for completeness it is proposed to verify the baseline water quality pre-construction and confirm the relevance of the following legislation during the ESIA process. It is not anticipated that any foul water discharges to surface water courses in relation to the construction or operation works and therefore standard for sanitary discharges are not presented.

- Sanitary requirements for development and approval of maximum allowed discharges (MAD) of pollutants discharged into the water bodies with waste waters (SanPin No. 0202-06)
- SanPiN No 0255-08 which provides the criteria for hygienic assessment of the level water bodies

2.6.4 Waste Management

Waste management laws relevant to the Project are listed below and key requirements described in the following sections:

- Law of the Republic of Uzbekistan "On wastes" (2002) amended in 2029; and
- SanPin № 0127-02 "Sanitary Procedures for inventory, classification, storage and disposal of industrial waste"

The Law of the Republic of Uzbekistan "On wastes" (2002) amended in 2029
The principal objective of this law is to prevent the negative impacts of solid wastes on human lives and health as well as the environment, reduce waste generation and encourage rational use of waste reduction techniques.

Article 19 Provided generated waste is subject to export and import operations, or hazardous waste is subject to transportation, an environmental certification procedure shall be completed by the Project to confirm compliance with sanitary and environmental norms and standards associated with waste management.

Article 20 states that transportation of hazardous waste shall be in specially designated types of vehicles with a waste certificate and permit. The responsibility for safe transportation of hazardous waste shall be with the transporting organisation.

Article 22 of the Law on Wastes specifies the general requirements for waste storage and disposal. Waste disposal of recyclable waste is prohibited in Uzbekistan. In addition, storage and disposal of waste in the environment including in nature conservation and protected areas, settlements, health and recreational areas or historical and cultural facilities is prohibited.

SanPin №. 0127-02 "Sanitary Procedures for inventory, classification, storage and disposal of industrial waste"
This regulation and norm ensure optimal hygienic accounting and inventory of industrial wastes, determination of toxicity index and classification of industrial waste by hazard classes with optimal selection of ways to neutralise and utilise them.

SanPiN of the Republic of Uzbekistan dated 29/7/2002 No 0128-02 – "Hygienic classifier of toxic industrial wastes in the Republic of Uzbekistan. Hazardous waste is classified into four groups known as "hazard classes". Waste hazards are assessed based on this law. Hygienic classifier of industrial hazardous waste and SanPiN No 0127-02-Sanitary procedures for industrial waste inventory, classification, storage and disposal. Waste hazard classes include:

- Class I: Extremely hazardous waste;

- Class II: Highly hazardous waste;
- Class III: Moderately hazardous waste;
- Class IV: Low hazardous waste.

Other relevant regulations and standards are listed below and their requirements will be incorporated into the ESIA assessment:

- SanPiN № 0157-04 "Sanitary requirements to the storage and neutralization of solid domestic waste on special grounds in Uzbekistan"
- SanPiN of the Republic of Uzbekistan dated 16/11/2011 No 0300-11 "Sanitary Rules and Standards for managing collection, inventory, classification, treatment, storage and disposal of industrial waste in the context of Uzbekistan
- Regulation "On the Procedure for the Disposal, Collection, Pay Settlement, Storage and Removal of Waste Industrial Oils" annexed to the Decree of the Cabinet of Ministers dated 04/09/2012 No.258
- Regulation on the Procedure for Handling Coloured and Black Metal Scrap" annexed to the Decree of Cabinet of Ministers dated 06/06/2018 No. 425
- SanPiN No. 0158-04 - Sanitarian Rules and Norms on collection, transportation and disposal of wastes containing asbestos in Uzbekistan.

2.6.5 Land rights, acquisition and resettlement

The following land Laws are relevant to the Project:

- Civil Code of the Republic of Uzbekistan (1997) as amended on 8.11.2022.
- Land Code of the Republic of Uzbekistan (1998) as amended on 1.10.2022.
- Law of the Republic of Uzbekistan on State Land Cadastre No.666-I of 28.08.1998.
- Presidential Decree № UP-5495. Decree "On measures on cardinal improvement of investment climate in the republic of Uzbekistan".
- Appendix No. 2 to the Resolution of the Cabinet of Ministers № 146 (2011), regulation "On the Procedure for Compensation for Losses of Land Owners, Users, Tenants and Owners, as well as Losses of Agricultural and Forestry Production".
- Resolution № 911 of the Cabinet of Ministers (2019) "On the Procedure for withdrawal of land plots and compensation to owners of immovable property located on the land plot.
- Law No 781 "On procedures for the withdrawal of land plots for public needs with compensation" October 1st, 2022.[4]

Law No. 781 specifies cases when the land plots can be acquired for public need among which construction (reconstruction) of roads and railways of national and local significance is also specified. Law No. 781 also prescribes procedures of land acquisition, communication with project affected people (PAPs), compensation calculation, and demolition of affected assets. From October 1st, 2022, all projects that require the acquisition of land for public needs should be managed following this Law.

2.6.6 Archaeology and Cultural Heritage

The principal legislation applicable to the archaeology and cultural heritage study comprise the

- Constitution of the Republic of Uzbekistan, the Criminal Code of the Republic of Uzbekistan[5],

4 Law 911 and Law 781 work alongside each other to address land withdrawal and compensation matters.

5 Criminal Code of the Republic of Uzbekistan of September 22, 1994 No. 2012-XII (as amended on 03-12-2019) Available at: https://www.lex.uz/acts/111457

- Law No. ZRU-229 "On protection and use of the objects of archaeological heritage" (13 October 2009)[6],
- Law No. 269-II "On the Protection and Use of Cultural Heritage Sites (30 August 2001, as amended)[7],
- Presidential Decree No. R-5181 "On improving the protection and use of objects of tangible cultural and archaeological heritage" (16 January 2018) [8]

Presidential Decree no. PP-4068 "Regarding the strengthening of the protection, management and enhancement of tangible and intangible cultural heritage" (19 December 2018)[9]. The relevance of these requirements will be determined during the ESIA process.

2.6.7 Right of way and land acquisition process in Uzbekistan

Procedures to establish a right of way (ROW) in Uzbekistan are the same for legal entities and individuals. ROW or limited use of a land plot is determined in the Land Code of Uzbekistan, Civil Code (under the term servitude), and the Resolution of Cabinet of Ministries No.911 dated 16.11.2019. All grid interconnection works are expected to be undertaken within the existing ROW; however, for completeness, the requirements for establishing a ROW are presented below, and their applicability will be confirmed during the ESIA process.

Article 30 of the Land Code (LC) determines engineering, electrical power and other lines and constructions as a reason for receiving the right to servitude. Following Article 30 of the Land Code, Article 173 of the Civil Code (CC), and Article 30 of Annex 1 of the Resolution of Cabinet of Ministers No. 1060 dated December 29, 2018, servitude is established by agreement between persons demanding the establishment of servitude and the owner, user, lessee, proprietor of the land plot. If they do not achieve consent, the servitude shall be established by a court decision at the user's claim. The agreement on servitude shall be subject to state registration and preserved when the land plot is transferred to another person. Servitude agreements can be terminated in cases of the cessation of the reason according to which it was established.

Article 173 of CC also states that the burdening of a land parcel by servitude does not deprive the owner of the parcel of the rights of possession, use, and disposition of this parcel.

Calculation and compensation of losses due to servitude agreement are performed following Law No 781 "On procedures for the withdrawal of land plots for public needs with compensation" (if it is a project for public needs) the Resolutions of Cabinet of Ministers No.146 from 25 May 2011 "On measures to improve the procedure for granting land plots for urban development activities and other non-agricultural purposes" and No. 911 from 16 November 2019 "On additional measures for enhancing modalities of providing compensation on withdrawal and allocation of land plots and safeguard the property rights legal and physical entities".

6 Law of the Republic of Uzbekistan dated August 30, 2001 No. 269-II "On the Protection and Use of Cultural Heritage Sites". Available at: https://www.lex.uz/acts/10375#1526009

7 Law of the Republic of Uzbekistan dated 13 October 2009 No. ZRU-229 "On protection and use of the objects of archaeological heritage". Available at https://lex.uz/docs/1526179

8 Presidential Decree No. R-5181 of 16 January 2018 "On improving the protection and use of objects of tangible cultural and archaeological heritage". Available at: https://www.lex.uz/docs/3506339

9 Presidential Decree No. PP-4068 of 19 December 2018 "Regarding the strengthening of the protection, management and enhancement of tangible and intangible cultural heritage". Available at: https://lex.uz/ru/docs/4113474/.

Article 86 of the LC states that losses caused to the owners of land parcels, landowners, land users and lessees are liable to be fully refunded (including the lost profit) in the case of limitation of their rights in connection with land acquisition. Refunding of losses is carried out at the expense of the resources of the corresponding centralized funds for compensation of losses to individuals and legal entities in connection with the seizure of land plots from them for public needs and by enterprises, establishments and organizations the activity of which causes limitation of rights of land parcel owners, landowners, land users and lessees or worsening the quality of the neighbouring lands in the order established by legislation.

Article 173 of the CC states that the parcel owner burdened with the servitude has the right unless otherwise provided by a Law, to demand from the person in whose interests the servitude is established proportional payment for the use of the parcel.

2.6.8 National norms and standards for transmission lines

An essential standard for establishing OHTL is SanPiN No.0350-17 "For the Protection of Atmospheric Air in Populated Areas of the Republic of Uzbekistan" (2017). This standard addresses health protection zones (HPZ), also known as setbacks. According to SanPiN No.0350-17, section 2.23.4, an HPZ must be established to protect the population from the effects of an OHTL's electric field. HPZ's are defined as the land along the route of a high-voltage OHTL in which the electric field strength exceeds 1 kV/m. For newly designed OHTL, buildings and structures must be set back the following distances either side of the OHTL[10]:

- 20 m for OHTL with a voltage of 330 kV;
- 30 m for OHTL with a voltage of 500 kV;
- 40 m for OHTL with a voltage of 750 kV;
- 55 m for OHTL with a voltage of 1150 kV.

Other relevant national laws and regulations to OHTL projects include:

- Resolution of Cabinet of Ministers of Republic of Uzbekistan No.95 "On approval of general technical regulations of environmental safety" (2020).
- Decree of the Cabinet of Ministers of the Republic of Uzbekistan No.1050 "On approval of Rules for Protection of Power Grid Facilities, 2018".
- SanPiN & Norms No. 0236-07 "Sanitary norms and rules to ensure safety for people living near high voltage power transmission lines, 2007".

2.7 Labour and Employment

The labour policy in Uzbekistan is applied at the national government level and is reflected in the following relevant laws, regulations, and national social programmes.

- Labour Code of the Republic of Uzbekistan 1996 as amended on 18.05.2022;
- Law "On the employment of the population" No. 642 of 20.10.2020;
- Resolution of the Ministry of Labour and Social Protection of the Population, Ministry of Health of the Republic of Uzbekistan, registered on 29.07.2009, reg. number 1990 "About the approval of the list of occupations with unfavourable conditions, in which the use of the labour of persons under 18 years of age is prohibited"

10 The HPZ (set back) is defined as the distance from the outermost wires in a direction perpendicular to the OHTL.

- Decree No. 133 of 11 March 1997 to approve normative acts necessary for the realization of the Labour Code of the Republic of Uzbekistan;
- Decree of the Cabinet of the Ministers No. 1011 of 22 December 2017 "On Perfection of the Methodology of Definition of Number of People in Need of Job Placement, including the Methodology for Observing Households with Regard to Employment Issues, also for the Development of Balance of Labour Resources, Employment and Job Placement of Population";
- Decree of the Cabinet of the Ministers No. 965 of 5 December 2017 "On the Measures of Further Perfection of the Procedure of Establishment and Reservation of Minimum Number of Job Places for the Job Placement of Persons who are in need of Social Protection and Face Difficulties in Searching Employment and Incapable of Competing in Labour Market with Equal Conditions"; and
- Decree No. 964 of 5 December 2017 "On the Measures for Perfection of the Activity of Self-Government Bodies Aimed at Ensuring Employment, Firstly for the Youth and Women"

As a member of the International Labour Organization (ILO) since 1992, Uzbekistan has ratified 17 ILO conventions, including the eight fundamental conventions (bold) set out in Table 9.

Table 9: Labour Conventions ratified by Uzbekistan

Convention	Date
Universal Declaration of Human Rights (1948)	1991
CCPR - International Covenant on Civil and Political Rights (1966)	28-Sep-95
Convention on the Elimination of All Forms of Intolerance and of Discrimination Based on Religion or Belief (1981)	30-Aug-97
EU Partnership and Cooperation Agreement (1996)	21-Jun -96
C029 - Forced Labour Convention, 1930 (No. 29)	13-Jul-92
P029 - Protocol of 2014 to the Forced Labour Convention, 1930	16-Sep-19
C087 - Freedom of Association and Protection of the Right to Organise Convention, 1948 (No. 87)	12-Dec-16
C098 - Right to Organise and Collective Bargaining Convention, 1949 (No. 98)	13-Jul-92
C100 - Equal Remuneration Convention, 1951 (No. 100)	13-Jul-92
C105 - Abolition of Forced Labour Convention, 1957 (No. 105)	15-Dec-97
C111 - Discrimination (Employment and Occupation) Convention, 1958 (No. 111)	13-Jul-92
C138 - Minimum Age Convention, 1973 (No. 138) Minimum age specified: 15 years	06-Mar-09
C182 - Worst Forms of Child Labour Convention, 1999 (No. 182)	24-Jun-08
C081 - Labour Inspection Convention, 1947 (No. 81)	19-Nov-19
C122 - Employment Policy Convention, 1964 (No. 122)	13-Jul-92
C129 - Labour Inspection (Agriculture) Convention, 1969 (No. 129)	19-Nov-19

Convention	Date
C144 - Tripartite Consultation (International Labour Standards) Convention, 1976 (No. 144)	13-Aug-19
C047 - Forty-Hour Week Convention, 1935 (No. 47)	13-Jul-92
C052 - Holidays with Pay Convention, 1936 (No. 52)	13-Jul-92
C103 - Maternity Protection Convention (Revised), 1952 (No. 103)	13-Jul-92
C135 - Workers' Representatives Convention, 1971 (No. 135)	15-Dec-97
C154 - Collective Bargaining Convention, 1981 (No. 154)	15-Dec-97
CEDAW - Convention on the Elimination of All Forms of Discrimination against Women	19-Jul-95
C187 - Promotional Framework for Occupational Safety and Health Convention, 2006 (No. 187)	14-Sep-21

Measures have been enacted via a national action plan to implement these conventions into national law, including a legal and institutional framework to prevent forced labour. The legislation of the Republic of Uzbekistan (Constitution, Labour Code, Law on Employment) prohibited the use of child and forced labour. Article 7 of the Labour Code stipulates that forced labour, namely compulsion to perform work under the threat of some form of punishment (including as a means of labour discipline) is prohibited.

2.8 Permits and Licenses

Required permits and licenses known at this time are listed in Annex D. A permit register will be maintained for the Project duration and reviewed and updated regularly.

2.9 Lender requirements

The following Lender requirements will be considered to provide maximum flexibility to the Project financing.

2.9.1 International Finance Corporation (IFC)

The Project will principally set out to comply with the requirements of the IFC Performance Standards 2012 (IFC PSs), including:

- Performance Standard 1: Assessment and Management of Environmental and Social Risks and Impacts.
- Performance Standard 2: Labour and Working Conditions
- Performance Standard 3: Resource Efficiency and Pollution Prevention.
- Performance Standard 4: Community Health, Safety, and Security.
- Performance Standard 5: Land Acquisition and Involuntary Resettlement.
- Performance Standard 6: Biodiversity Conservation and Sustainable Management of Living Natural Resources.
- Performance Standard 7: Indigenous Peoples.
- Performance Standard 8: Cultural Heritage.

IFC PS1 establishes the importance of: (i) integrated assessment to identify the social and environmental impacts, risks, and opportunities of projects; (ii) effective community engagement through disclosure of project-related information and consultation with local communities on matters that directly affect them; and (iii) management of social and environmental performance throughout the life of the project.

IFC PS2 through IFC PS8 establish requirements to avoid, reduce, mitigate or compensate for impacts on people and the environment and to improve conditions where appropriate. While all relevant social and environmental risks and potential impacts should be considered as part of the assessment, IFC PS2 through IFC PS8 describe potential social and environmental impacts that require particular attention in emerging economies and sensitive and critical natural and human environments. Where social or environmental impacts are anticipated, they are to be managed through an Environmental and Social Management System (ESMS) consistent with the requirements of IFC PS1.

IFC PS3 refers to the World Bank Group EHS Guidelines. These guidelines are the technical reference documents for environmental protection and set out specific examples of good international industry practice (GIIP). The General EHS Guidelines contain information on crosscutting issues applicable to projects in all industry sectors, including geothermal. They provide guidance on performance levels and measurements considered achievable at reasonable cost by new or existing projects using existing technologies and practices. Projects are expected to comply with standards and guidelines identified in the General EHS Guidelines where host country requirements are less stringent or do not exist.

This project is considered a Category "B": *"Business activities with potential limited adverse environmental or social risks and/or impacts that are few in number, generally site-specific, largely reversible, and readily addressed through mitigation measures".*

2.9.2 World Bank Group Guidelines

The IFC PSs refer to the World Bank Group (WBG) Environment, Health and Safety (EHS) Guidelines as general guidance for implementing GIIP. The EHS Guidelines applicable to the Project include the following:

- WBG General EHS Guidelines (April 2007) - cover the four areas of the environment; occupational health & safety (OHS); community health & safety (CHS); construction and decommissioning; and
- WBG EHS Guidelines Electric Power Transmission and Distribution (April 2007).

2.9.3 EBRD Policy

The ESIA will also consider the E&S requirements of the EBRD as set out in the following Performance Requirements (PRs), where there are material requirements over and above the IFC PSs.

- The European Bank for Reconstruction and Development (EBRD) Environmental and Social Policy 2019 (ESP 2019);
- EBRD PRs:
    - PR1 – Assessment and Management of Environmental and Social Risks and Impacts;
    - PR2 – Labour and Working Conditions;
    - PR3 – Resource Efficiency and Pollution Prevention and Control;
    - PR4 – Health, Safety and Security;
    - PR5 – Land Acquisition, Restrictions on Land Use and Involuntary Resettlement;
    - PR6 – Biodiversity Conservation and Sustainable Management of Living Natural Resources;
    - PR7 – Indigenous Peoples;
    - PR8 – Cultural Heritage;
    - PR10 – Information Disclosure and Stakeholder Engagement.

With reference to EBRD ESP 2012, Appendix 2, this project is proposed to be categorised as Category "B" . A project is categorised B when its potential environmental and/or social impacts are typically site specific, and/or readily identified and addressed through effective mitigation measures. EBRD will determine the scope of environmental and social appraisal on a case-by-case basis. Category B projects do not require EBRD disclosure of key ESIA documents over and above the requirements of PR10.

2.9.4 Equator Principles

The Equator Principles (EPs) are voluntary standards signed up by various financing institutions to serve as a common baseline and risk assessment framework. EP4 includes ten principles covering:

- Review and categorisation
- E&S Assessment
- Applicable E&S Standards
- E&S Management System and EP Action Plan
- Stakeholder Engagement
- Grievance Mechanism
- Independent Review
- Covenants
- Independent Monitoring and Reporting
- Reporting and Transparency

This project is likely to be categorised as "Category B". As such, it must apply the requirements of the applicable IFC PSs and WBG EHS Guidelines as defined above. The project must also implement effective stakeholder engagement, grievance management and an Environmental and Social Management System (ESMS). EP4 also sets out specific requirements relating to Human Rights in line with the United Nations Guiding Principles on Business and Human Rights (UNGPs) by carrying out human rights due diligence (HRDD) and improving the availability of climate-related information, such as the Recommendations of the Task Force on Climate-related Financial Disclosures (TCFD) to incorporate a Climate Change Risk Assessment (CCRA) for the assessment of potential transition and physical risks of Projects.

2.9.5 Good International Industry Practice (GIIP)

The Project will also follow GIIP. Including, but not limited to:

- Voluntary Principles on Security and Human Rights (est. 2000); (http://www.voluntaryprinciples.org/);
- United Nations Guiding Principles for "Protect, Respect and Remedy" Human Rights Framework (2011); (https://www.business-humanrights.org/en/un-secretary-generals-special-representative-on-business-human-rights/un-protect-respect-and-remedy-framework-and-guiding-principles);
- United Nations Code of Conduct for Law Enforcement Officials; and (https://www.un.org/ruleoflaw/blog/document/code-of-conduct-for-law-enforcement-officials/);
- United Nations Basic Principles on the Use of Force and Firearms by Law;
- Use of Security Forces: Assessing and Managing Risks and Impacts (February 2017);
- Worker's Accommodation: Processes and Standards (Guidance Note by IFC and EBRD, 2009), and
- Stakeholder Engagement: A Good Practice Handbook for Companies Doing Business in Emerging Markets, 2007.

2.10 International conventions and agreements

Fundamental conventions and agreements (in addition to the ILO conventions mentioned in Table 9 signed and ratified by Uzbekistan that are relevant to the Project are provided in Table 10.

Table 10: Conventions relevant to the Project that have been ratified by Uzbekistan

Convention name
ENVIRONMENT / CLIMATE CHANGE
United Nations Framework Convention on Climate Change (UNFCC) (New York, 1992) (Official Gazette of RM no. 61/97) including Paris Agreement (joined April 2017)
United Nations Convention on Biological Diversity (Official Gazette of RM no. 54/97)
United Nations Convention to Combat Desertification (UNCCD) (26/12/2006)
Convention on the Prohibition of Military or Any Other Hostile Use of Environmental Modification Techniques (05/26/1993)
Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal (12/22/1995)
The Convention on the Protection and Use of Transboundary Watercourses and International Lakes
Convention Concerning the Protection of the World's Cultural and Natural Heritage (ratified 1993)
Convention for the Safeguarding of the Intangible Cultural Heritage. Paris (ratified 2008)
Convention on International Trade in Endangered Species of Wild Fauna and Flora (07/01/1997)
Convention on the Conservation of the Migratory Species of Wild Animals (Bonn Convention) (05/01/1998)
Convention on Wetlands of International Importance, especially the Water Fowl Habitats of Aquatic Birds (Ramsar Convention) (1975) (ratified 2001)
Vienna Convention for the Protection of the Ozone Layer (1985).
Montreal Protocol to Protect the Ozone Layer (including 1990 and 1999 amendments)
Convention on Environmental Impact Assessment in a Transboundary Context (Espoo, 1991) - the 'Espoo (EIA) Convention'
Convention on Access to Information, Public Participation in Decision Making and Access to Justice in Environmental Matters (Aarhus Convention) (Official Gazette of RM no. 40/99

3 Project Description

3.1 Summary of needs case and analysis of alternatives

Uzbekistan has abundant renewable energy resources (solar and wind) and renewable generation potential, largely untapped. This potential has remained virtually untapped due to a lack of incentives, experience, historically subsidised natural gas prices for the country's gas-fired thermal power plants that constitute over 80% of the total power generation capacity, and low tariffs.

The Government of Uzbekistan (GOU) aims to increase its power supply and has adopted the 2030 Energy Strategy, which defines several objectives and directions for electricity supply between 2020-2030. One of the Energy Strategy objectives includes developing and expanding renewable energy use and its integration into the unified power system. To fulfil this objective, the Government of Uzbekistan intends to "Ensure diversification in power and heat energy sectors through the increased share of renewable energy sources and creation of renewable energy investment project mechanism utilising PPP [public-private partnership] approaches, enhancement of government policies related to the development of renewable energy sources, demonstration of renewable projects".

In May 2019, the laws of the Republic of Uzbekistan, "On the use of renewable energy sources" and "On public-private partnership", were adopted. Thus, a regulatory and legal framework has been created to accelerate the implementation of renewable energy projects such as this one. Uzbekistan plans to increase the share of renewable energy sources to 25% by 2030.

The Nur-Bukhara PV Project is part of the Uzbek Solar 3 program, which aims to enable the rapid roll-out of competitively priced, utility-scale solar PV power in Uzbekistan through a largely standardised joint World Bank Group (World Bank, IFC and MIGA) solution based on a templated Public Private Partnership (PPP) transaction.

The Project aligns with the Uzbekistan Energy Sector Strategy (BDS18-237(F)), the Green Economy Transition approach (BDS15-196(F)) aimed at supporting cleaner production and distribution of energy through greater energy and resource efficiency. The Project is also part of a more comprehensive program to help the broader integration of renewables into the national grid.

The ESIA report will document the information on the decision making relating to the following:

- No project alternative
- Site and layout alternatives
- Grid connection alternatives
- Technology alternatives
    - solar versus other energy generation technologies)
    - battery technology selection

3.2 Project location and setting

The Project site is a 691-ha trapezoid-shaped site surrounded by the Amu-Bukhara canal to the North, South and East. The Site is approximately 24 km South of Alat city and about 25 km from the border with Turkmenistan. Two main communities are close to the Project site Kirlishon and Kulchovdur with about 2,000 residents, and approximately 700 residents respectively (see Figure 2). The site is adjacent to national road R78 on the north. The Amu Bukhara canal borders the site to the North, East, and South, with small wetlands located more than on kilometre to the West of the Project area (see Figure 2).

The reference Universal Transverse Mercator (UTM) coordinates (Zone 41) are:

Table 11: Site coordinates

Coordinates UTM Zone 41	
X	593086.775
Y	4353389.886

The Site is relatively flat, with a slight slope towards the Southern direction in the upper parts of the Site. The Site is predominantly bushy shrubs. There are remnants of dismantled OHTL tower footings from a OHTL that used to cross the site (refer to Figure 3).

Figure 3: Sandy desert on the Project site

Figure 4 Calligonum Bushes on the Project site

Figure 5: Unpaved Road along the canal

Figure 6: Remains of the OHTL foundations on the Project site

Figure 7: Asphalt road and existing OHTL along the western border of the Proct site

Figure 8: Amu-Bukhara canal

Figure 9: Mining area within the Project site footprint

Figure 10: Wider Project area

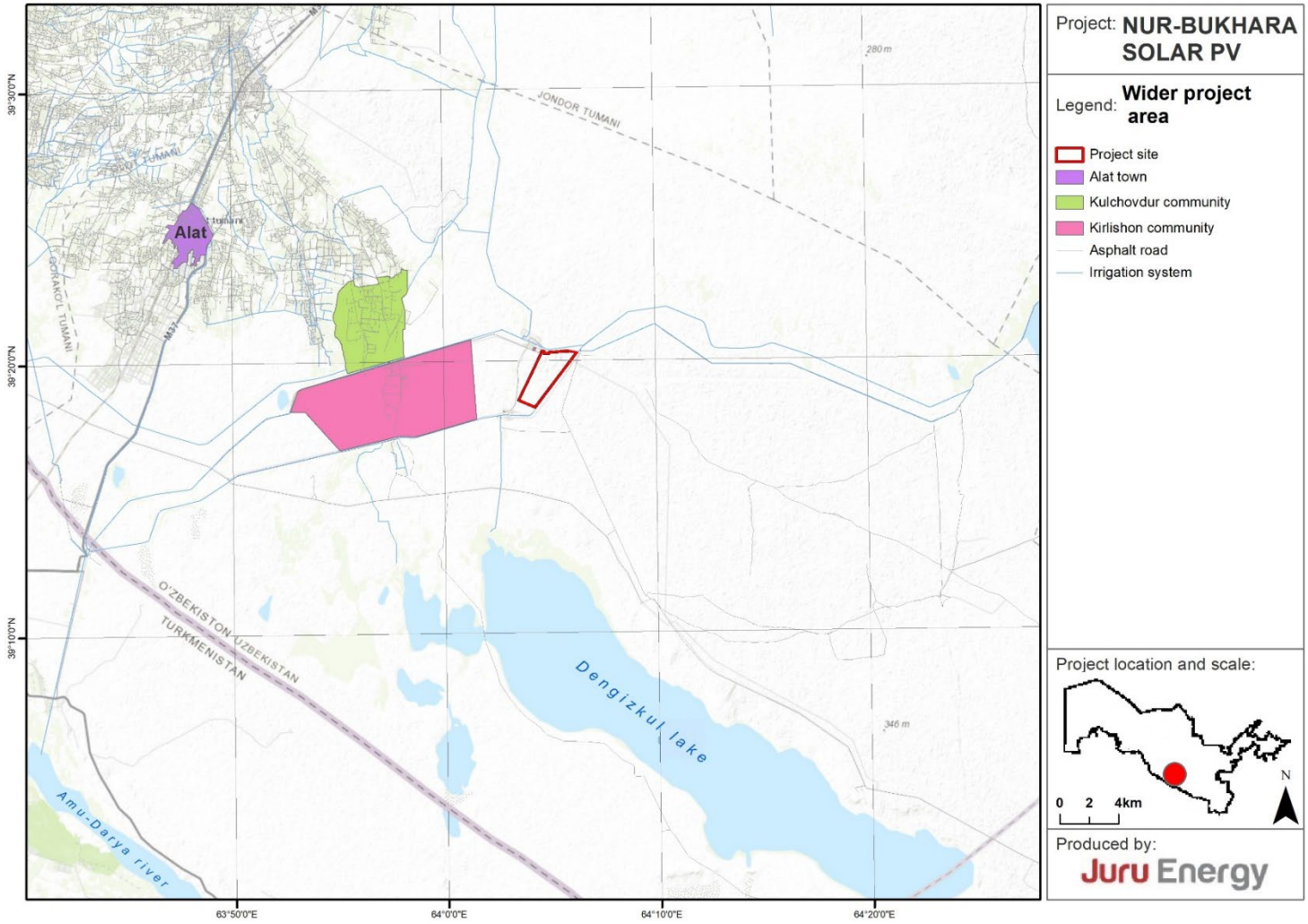


Figure 11: Project setting (map view)

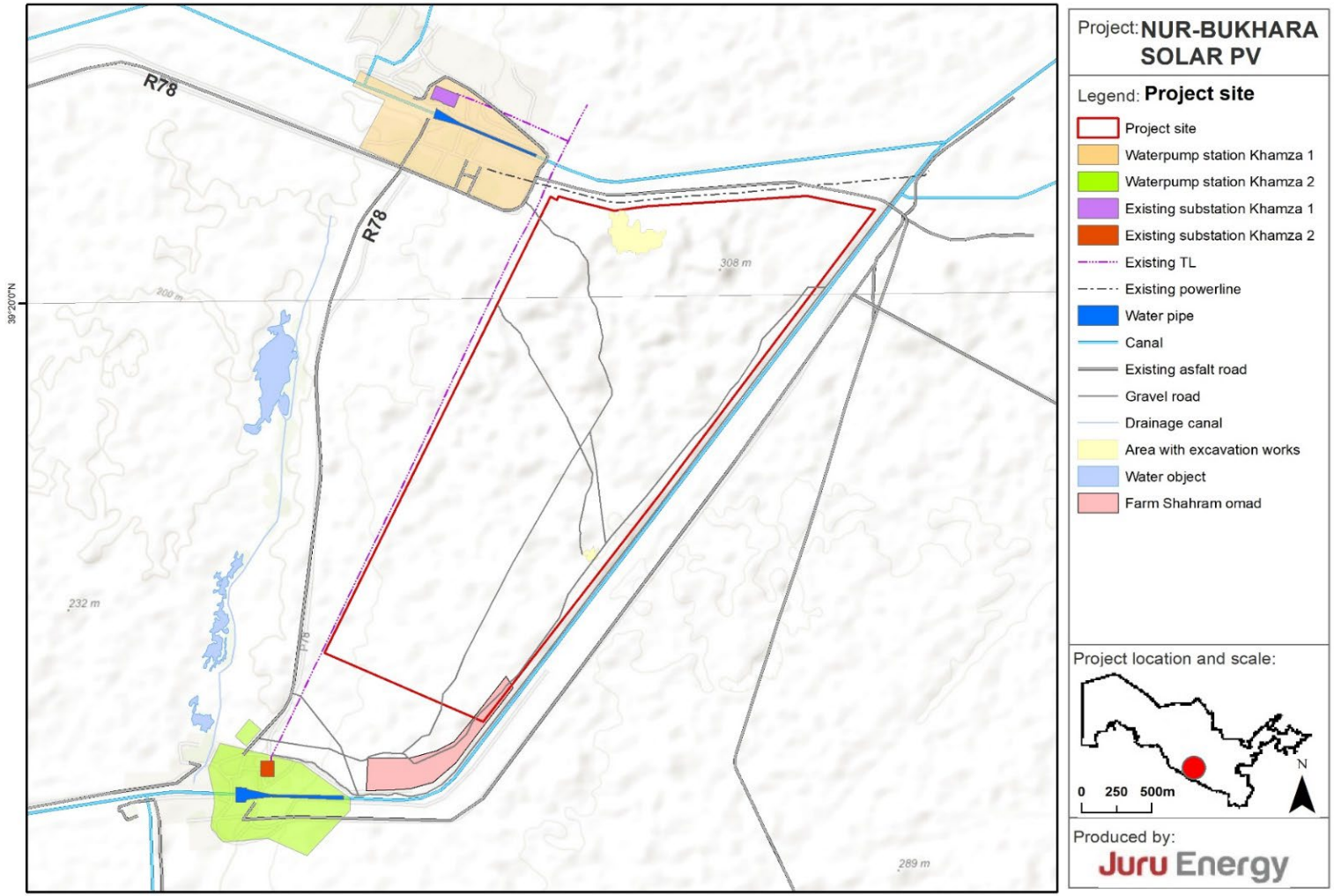
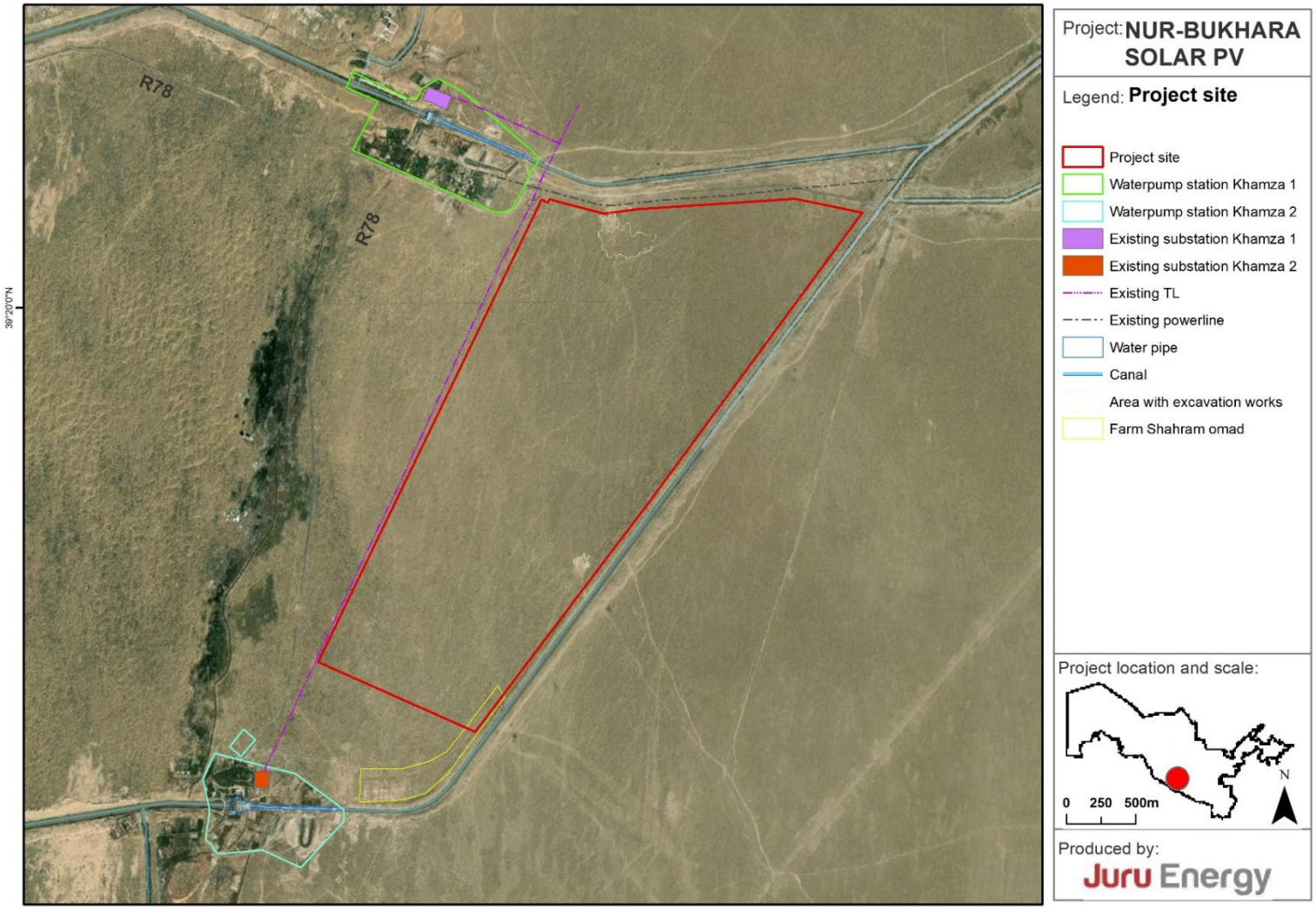


Figure 12: Project setting (aerial photo view)



3.3 Project receptors

In addition to residents of Kirlishon and Kulchovdur communities there is a small community within the existing Khamza 1 substation compound (see Figure 4) comprising approximately eight families living in six households (there are about ten houses, but not all are inhabited). These people originate from and are considered part of Kirlishon community. There is also a worker accommodation camp within the Khamza 1 compound used by workers from the Chinese company CNTIC, which is undertaking construction works on the Khamza 1 substation. There are also workers from a different Chinese company CNNC Ind. undertaking reconstruction works at the Khamza 2 substation. They are located in a walled area just outside the southern part of the Project footprint (see Figure 14).

Although no seasonal herders were seen to be using the Project footprint, herders could use the area during the spring months. Four herder camps were identified in the area surrounding the Project footprint (see Figure 5). It is understood that these camps are only used during the spring months. The usage of these herder camps will be further explored during the next site visit.

One farmer has a lease agreement to farm 20 ha of land at the southern section of the project footprint. He uses approximately 4ha for agriculture which is not going to be impacted by the Project, but approximately 2-3 ha of land that he uses for grazing 30-40 cows between March and June will likely be impacted and he has built a stable on this land.

There are two areas on the Project site that have been subject to small-scale mining activities, but they have not been used for some time. There is a structure at the South of the Project footprint, which is not being used but is owned by the Khamza 2 substation.

Based on interviews, some people were identified as fishing in the canal. Khamza 1 and 2 substations (including the worker accommodation and the village members) and the Kulchovdur community all use water from the canals for drinking water, construction, and irrigation.

3.4 Project layout

The project layout is illustrated in Figure 14 and Figure 15.

Figure 13: Receptor map (project site and direct area of impact)

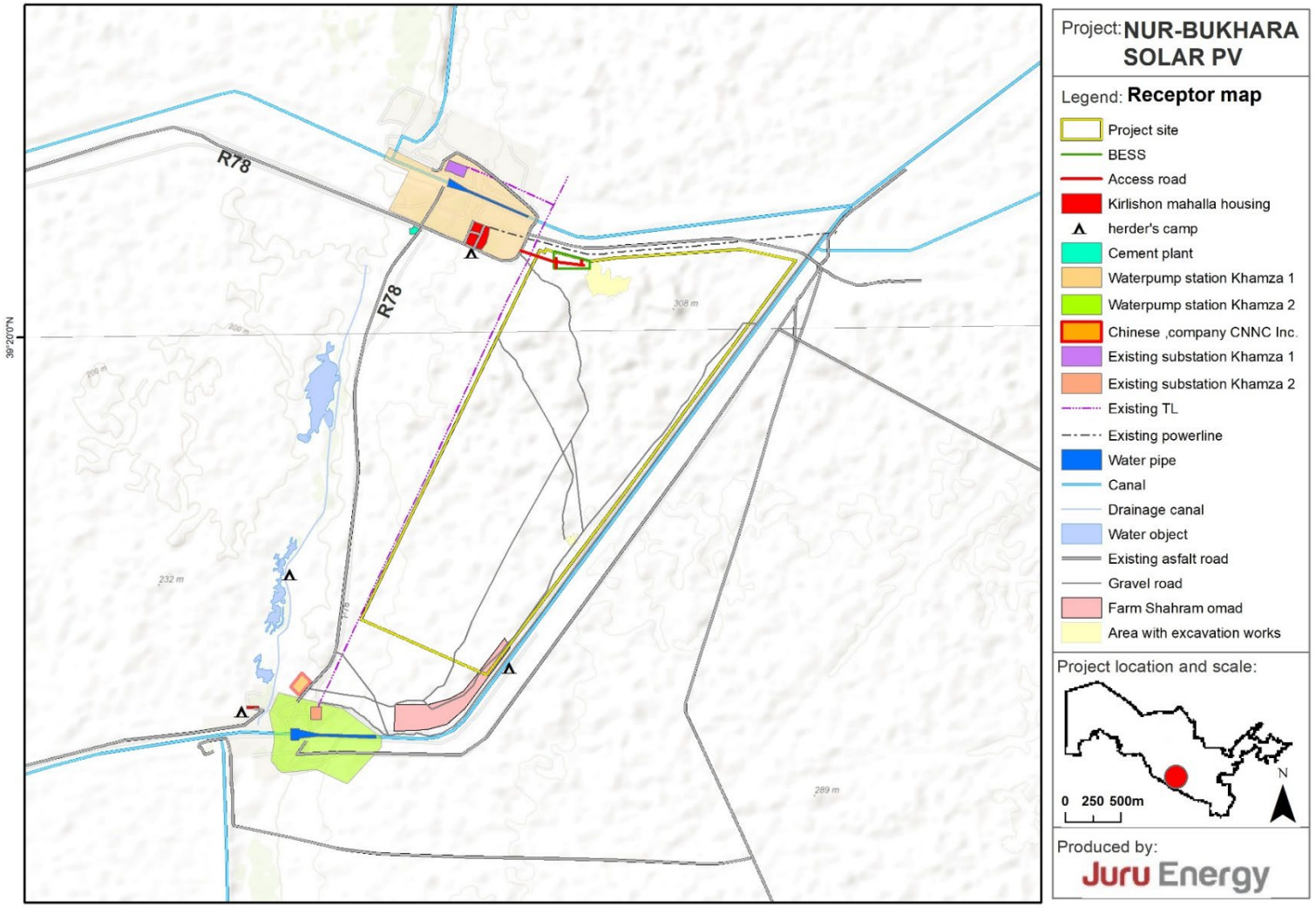


Figure 14: Site boundary

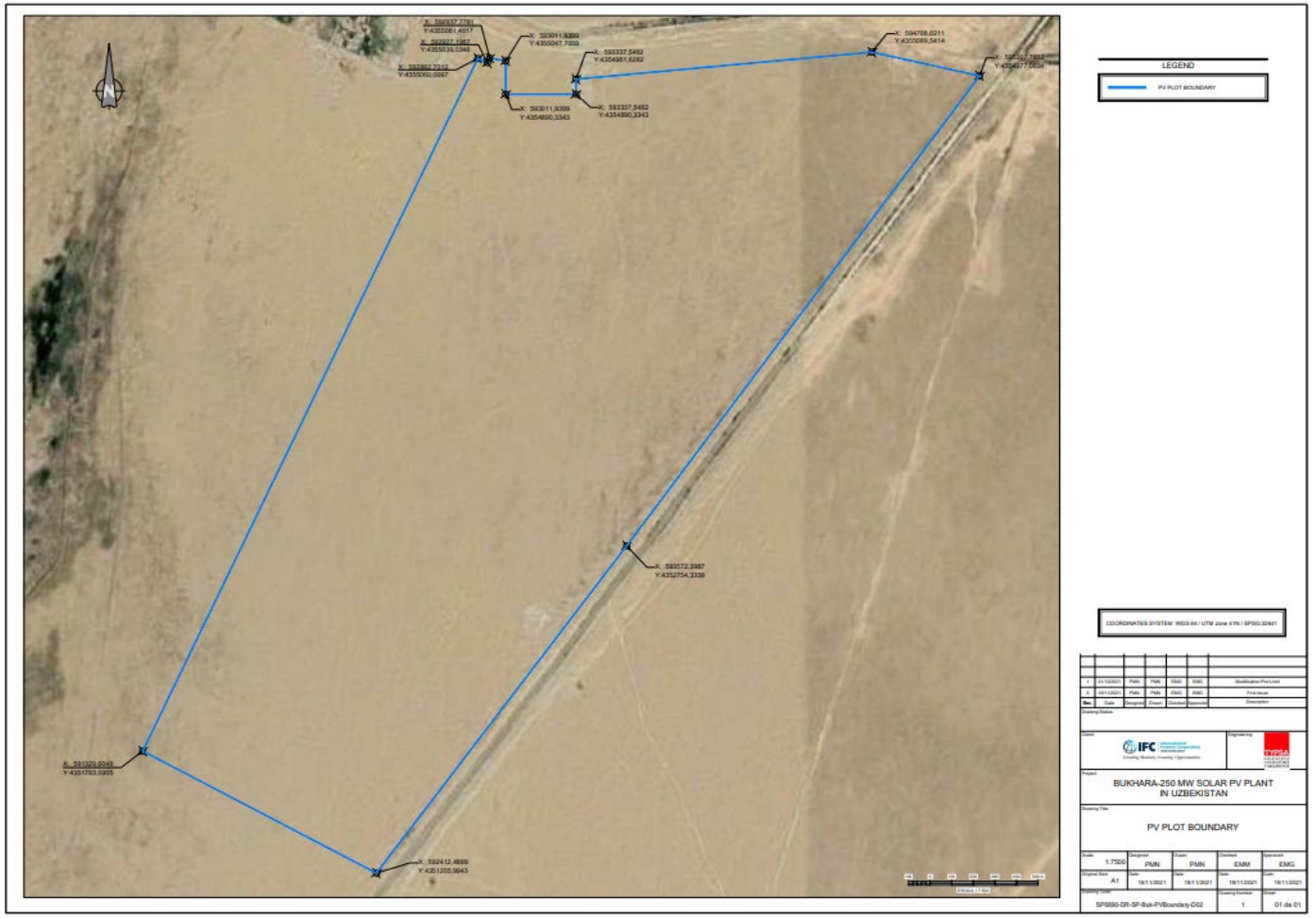
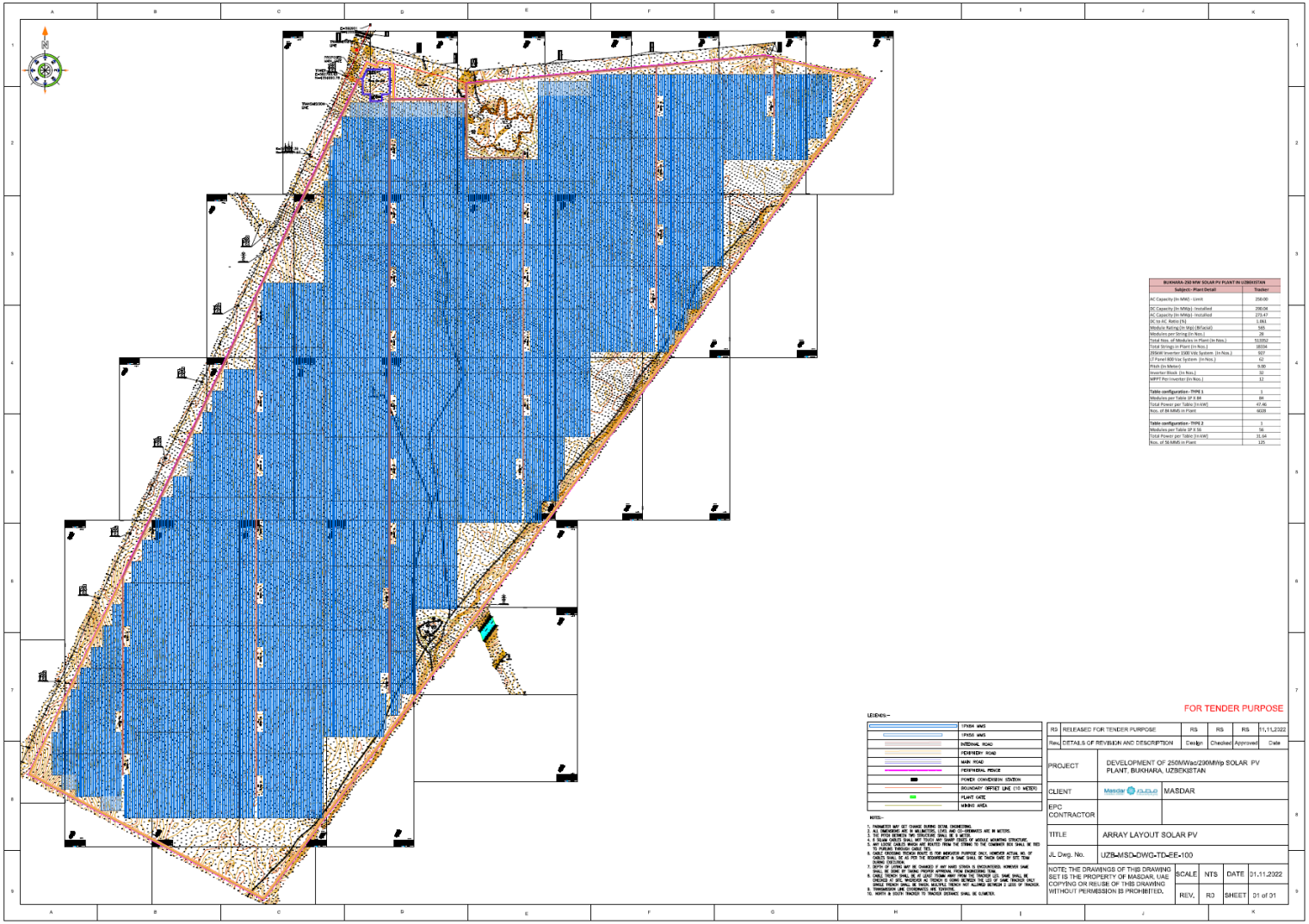


Figure 15: General configuration of PV plant with battery storage

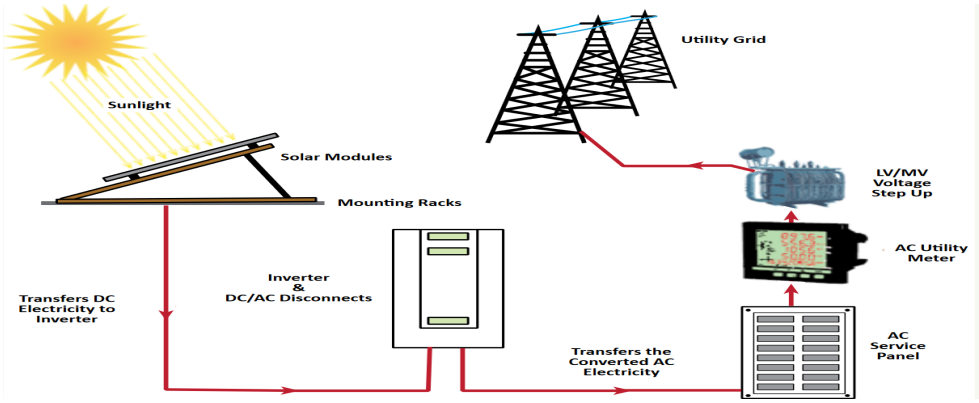


3.5 Project components

3.5.1 Overview

Photovoltaic (PV) power uses solar panels to convert sunlight into electricity by converting solar radiation into DC electricity. PV inverters convert the direct current will be transformed into alternating current, and the transformers (located in the Power Stations) will raise the voltage from Low Voltage (LV) to Medium Voltage (MV). Then, the energy generated will be conducted through an underground medium voltage (MV) network of 35 kV to the 35/220 kV Substation. An overview of the process is illustrated in Figure 15.

Figure 16: Overview of the PV process (compiled from IFC, 2015[11])



3.5.2 Primary component - PV Plant

A summary description of the primary components of the PV Plant is provided in Table 12.

Table 12: Description of PV Plant components

Project components	Summary description
PV panels and tracking system	Bifacial photovoltaic modules based on Half-Cut monocrystalline silicon technology will be used. Approximately 513,352 modules across about 18 strings (~28 modules per string) will be laid out as shown in Figure 6 for a total nameplate capacity of 290MWp. Each module is approximately 2.3m x 1.2m. (see Figure 16).
Trackers	The modules will be set on a horizontal (north-south) axis to track the sun's position. The structure of the trackers will be installed employing direct driving to the ground whenever possible to a minimum depth determined by the geotechnical studies. Only if direct driving is not possible will a pre-drilling method be used.
LV electrical Installation	The Low Voltage Electrical Installation is considered to refer to the downstream of the LV/MV transformers located in each of the Power Stations of the Solar PV Plant. It is the connection between PV modules on each string, between strings and string inverters and the inverters and the low voltage panel of the power station.

11 IFC 2017, Utility-Scale Solar Photovoltaic Power Plants, A project developer's guide

Project components	Summary description
Invertors	Inverters convert the DC electricity produced by PV arrays into AC electricity compatible with utility grids. In addition, PV inverters often provide system protection and data communications. A total of 927 inverters will be installed.
Medium voltage (MV) (35kV) internal cabling	The MV power station comprises the MV cells and the power transformer, which is responsible for raising the output voltage of the inverters (800 V) to 35 kV. An MV ungrounded power network connects the MV power stations with the 35/220 kV Substation. The MV cables will run in trenches (directly buried or under a tube, depending on the section).
Control System	The PV Plant's monitoring and control system will be based on open products on the market and will include the SCADA and the Plant's control system, as well as all the necessary equipment to communicate with the rest of the Facility's systems

Figure 17: PV Panels

Figure 18: MVS 8850-LV "Power Station"

3.5.3 Primary components - Battery Energy Storage System

Battery energy storage systems (BESS) can help address the intermittency of solar power and enable a power system to respond rapidly to large fluctuations in demand, making the grid more responsive and reducing the need to build back up power plants.

A BESS is a set of energy accumulators that, through an electrochemical process, can store electrical energy. The BESS consists mainly of batteries and a battery control and monitoring system (BMS). As depicted in Figure 19, the smallest, indivisible battery unit is called a cell, within which chemical reactions occur. Cells are connected within modules. These modules are equipped with voltage, current and temperature sensors to monitor the state of the cells. The modules, in turn, are connected inside cabinets, commonly called battery racks, until the desired system DC voltage level is reached at the design level. The battery racks also contain additional control and protection module. This BMS monitors the primary variables, such as voltages, currents and temperatures, at the level of the modules included in the rack and the cell. The stored power is transformed when needed by the power conversion system in the form of DC by the batteries into AC and vice versa by executing the appropriate current control to discharge and charge the batteries.

The BESS shall consist of:

- A power conversion system (PCS) suitable for outdoor installation on a user-furnished concrete pad or the user-furnished box pad.
- Lithium-ion battery with Design life expectancy rating of 10 years under site operating conditions,

suitable for outdoor installation, and a battery management system (BMS). Any replacement / modification required to meet Warranty requirement or design life shall be included in scope.

- An Energy Storage Unit as per type tested design and SOC
- DC Cables.
- Instrumentation and communication cables.
- Interfacing to meet statutory requirements and comply with Local Grid Code. All required hardware (AI & DI Cards).
- Fire Detection & protection system.
- HVAC system for BESS.

The BESS, and associated equipment, shall be provided in self-contained National Electrical Manufacturers Association (NEMA) enclosure(s) rated for the site conditions with adequate ventilation and multiple layers of protection. Hazad and fire protection includes gas extinguishing method using NOVEC1230 and water or liquid Fire Fighting (Suppression) System) (FFS) along with the detection of the combustible gas like hydrogen or carbon monoxide and their exhaust system. The FFS include smoke detector, control panel, alarm device, exhaust pipe and bump head. It uses clean fire suppression gas to minimize the second loss.

The BESS will likely include 4 containers of 40 ft containers with up to 3.32 MWh modular containers (see Figure 20). OEM provided thermal conditioning systems shall maintain ambient temperature within warranty requirements to minimise the chance of fire spread or thermal runaway (see Figure 22). The BESS components and associated ancillary equipment shall have working space clearances required by local code, and electrical circuitry shall be within weatherproof enclosures marked with the environmental rating suitable for the type of environment in compliance with NFPA 70. All BESS containers will be locked to prevent unauthorised access.

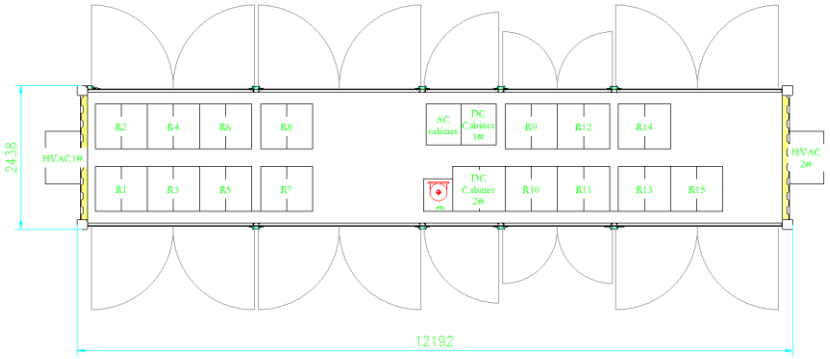
The areas between and around equipment will be finished with gravel and kept free of vegetation or other material that could act to spread a fire. The Project will have a dedicated emergency plan in place.

The operational period is 10 years after this time the batteries will be replaced.

Figure 19: A: Battery cell (175×27×200mm), B: Battery Pack (contains 40 battery cells), C: Battery Cluster (contains 18 battery packs).

There are 15 battery clusters in one battery container as per Figure 16

Figure 20: Typical BESS container



3.6 Substation and grid connection

The Project air-insulated substation will transform the generation and BESS output voltage levels to the utility one (220 kV) through two power transformers for the PV generation and another for BESS and the associated electrical devices. The arrangement shall be a single busbar with three transformer bays, two-line bays, three power transformers, and indoor MV and LV systems. Medium voltage switchgear shall be indoor, gas insulated (GIS) type and with the required functions (transformer, feeders, auxiliary services, capacitor bank, etc.). The substation shall have a control building incorporating the following systems:

- MV switchgear
- Protection and control panels.
- AC/DC auxiliary power supply panels.
- DC battery banks (in a separate room) and chargers.
- MV/LV transformer for supplementary services.
- Telecom panels.
- Other rooms (offices, warehouse, toilets, etc.).

The Project substation will connect to the existing overhead transmission line (OHTL), "Karaku'l 500 SS" - "Hamza-2 SS" (see Figure 3) from the Project 35/220 kV Substation via a short 220 kV Line-in-Line-Out (LILO) connection requiring approximately 300 m of new OHT infrastructure (see Figure 23) . About 200 m of existing OHTL will be dismantled to enable the new LILO link to be made. The connection from the substation to the existing OHLT extends approximately 10 m outside the boundary of the Project Site and does not require a new ROW to be established for this short connection system. The new section of OHTL will need one new lattice transition tower and approximately 200 m of new conductor and ground wire. No expansion to the existing right of way (ROW) is required for the new line within the current ROW. Setback requirements as per national law will be maintained. The interconnection system will incorporate protection, control and communication equipment meeting national and international standards.

3.7 Access road and internal roads

The access to the PV Project from Bukhara city uses the M37 highway, which connects Bukhara and Alat cities. From Alat city and the R-78 regional road, an asphalt road in good condition connects Alat city to Muborak District, which runs along the site's northern boundary. The Project will require a new junction with the (R78) at the location shown in Figure 21. Approximately 50 m of paved access from the new junction to the

substation compound will be constructed. A second access from the South may also be established to support emergency response/evacuation requirements, if required.

Figure 21: Existing R78 (photo)

The proposed internal road layout uses north-south oriented internal (paved/unpaved) service roads (4 m wide) to access the different inverters and areas of the PV plant and a few east-west internal service roads. The total length of the internal road network is approximately 41 km (refer to Figure 24).

Figure 22: BESS layout

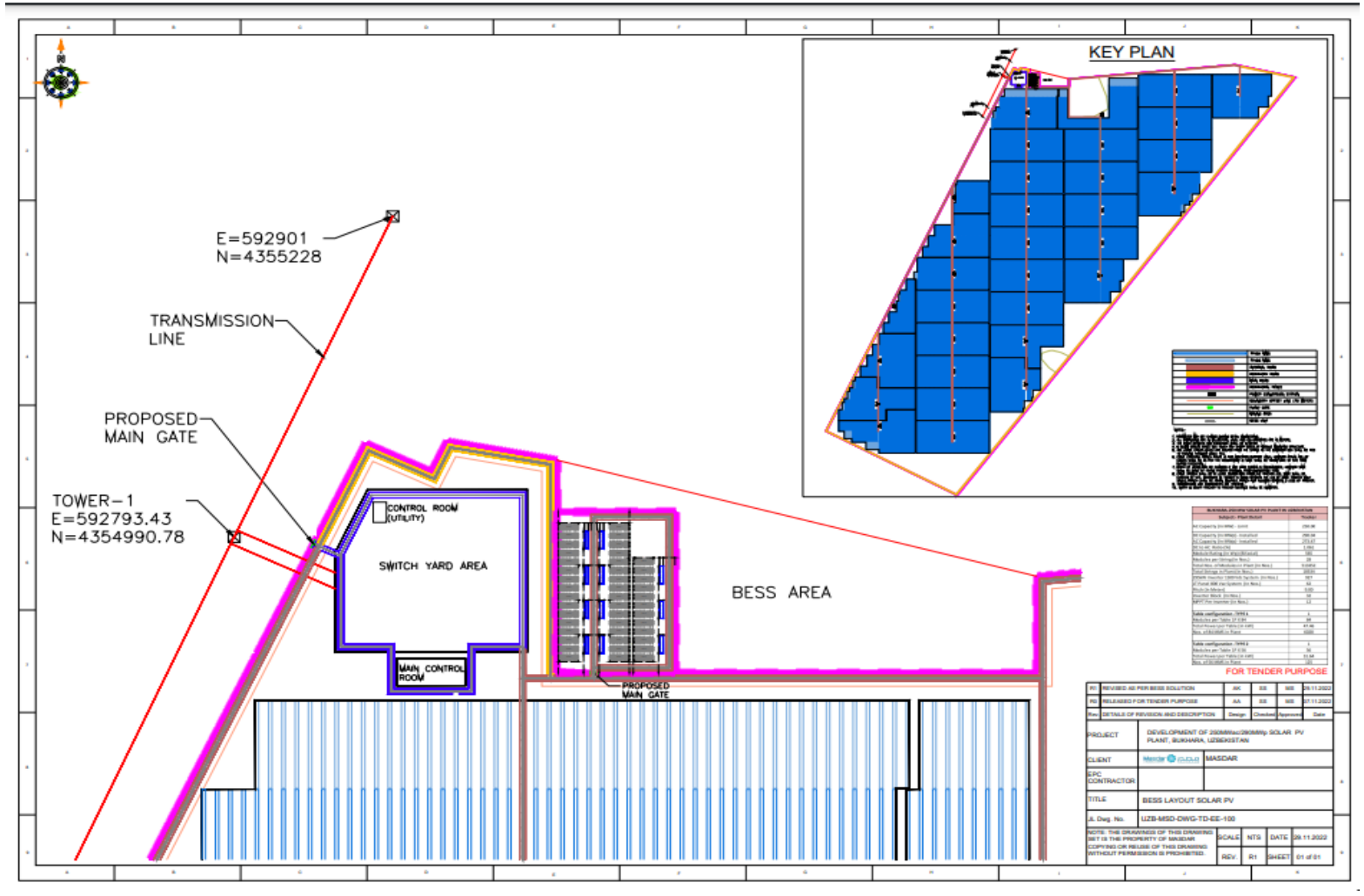


Figure 23: OHTL interconnection, substation layout (source: Typsa Scoping Report 2021)

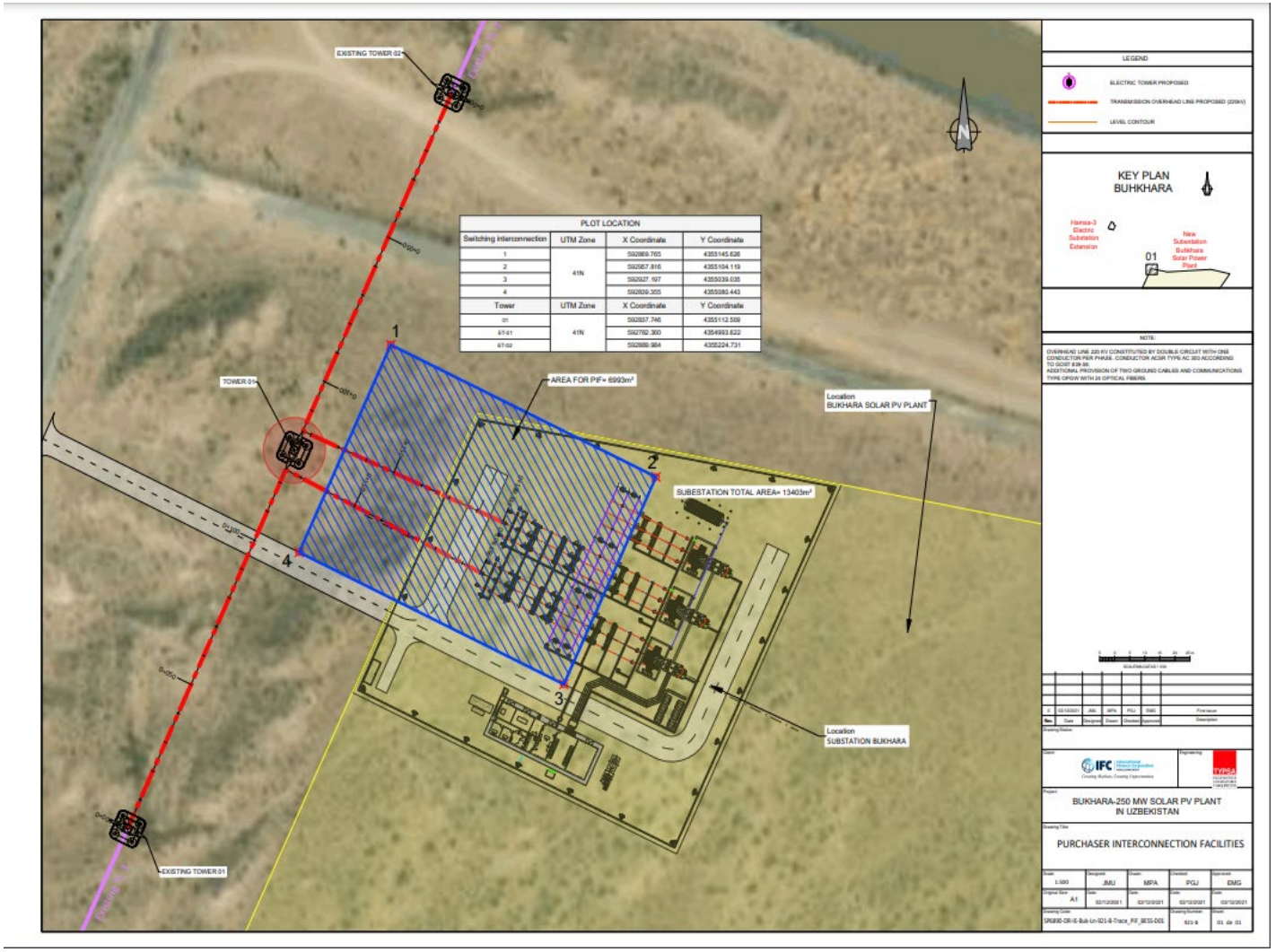
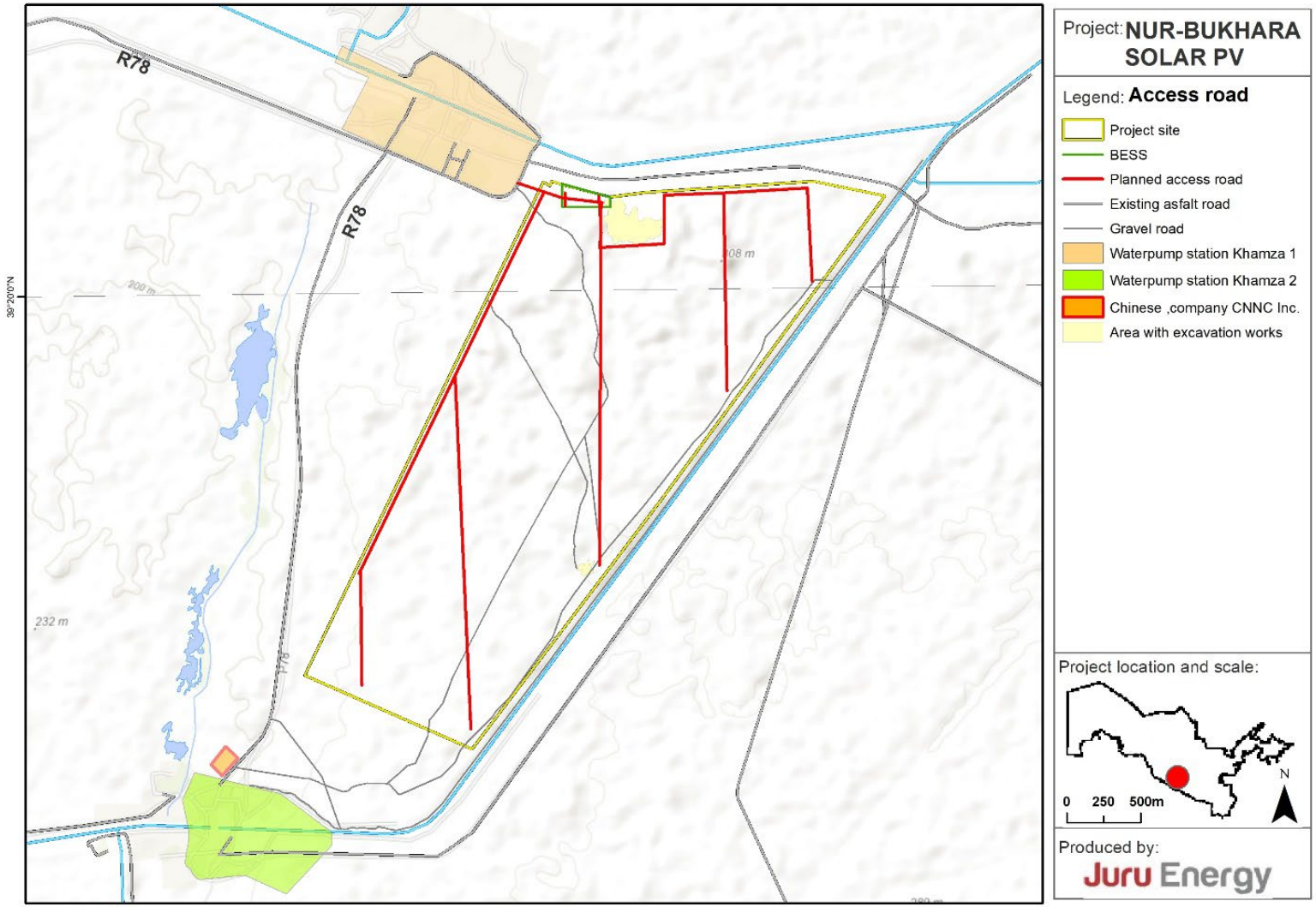


Figure 24: Access Roads



3.8 Water supply and treatment

The Project will require water for construction works and domestic use operations, as described in Table 13. Based on the projected water consumption volumes, the Project does not require long-term significant water storage or a dedicated water borehole. The following key assumptions regarding water use are highlighted:

- Cement batching will be undertaken using an existing offsite facility (the nearest existing concrete batching plant is ~2km from the project site, but the final supplier is still to be determined).
- During operation, dry cleaning will be used for module cleaning,
- Septic tanks of 2,500 litres will treat sewage water during construction and operation.

Table 13: Project water requirements

Phase	Task / Sub-task		Water quantity	Unit	Water quantity (m3/Year)
Construction	Human consumption	Potable water	3	L / person / day	296
		Non-potable water / Sewage water	27	L / person / day	2,661
	Construction activities	Dust mitigation	3,000	L / km road / day	10,496
		Soil compaction	15	L / m road	263
		Concrete curing	250	L / m³ concrete	120
		Cleaning machinery	500	L / construction machine / day	1,916
Total Construction Phase (m3/year)					**15,752**
Phase	**Task / Sub-task**		**Water quantity**	**Unit**	**Water quantity (m3/Year)**
Operation (O&M)	Human consumption	Potable water	3	L / person / day	11
		Non-potable water / Sewage water	27	L / person / day	99
	PV Module cleaning	Dry cleaning	N/A	L / MWp / cleaning	N/A
Total Operation & Maintenance Phase (m3/year)					**110**
Assumptions Construction Phase:					
Installed Peak Power (MWp)					300
Construction duration (months)					19
Number of daily workers (average)					270
Assumptions O&M Phase:					
Number of daily workers (average)					10

3.9 Associated facilities

Under IFCPS1, associated facilities are defined as facilities that are not funded as part of the project and that would not have been constructed or expanded if the project did not exist and without which the project would not be viable. No associated facilities as defined by IFC PS1 are identified in connection with this Project. No further consideration of associated facilities will be included in the ESIA.

3.10 Supporting infrastructure

Supporting infrastructure for the construction and operation phase includes:

- on-site buildings (operational control centre, office, and welfare facilities)
- diesel generator for emergency power supply
- guard house
- laydown area (temporary)
- new drainage system
- emergency response (fire suppression, hydrants, water storage tanks).

The PV Plant will have a storage drainage system that allows the evacuation of rainwater outside the PV Plant. The drainage system will consist of a perimeter drainage network and another ditch-shaped internal drainage network on the side of the interior roads where runoff water is collected. No groundwater is observed at the Project site however, the area will be kept dry by designing the buildings to enable runoff away from structures and to ensure drainage for both subsurface and surface water to protect foundations. Drainage design will be sized for 1: 100-year storms and consider future climate change predictions in sizing.

3.11 Security system

The Project security system will have the following features:

- perimeter security system
- access control system
- closed-circuit television (CCTV) system
- monitored and alarms in the access doors to the MV Power Stations or any other building of the installation.

The system itself will be responsible for automatically managing the alarm signals, first checking if it is an unwanted alarm. At the point of intrusion, the system will send a warning signal to the security centre and the person responsible will verify the alarm notify as necessary third-party security forces, firefighters, etc. During construction, security guards will employ additional security measures using permanent surveillance.

3.12 Land ownership status

The land is currently leased by the Sericulture and Wool Industry Development (SWID) Committee, which has the ability to provide LLA's to limited liability companies (LLCs) in order to farm the land or use it for grazing purposes. The allocated site will be provided to the Project via a Land Lease Agreement (LLA) between Nur Bukhara LLC and SWID. There is also one existing LLA that has been identified that overlaps with the proposed LLA. It is held by a farmer who has access to 20ha of land, 2-3 ha of which is within the Project footprint. There are also two abandoned mining areas, which will need to be further explored to understand

if LLAs are currently in place. For further information on land use see section 4.2.3. Land requirement for the access road are also required to be considered.

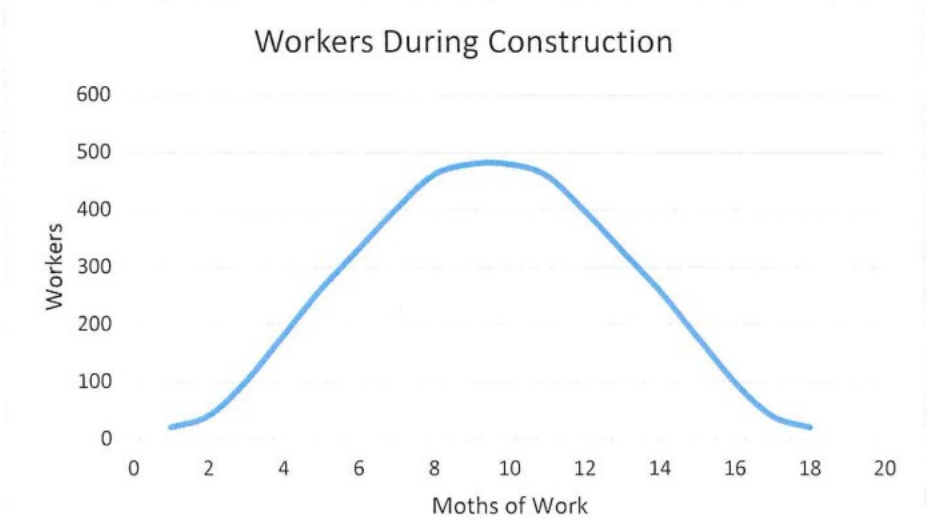
3.13 Project accommodation

Some construction accommodation at the Site is planned as illustrated in Figure 8. The accommodation will be designed and operated following the "Worker's Accommodation Processes and Standards": Guidance Note by IFC and EBRD1. In addition, the Project will allow Contractors to employ offsite accommodation provided it meets the guidance requirements of the above and adheres to the management and measures to be stipulated in the ESIA.

3.14 Project workforce

The PV Project construction phase will last up to 18 months. The following graph depicts the approximate number of workers (conservative) at each stage of the construction (civil work, electrical, mechanical installation and commissioning). The total workforce required during the peak construction period is approximately 250-500 workers (skilled and non-skilled).

Figure 25: Manpower plan



3.15 Project development process

The Project development process follows the following stages:

- Site selection/screening (including developing the project concept).
- Development (including assessment of technology and supplier options, contracting strategy, technical feasibility, E&S assessment, permitting and financing).
- Mobilisation (including detailed design, project implementation activities, local permit requirements, procurement and contracting).
- Construction (including mobilisation, site preparation, testing and commissioning).
- Operation.
- Decommissioning.

An overview of the project activities for each phase is presented below.

- Mobilisation phase
  - Transportation of civil construction materials to site
  - Storing of materials
  - Recruitment of local workforce / services
  - Identification of local materials
- Site set up
  - Preparation of accommodation facility
  - Procurement
  - Construction phase - civil works
  - Secure site
  - Construct internal access road
- Site clearance / excavations
  - Foundation works (including delivery of cement)
  - Cabling excavations
  - Transportation of abnormal loads materials to site
  - Construction of operations building, stores and maintenance yard
  - Enabling work
- Construction phase - mechanical and electrical works
  - PV/BESS infrastructure installation
  - Excavation for placement of tracking system
  - Construction of SS
  - Installation of SS equipment
  - LILO connection
  - Commissioning
- Operation phase
  - Operation of PV / BESS project.
  - Day to day maintenance
  - Periodic / planned maintenance
  - Monitoring
- Decommissioning phase (construction)
  - Reinstatement of excavated areas
  - Removal of construction materials
  - Rehabilitation of temporary storage and accommodation areas

3.16 Transportation of components

The PV and BESS system transportation from the factory will be a combination of sea and land freight. The main and alternative routing solutions are given hereunder:

- Direct Rail Route traditional route from China origins via Kazakhstan up to Tashkent hub;
- Sea Rail Route via Turkey alternative route, by sea to Mersin port in Turkey and further by rail to destination;
- Sea Rail Route via Baltic Sea alternative route, by deep sea to Baltic ports, and thereafter by rail to destination.

3.17 Maintenance

The PV and BESS Plant will be maintained and operated by skilled personnel, ensuring that the system is in optimal condition and that all parts are fully serviced and functional. Routine maintenance will likely be undertaken on the PV and BESS equipment twice a year. This typically consists of a major maintenance period and a minor maintenance period. The major maintenance is relatively non-intrusive and involves checking connections and inspections. This will encompass all PV and BESS equipment, including the fire system. Minor maintenance is typically a visual inspection and rectification of any accumulated noncritical defects.

3.18 Operation

During operation, all works on the Site will be controlled under safe work systems. This means all work is risk assessed to protect personnel and equipment. The PV Plant and BESS operation will be managed following the OEMP and an Environmental Social Management System (ESMS).

3.19 End-of-life disposal/decommissioning

With regards to the decommissioning of the PV and BESS components, the requirements will be determined during the ESIA for application during the procurement contract stage, these will set certain obligations in respect of PV components/battery return and disposal as well as other requirements.

3.20 Project schedule

The development schedule is anticipated as set out in Table 14:

Table 14: Current anticipated development schedule

Activity	Date
Scoping	March 2023
Consultation on national EIA	Late April 2023
Submission of national EIA	05 May 2023
Submission of draft ESIA	End of May 2023
Lender disclosure period	TBD
Finalise ESIA (including public consultation comments and ongoing studies)	May 2023
Early Work program/ Limited Notice to Proceed to EPC (site clearance and preparation works)	15 May 2023
Financial close	15 August 2023
Construction Start (civil works)	September 2023
1st Module Delivery at Site	February 2024

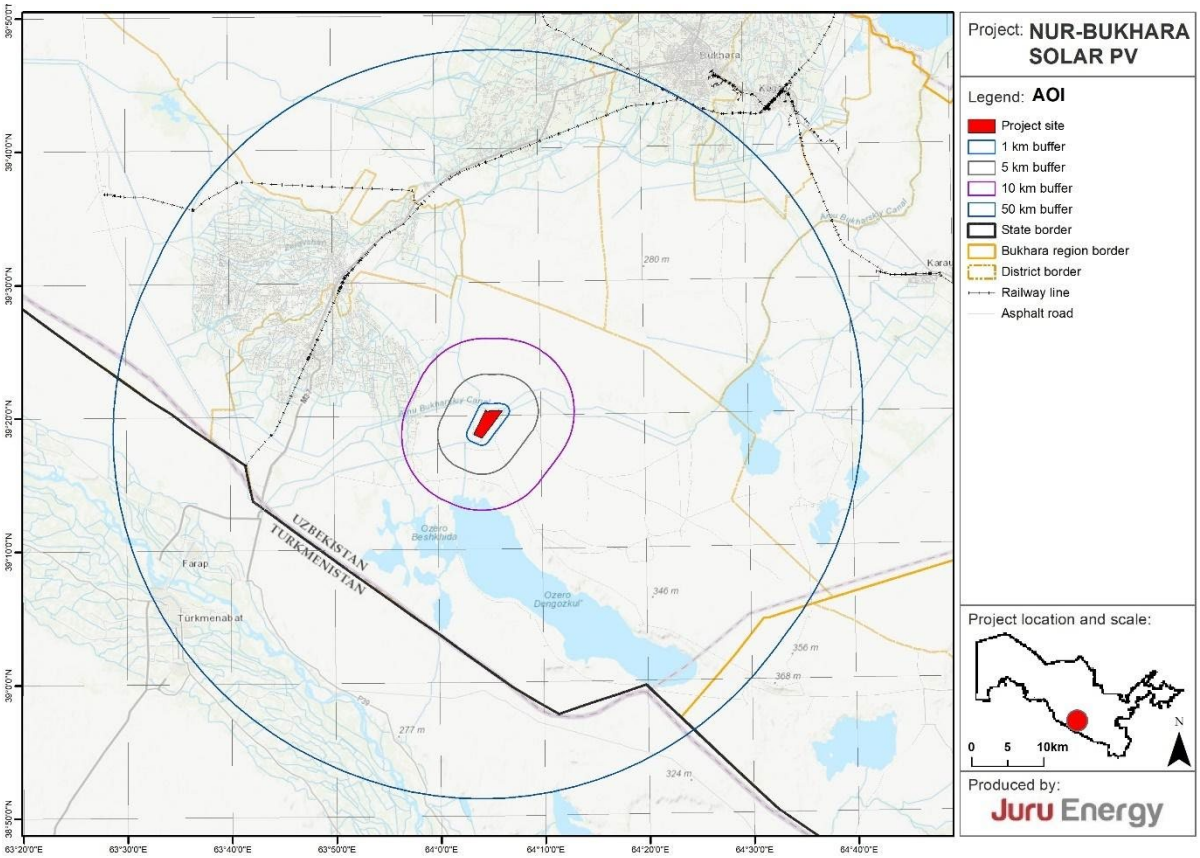
Activity	Date
Early generation	May 2024
Commercial Operation Date (FC plus 12 months)	16 August 2024
Expected Lifetime	25 years

4 Baseline Conditions

4.1 Area of influence

The general area of influence (AOI) is defined by where Project impacts may be felt or observed, e.g. the zone of visual impact or the distance from the working area where noise or air quality impacts may be identified. The indirect AOI area is defined as where secondary or induced benefits or impacts may be realized, including employment impacts or impacts from an influx of workers. The ESIA will define the direct and indirect AOI for each respective topic under consideration. For the scoping phase, a general AOI approximately 50 km from the Project site has been defined considering the potential avifauna risks and potential impacts and benefits on the wider communities in the AOI (Figure 26).

Figure 26: Project area and AOI



4.2 Baseline data collection, scoping site visit and receptor mapping

Baseline data collection to inform the scoping assessment has been obtained from secondary source information, including:

1. Desk-based review of laws, policies, reports from the relevant governmental and non-governmental institutions and existing national and international publicly available information data from websites.
2. Review of the IFC Environmental and Social Scoping Report – Bukhara Solar PV Project prepared by Typsa from 07/02/2022
3. Review of the IFC Critical Habitat Assessment – Bukhara Solar PV Project prepared by Typsa from 01/08/2022
4. IBAT PS6 & ESS6 Report. Generated under licence 1781-26131 from the Integrated Biodiversity Assessment Tool on 17 January 2022 (GMT). www.ibat-alliance.org
5. Site visit to identify physical, biological and socio-economic features on the Project site and 10 km AoI, in particular, to identify any:
    a. wells, boreholes on the Project site
    b. infrastructure utilities such as network cables, OHTLs, gas pipelines etc
    c. waste municipal landfills, disposals in the vicinity of the Project site
    d. existing concrete batching plant in the area
    e. existing OHTLs crossing the Project site
    f. soil contamination and air emissions sources (anthropogenic) cases.
6. Ground truth baseline locations for air, noise, soil and water baseline monitoring locations.
7. Understand the existing road quality
8. Understand surface water sensitivities outside the PV plant footprint (on the west side)
9. Perform terrestrial scoping ecology walk-over in the area of the proposed access road and OHTL connection
10. Consultations with local stakeholders and scoping meetings with local khokimiyats

The site visit was performed on 02 and 03 March by five representatives of JE:

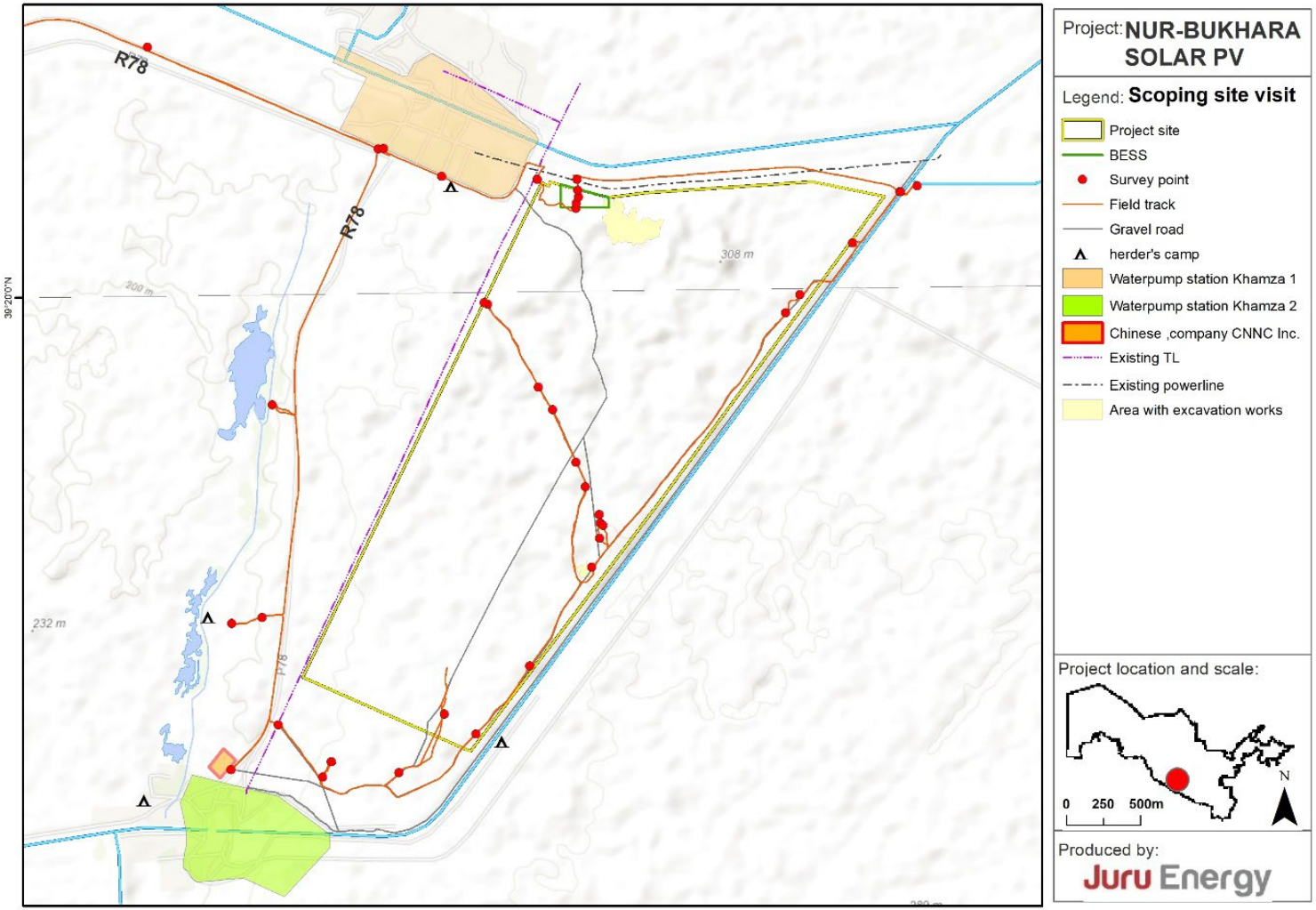
- Viktoria Filatova (senior environmental consultant)
- Anna Ten (senior biodiversity expert)
- Oleg Khegay (environmental consultant)
- Dinara Rustami (environmental consultant)
- Zilola Kazakova (senior social/resettlement consultant)

Figure 27 below presents the route track undertaken during the scoping site visit.

For the ESIA report, a comprehensive desktop review of available information will be undertaken to develop further the biophysical baseline, which will include governmental and non-governmental reports, scientific publications, available aerial imagery and maps of the area.

Further fieldwork will be undertaken to obtain additional primary data regarding the biophysical characteristics and cultural heritage around the Project area through observations and surveys by qualified professionals. The scope of this work is defined in Annex C.

Figure 27: Track route of the scoping site visit (March 2-3)



4.3 Physical Overview

4.3.1 Climate

Uzbekistan has an arid and continental climate characterised by large variations in temperature within days and between seasons. Large parts of the country (79% by area) feature flat topography either in the form of semi-desert steppes or desert zones, including desert areas in the far west that have formed due to the drying of the Aral Sea.

The majority of the territory of Uzbekistan is attributed to a moderate climate zone. According to the criteria of the UNESCO world map of desertification and the UN convention to combat desertification, the country has an aridity index from 0.03 to 0.20 which categorises it as an arid region, subject to intensive desertification and droughts. The southern part of the country is located in the arid subtropical climate zone. In the west, the climate is sharply continental with dry, hot summers and relatively cold snowless winters and a moisture deficit, with a significant excess of evaporation over precipitation. The remaining south-eastern areas have a continental climate, including the area covering the largest cities of Tashkent and Samarkand, and contain high mountains forming part of the Tien-Shan and Gissar-Alai Ranges12.. In general, temperature ranges vary across the country. Uzbekistan's desert regions can reach maximum temperatures of 45-49°C, while minimum temperatures in the southern parts of the country can drop as low as -25°C 13.

Alat district has a Mid-latitude desert climate (Classification: BWk), characterized as cold and semi-arid. The district's yearly temperature is 20.19ºC, which is 2.52% higher than Uzbekistan's averages. Alat typically receives about 11.91 millimeters (0.47 inches) of precipitation and has 27.79 rainy days (7.61% of the time) annually14.

IFC Environmental and Social Scoping Report prepared by Typsa provides data on the project site's climatology obtained from the stations located close to the site. The climate data was obtained from the Central Asia Temperature and Precipitation Data, which was operated by the National Snow and Ice Data Centre (https://nsidc.org/data/G02174/versions/1)15

12]https://climateknowledgeportal.worldbank.org/sites/default/files/2021-09/15838-Uzbekistan%20Country%20Profile-WEB.pdf

13 https://tcktcktck.org/uzbekistan/bukhara/dzhankel-dy

14 Alat, Bukhara, UZ Climate Zone, Monthly Averages, Historical Weather Data (tcktcktck.org)

15 IFC, Typsa, 2022. Environmental and Social Scoping Report – Bukhara Solar PV Project

Figure 28: Average monthly statistics of air temperature and precipitation

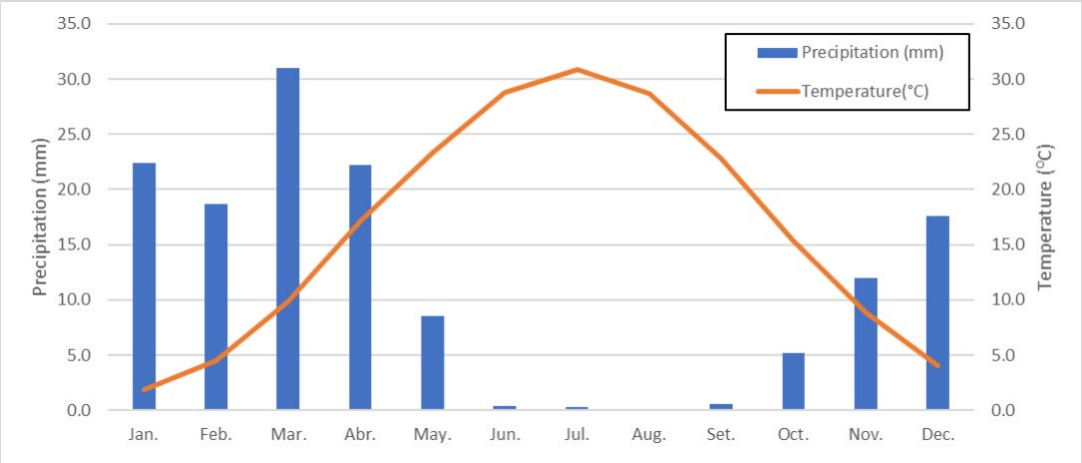
Source: IFC, Typsa, 2022. Environmental and Social Scoping Report – Bukhara Solar PV Project

Parameter	Jan.	Feb.	Mar.	Abr.	May.	Jun.	Jul.	Aug.	Set.	Oct.	Nov.	Dec.	Year
Temperature(°C)	1.9	4.5	9.8	17.2	23.3	28.8	30.9	28.7	22.8	15.4	8.8	4.1	16.4
Precipitation (mm)	22.4	18.7	31.0	22.2	8.5	0.4	0.3	0.1	0.6	5.2	12.0	17.6	139.1

The bar chart below shows monthly precipitation and temperature variability for the project site16.

Figure 29: Average monthly precipitation and temperature variability at the project Site

Source: IFC, Typsa, 2022. Environmental and Social Scoping Report – Bukhara Solar PV Project



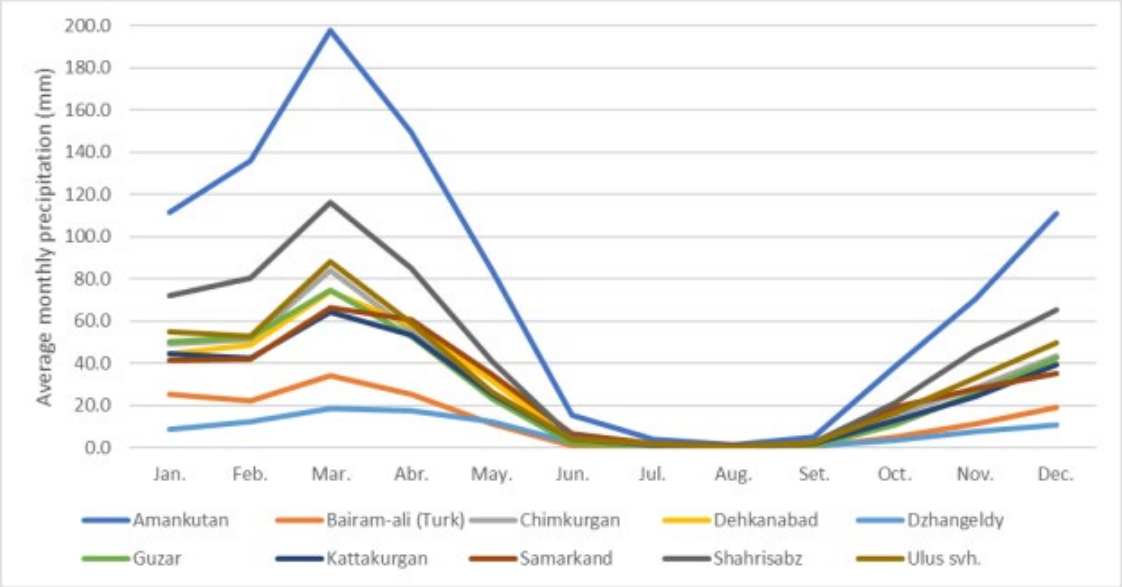
Precipitation data for 10 meteorological stations is shown in the next graph depicting very dry summers with most of the precipitation occurring between December and May 17.

16 TYPSA Hydrology and Hydraulic Report.

17 IFC, Typsa, 2022. Environmental and Social Scoping Report – Bukhara Solar PV Project

Figure 30: Average monthly precipitation for 10 stations.

Source: IFC, Typsa, 2022. Environmental and Social Scoping Report – Bukhara Solar PV Project



4.3.2 Climate projections

Uzbekistan is exposed to a range of weather-related extreme events, including dust storms, mudflows, floods, drought, and avalanches and is significantly threatened by climate change, with serious risks already in evidence.[18] Historical trends indicate an increasing average temperature of 0.13°C per decade between 1901 and 2013, rising more steeply (0.51 °C per decade since 1983) with a temperature increase greatest at low altitudes and more prevalent during the winter months. The average number of days with a maximum of 40°C in the central part of the Kyzylkum desert has increased from 10 days in the 1950s to more than 20 days in 2016[19] [20]. Uzbekistan climate projections, based on the Projections of the World Bank Climate Change Knowledge Portal, are as follows[21]:

- Increase in annual mean temperature of 1.3 to 2.1°C by 2030, 1.8 to 3.3°C by 2050, and 2.0 to 5.4°C by 2085.
- Increase in annual maximum temperature of 2.1 to 6.3°C and increase in minimum temperature of 2.2 to 5.6°C by 2085.
- There will be an increase in long-lasting heat waves from three to nine days by 2030, between four and 17 days by 2050, and between six and 43 days by 2085.
- Anticipated change in total annual precipitation ranges from a decrease of three per cent to an increase of 12 % by 2030 and a decrease of 6 % to an increase of 18 % by 2085, with most projections showing an increase.

18 World Bank's Overview of Climate Change Activities in Uzbekistan (October 2013)
https://openknowledge.worldbank.org/bitstream/handle/10986/17550/855660WP0Uzbek0Box382161B00PUBLIC0.pdf?sequence=1andisAllowed=y

19 Climate Service Center Germany. 2016. Climate-Fact-Sheet: Uzbekistan.

20 http://www.un-gsp.org/sites/default/files/documents/tnc_of_uzbekistan_under_unfccc_english_n.pdf The 3rd National communication of the Republic of Uzbekistan under the UN Framework Convention on Climate Change. Tashkent 2016.

21 https://www.climatelinks.org/resources/climate-risk-profile-uzbekistan Uzbekistan Climate risk profile, (17/02/2022)

- Likely increased precipitation between November and April, with precipitation in other months remaining stable or decreasing slightly.
- Dry spells are expected to grow longer by up to four days by 2085.
- An overall increase in arid conditions due to changing precipitation patterns and increased temperatures.
- Increased in the intensity of heavy rain events by 3 to 11 % and frequency by 7 to 36 % by 2030, and in intensity by 7 to 23 % and frequency by 12 to 74 % by 2085. [22,23]
- The number of hot days in Uzbekistan to increase by 28.6 days by 2040-2059, under a RCP 8.5 scenario.
- The number of tropical nights (minimum temperature above 20°C) is projected to increase over 31 days by 2040-2059, under a RCP 8.5 scenario[24].

4.3.3 Air quality

There are no anthropogenic sources of air pollution near the Project site except transport emission from the main road. Most soil conditions of the territory are sandy soil, making the site prone to dust generation.

4.3.4 Soils and topography

The site is located on a plateau close to the Turkmenistan border, in an area that could be considered basically topographically smooth, with a west-facing slope at the western side, and surrounded by two large hydraulic infrastructures (channels). The relief is mostly flat, undulating-hilly, due to the roughness of the bedrock relief, and partly, the development of the aeolian cover. The elevation along the working area ranges from 219 m to 237 m.

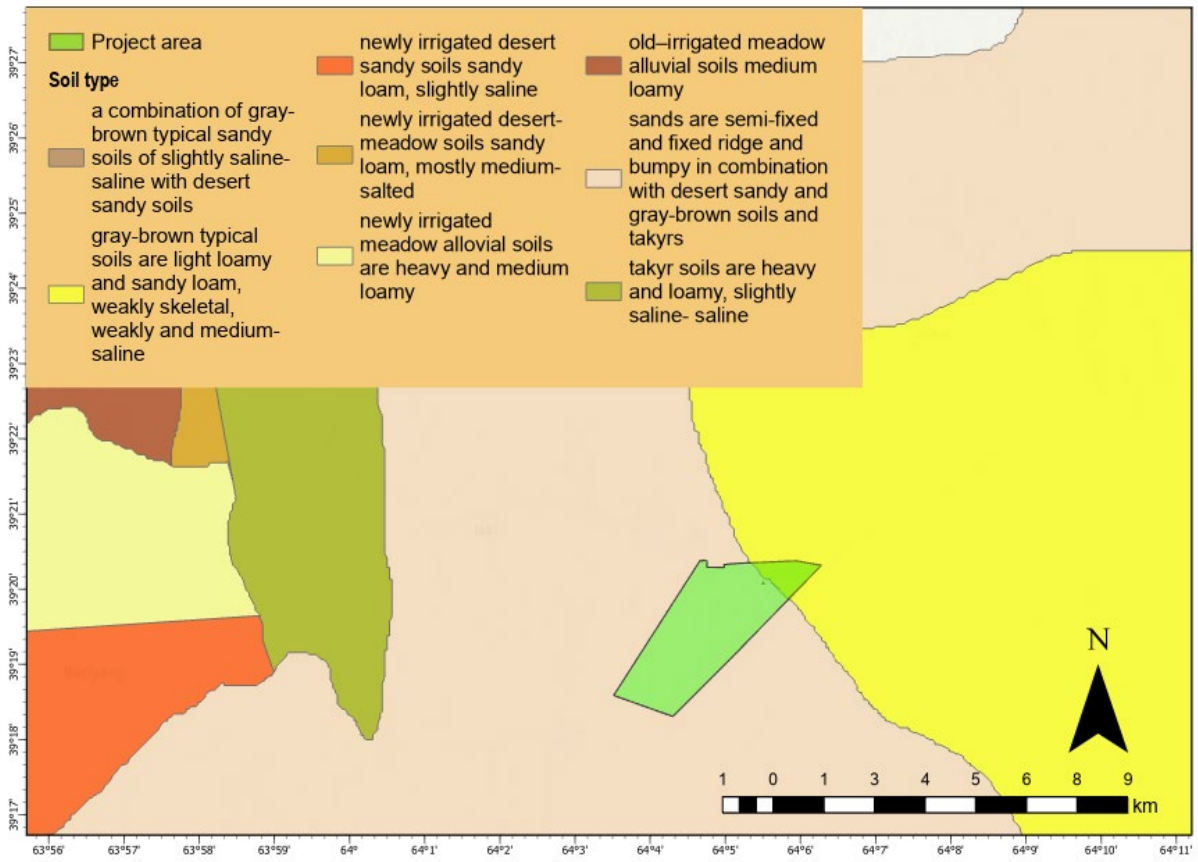
The project area is located in two soil layers. The variety of soil is presented in Figure 31.

22 Climate Service Center Germany. 2016 (https://www.climate-service-center.de/products_and_publications/fact_sheets/climate_fact_sheets/index.php.en)

23 Tashkent. 2016. Third National Communication of the Republic of Uzbekistan Under the UN Framework Convention on Climate Change.

24 RCP 8.5 is a high emission scenario also referred to as "business as usual".

Figure 31: Soil profile for the project area



(Source: Institute of Soil)

4.3.5 Geology and Seismicity

Uzbekistan's territory is related to the active tectonic structure of the lithosphere of Western Tian-Shan, the development of which results in the formation of deep fault networks.25 A considerable part of the territory of Uzbekistan belongs to the zone of seismic intensity VII (very strong) (MSK scale)[26].

In Uzbekistan and surrounding regions, there have been several earthquakes with magnitude ML ≥ 7 and intensity of ground shaking in epicentral areas I0 with 9–10 points by MSK-64 scale in historical and modern times. Therefore, maintenance of seismic safety of country is vital. Figure 28 shows the complex variant of Mmax constructed on the basis of seismological design techniques. In majority of cases, values of Mmax calculated by seismological and seismotectonic methods, fits each other (deviations were in range 0.2–0.4 magnitude units), which confirms reliability of made constructions.[27]

25 Mavlyanova N. et al (2004): Seismic code of Uzbekistan. Proceedings 13th World Conference on Earthquake Engineering Vancouver, B.C., Canada. August 1-6, 2004. Paper No. 1611

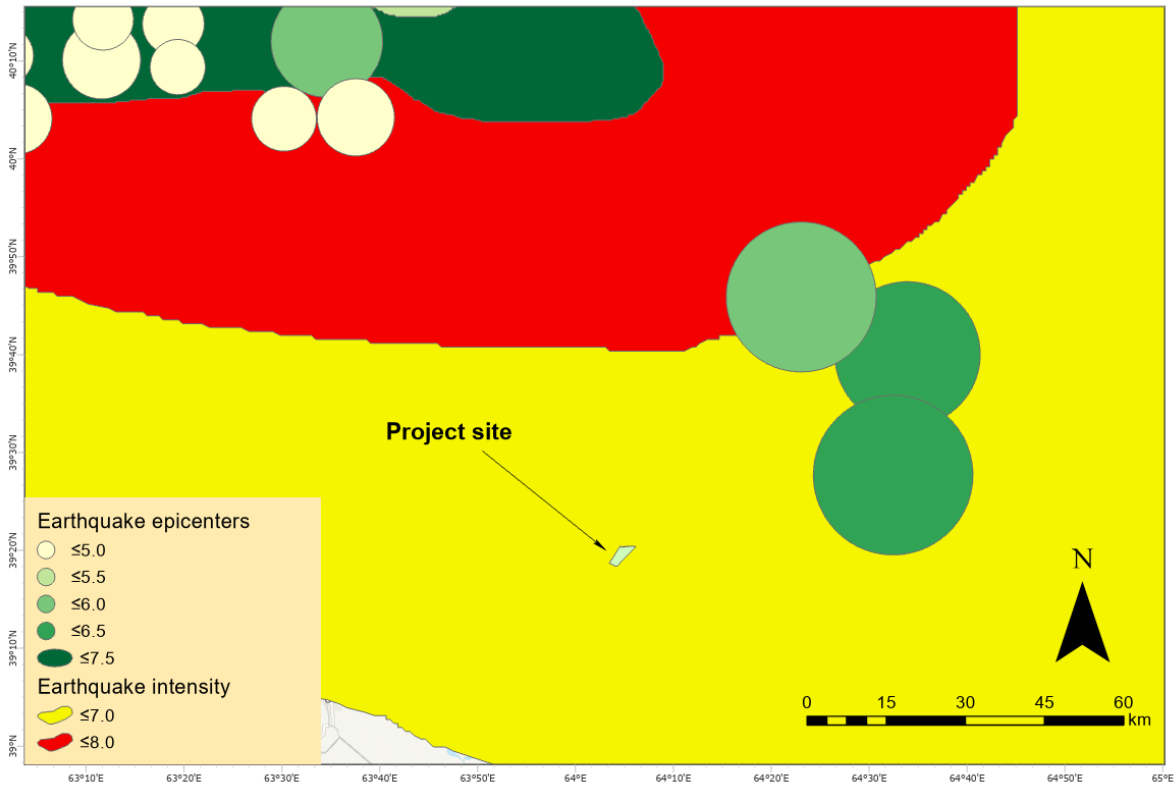
26 Medvedev-Sponheuer-Karnik (MSK) scale. This is similar to the Modified Mercalli Intensity scale used in the United States and Europe.

27 Complex of general seismic zoning maps OSR-2017 of Uzbekistan (Turdali Usmanalievich Artikov, Roman Solomonovich Ibragimov)

The collision of the Eurasian and Indian plates has led to a region of substantial crustal compression in Central Asia. As a result of this convergence and shortening of the crust, deformation occurs, leading to frequent high magnitude earthquakes throughout the region, including the eastern part of Uzbekistan.

Several seismically active zones exist in Uzbekistan, which align with significant tectonic deformation strike lines. These internal zones are capable of producing earthquakes with magnitudes of M ≥ 5.

Figure 32: Seismic zoning near the project area



(Source: E&S Scoping report by TYPSA)

4.3.6 Hydrology (surface water and groundwater)

No signs of temporary water bodies were observed within the site during the site visit as well as no wells or boreholes were identified. The Project site is located approximately 8 km from the Dengizkul lake (also a nationally protected area). As noted in general description the site is bordered by two large irrigation channels from north, east and south - Amu Bukhara Irrigation System (ABIS). One large temporary surface water area was observed outside the PV plant footprint to the west from the project area as well as a few smaller ones; these seem to be related to a drainage channel that runs from north to south around 800 m from the western boundary.

According to IFC Environmental and Social Scoping Report prepared by Typsa from 07/02/2022, the groundwater level regime on the Project site is determined by the flow regime of the Amu-Bukhara canal and the associated intensity of irrigation for crop fields. Groundwater was not encountered during the survey period (July 2021)28, up to the maximum investigated depth (15m). Further groundwater studies will be

28 Hydrology and Hydraulic Report prepared by Typsa from 21/09/2021

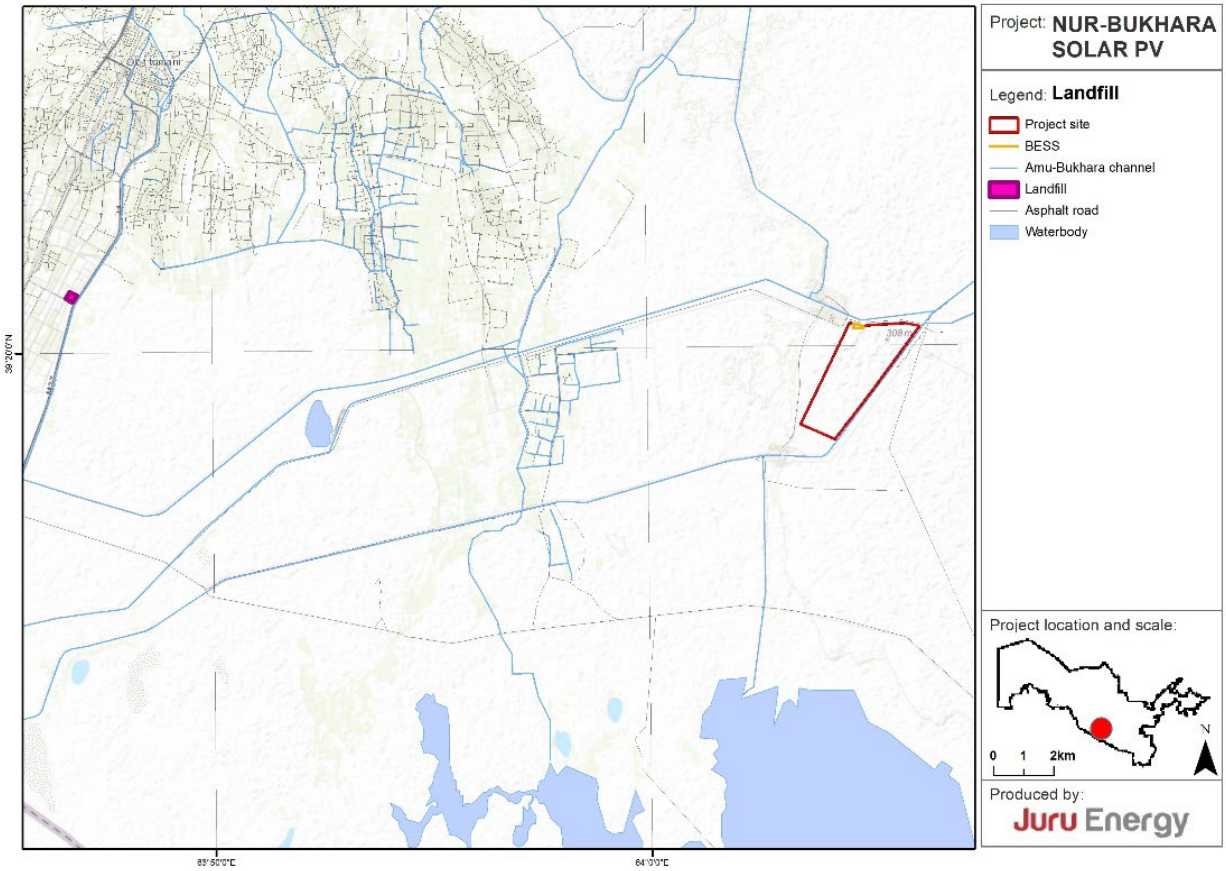
conducted during the pre-construction survey work to give more indication of the groundwater profile at the site. The relevance of the proximity of the Dengizkul lake will also be confirmed during this time.

4.3.7 Physical Infrastructure

Waste

Telephone consultations with the local municipality representatives revealed that the nearest landfill to the Project site is located approx. 36 km to the north-west of the Project site. The total area of the landfill is 6.24 ha. Half of landfill is owned by Bukhara region "Toza Hudud" State Unitary Enterprise while the other part is owned by Olotobod LLC. Only household waste is currently disposed at the landfill. No information on hazardous waste disposal options is available at this time.

Figure 33: Landfill in the vicinity of the Project site



Roads

A few country roads have been identified within the project area, these are assumed to have been used by local herders and for access to the mining areas. There is also an unpaved road along the eastern border of the Project site between the Amu-Bukhara canal and the Project site; it is not intended to use this road for the project. The R-78 regional (asphalt) road connects Alat city with the Project site and runs along the northern and western boundaries of the Project site, and this will be the main external route to the site. Low traffic levels were observed on R-78 road during the scoping site visit. Road M-37 connects Alat city with Bukhara (the regional centre of the Bukhara region).

Airfields

The closest airfields to the Project site are:

- Bukhara International Airport in Uzbekistan (57 km from the Project site)
- Turkmenabad International Airport in Turkmenistan (60 km from the Project site)

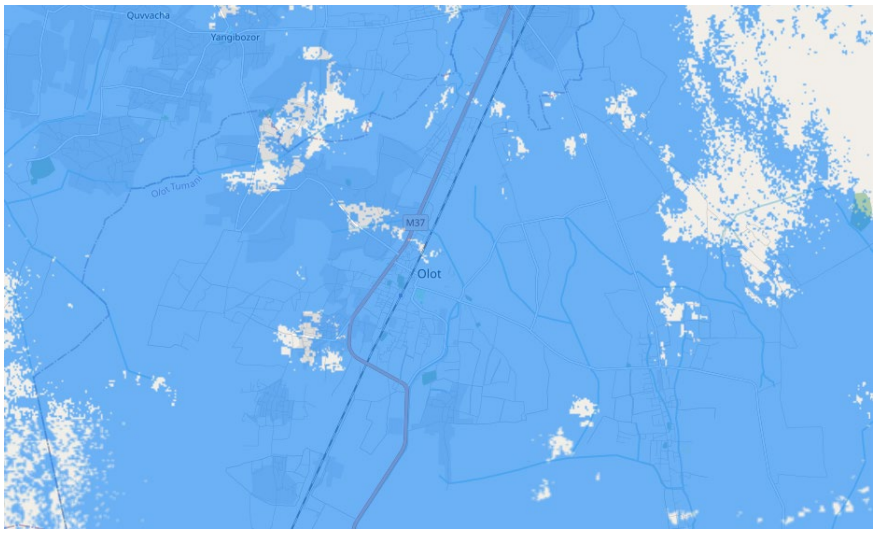
No public airfields were identified within 10km of the project site.

Communication network

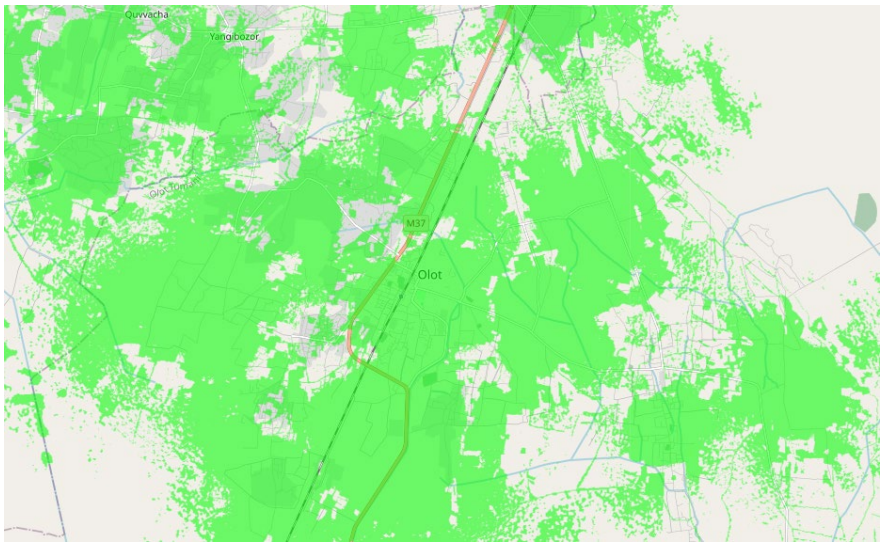
Mobile networks in Uzbekistan are available only in villages, and their working zones are not distributed in unpopulated areas such as the Project Site. It is possible to use 3G and 4G in most parts of the Alat district; Figure 29 below represents the coverage areas for Uzmobile as the provider with the best coverage in the AOI.

Figure 34: Mobile network coverage in the Alat district: a-3G, b-4G (Source: https://uztelecom.uz/)

a)



b)



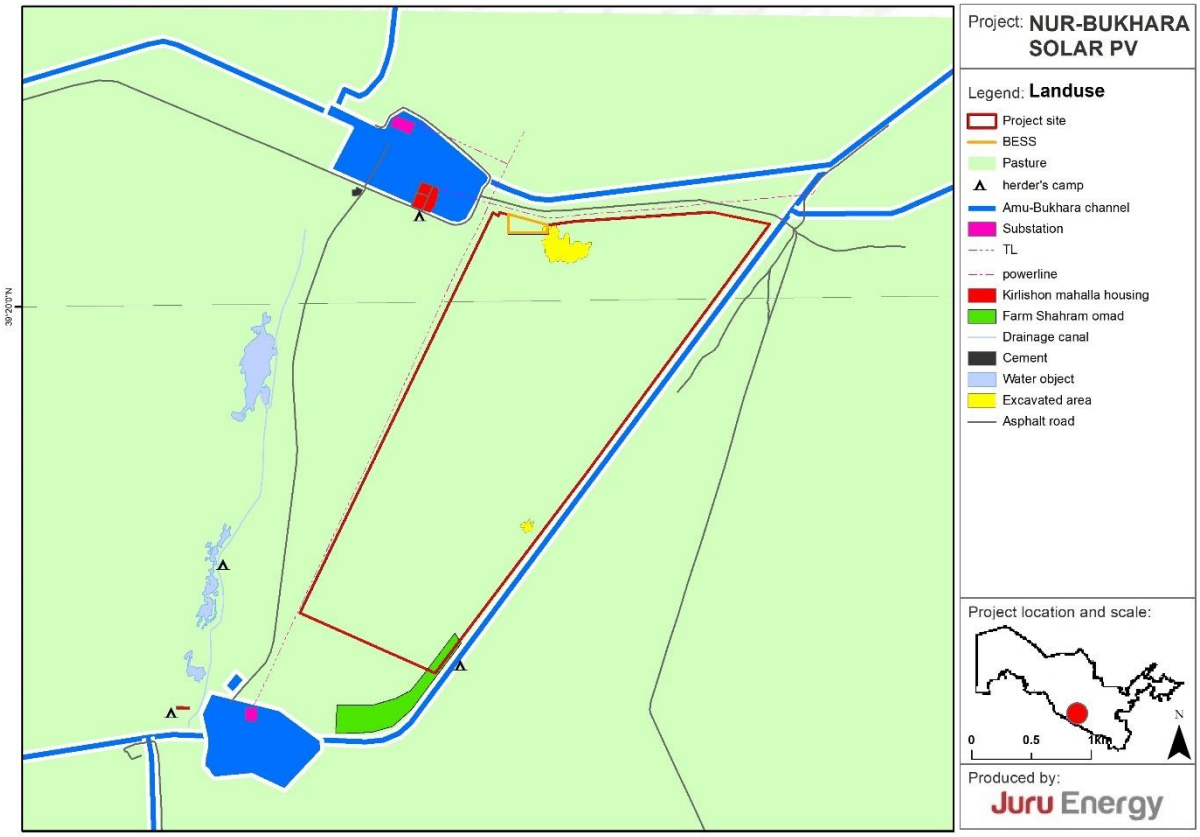
4.4 Land Use

Scoping site observation revealed that the Project site is in a desert area. The area is mainly covered with shrubs, and no crops are grown. According to the face-to-face consultations held with the Alat district municipality Cadastral Department, it was identified that the Project site belongs to the Sericulture and Wool Industry Development (SWID) Committee. This committee leases the land to limited liability companies (LLC) and herders to graze livestock under different terms and conditions. The Cadastral Committee confirmed that the Project land is not currently leased to LLCs or herders.

During the scoping site visits, local community members living in Kirlishon and Kulchovdur stated that they informally (i.e. without a lease from the SWID Committee) use the Project land for grazing their livestock seasonally at the northern part of the Project site: during the spring months of March, April and May. Some local community members have constructed temporary structures such as herder camps and stables that are only used during the spring months. These are outside of the Project footprint, except for one stable, which the Project may impact.

Figure 35 provides an overview of the Project land use.

Figure 35: Land use



A total of 20 ha of land located at the southern part of the Project site is used by a farmer who leases the land from the Alat district municipality. The land lease agreement was signed for 49 years and has only been in place for one year. The farmer uses 4 ha of land for agricultural purposes and plants alfalfa and wheat for his cattle; this growing area is not within the Project site. The remaining 16 ha of land is undeveloped, and a small portion of this 16 ha, approximately 2-3 ha, is within the Project site boundaries. The farmer commutes from

Alat district in his private car to undertake agricultural activities. The farmer uses water from the Amu-Bukhara canal to irrigate land, using his private pump.

In March, April and May, the land may be used to graze cattle and a temporary stable for the cattle and a herder camp (not within the Project footprint) is observed. According to the consultations held with the farmer, he plans to build permanent structures (stables) and start a cattle business.

Figure 36: Photo of potentially affected farm land outside of the Project footprint

Figure 37: Photo of temporary stable within the Project footprint

Figure 38: Photo of pump

Figure 39: Photo of potentially affected farmer

Two mining areas were identified during site observations with evidence of historical excavation works. No current mining activity was observed, which will be clarified during the ESIA process.

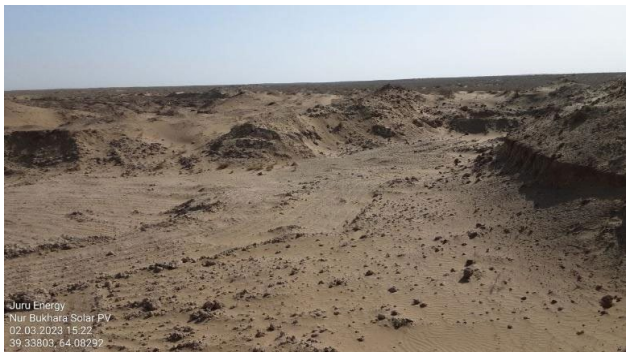


Figure 40: Excavated area located north of the Project site

Figure 41: Excavated area located south-east to the Project site

According to the phone consultations with the local municipality, the excavated area was used for soil extraction for historical construction activities. However, further details are subject to verifications during the ESIA stage with the Ministry of Mining Industry and Geology of the Republic of Uzbekistan.

The existing overhead transmission line (OHTL), "Karaku'l 500 SS" - "Hamza-2 SS" goes along the western border of the project site. The Project substation will connect to this existing line.

Figure 42: Existing OHTL

Figure 43: Existing OHTL crossing the irrigation channel

The Project site is surrounded by the Amu Bukhara Canal, which the Amu Bukhara Irrigation Systems department manages. During consultations with local community members, it was identified that canal water is used for drinking as communities are not supplied with potable water. It is important to note that canal water is also used for irrigation.

Informal fishers who do not have special permission for fishing in the canal were also observed during site observations, and it is suspected that people use the channel for swimming as well, but it was too cold at the time of the site visit to identify swimmers.

Figure 44: Informal fishing activities in the canal

Figure 45: Amu Bukhara Canal

During scoping site visits, a concrete batch plant belonging to China National Technical Import and Export Corporation (CNTIC) was observed north of the Project site. This company is engaged in reconstruction activities at the Khamza-1 substation. Reconstruction works started in 2019 and are expected to last until Q4 of 2024.

Near the batch plant, a temporary workers' camp was also identified. It accommodates approximately 130 CNTIC workers who work at the concrete batch plant and on the renovation of the Khamza-1 substation.

Figure 46: Photo of batch plant

Figure 47: Workers temporary camp

Site visit consultations identified that the Khamza-2 sub-station is being renovated by a China National Nuclear Corporation ("CNNC") and the renovation works are expected to be completed in Q4 of 2023. Another temporary workers' accommodation is located near the Khamza-2 substation and accommodates 70 Uzbek workers and 40 Chinese workers.

The reconstruction and renovation work at both substations use water from the Amu-Bukhara canal. The Ministry of Water Resources of the Republic of Uzbekistan is responsible for renovations works at Khamza-1 substation and Khamza-2 substation.

Figure 48: Khamza-2 station

Figure 49: Workers' temporary camp

4.5 Socio-economic overview

4.5.1 General characteristics

Administratively the Project site is located in Alat district of Bukhara region (refer to Figure 2). It is located 24 km southeast of Alat city, close to the border with Turkmenistan which at the closets point lies around 25 km southeast of the Project site. The proposed site is flat and is surrounded by the Amu-Bukhara canal to the North, South and East. The site has existing road access.

4.5.2 Description of region and district

Bukhara region

Bukhara region is situated in the southwestern part of Uzbekistan. It borders Turkmenistan, Khorezm region, Navoi region, Kashkadarya region, and the Republic of Karakalpakstan. The territory of Bukhara region is 39.4 thousand km². As of 1 January 2023, the permanent population in Bukhara region was 2,009,800 people. The administrative centre of the region is Bukhara city, located in the southwestern part of Bukhara region.

The agricultural, forestry and fishery sectors in Bukhara region, make up 9.4% of the total in the Republic of Uzbekistan. The region is focused of production of grains, potatoes, fruit and vegetables. Livestock products make up 48.0% of the total agricultural production. The breeding of black cattle, cows and horses is considered valuable in the region. Between January and December 2022, farms of all categories in the region produced 284,900 tonnes of live-weight meat.

As of January 2023, there were 4,982active industrial enterprises in the region that produced 1,379.5 billion UZS (approximately USD $121.5 million) worth of industrial products. The largest share of industrial production from the "manufacturing industry", which manufactured 1,254.8 billion UZS worth of products.

As of 21 April 2022, there were 566 pre-school educational organisations, 563 high schools, and a small number of higher educational institutions in the region. As of 1 February 2023, 821 enterprises and organisations were operating in the healthcare and social services sector, of which 741 were small business enterprises.

The average monthly salary of a person living in Bukhara region amounted to 2,505,300 UZS (or approximately USD $220) as per statistics provided for 2022.

Alat District

According to the information provided by the Alat District khokimiyat, the population of Alat District as of 1 January 2023 was 102,800 people, among them, the urban population totalled 38,700 people (38% of the population) and the rural totalled 64,100 people (62% of the population). It should be noted that the proportion of men and women in the district is equal – 50% each. There are a total of 38 communities living within the district. The ethnic composition of which predominantly Uzbek (98.3%), with the remainder of the district coming from the following ethnic groups Turkmen (0.5%), Kazakhs (0.5%), Russians (0.1%), Tajiks (0.2%) and representatives of other nationalities (0.4%).

4.5.3 Access to services and connectivity

There are 36 high schools, 29 pre-school educational organisations, 1 public library in Alat district. The District is equipped with natural gas, potable water and electricity supply. Furthermore, roads as well as railway of local and international importance also cross the district. With regards to healthcare, only one policlinic was observed in Kirilishon community. Overall, local communities in regions and in particular in districts have only limited number of healthcare services. Usually, villages have only one policlinic for providing first aid and general medical consultations. For specified medical services villagers have to refer to district or regional medical centres.

4.5.4 Economy, Employment and Livelihoods

Alat District's core sectors are focused on agriculture, livestock farming, food industry, textiles and building materials. There are 10 joint ventures, 179 small industrial enterprises and one large industrial enterprise such as ("Olot neft va gaz qidiruv ekpedisiyasi" LLC, “Buxoro viloyat suvta'minot” LLC, Olot telecommunications authority and etc) in the district.

The number of people employed in the labour market is 43% of the total population. The number of people who migrated to work abroad is 377 people. The majority of economically active people are employed in the agricultural sector (32%), education (12%), industry (9%), construction (8%), commerce, catering, and logistics (7%), health, and social welfare (7%), housing and communal services (5%) and other sectors (20%). The average monthly salary of a person living in Alat District amounted to 2,662,800 UZS (or USD $235) in 2022.

Agricultural production is highly developed in the district. The cotton and grain industries are considered well-developed sectors. Agricultural land makes up 55% of total area of the district.

4.5.5 Community Profile

There are two communities located relatively close to the Project site: Kirlishon and Kulchovdur communities. The Location of these communities are indicated in Figure 2.

Kirlishon community is located approximately ten kilometres north-west of the Project site. However, six households, with eight families considered part of the community, are located approximately 400 m north of the Project site within the complex of the Khamza 1 substation. The total area of the Kirlishon community is 23,509 ha, and the total number of households amounts to 142 (not including the six households in the Khamza 1 substation). The total number of residents is 669, according to the information provided by the

makhalla. Approximately ten vulnerable people were identified during consultations with the Kirlishon community leader; this relates to youth, unemployed and disabled community members. There is a local school (No. 20) with 137 pupils and 20 teachers and a kindergarten (No. 11) with 46 pupils and three kindergarten teachers.

Kulchovdur community is located approx. 11 km northwest of the Project site. The total area of the Kulchovdur community is 2,787 ha. The total number of households is 545, and the number of residents is 2,636 people, according to the information provided by makhalla. A total of potentially 70 vulnerable people were identified during consultations with the Kulchovdur community leader; this relates to youth, unemployed and disabled community members. There is a local school (No. 21) with 574 pupils and 48 teachers and a kindergarten (No. 19) with 120 pupils and seven kindergarten teachers.

Figure 50: Photo of Kirlishon Community households located 400 m north of the Project site

4.5.6 Access to services

Both communities have stable internet connection from “Uzbektelekom” JSC and a stable electricity supply maintained by Bukhara MET JSC (the local electricity grid company).

Neither Communities have any potable water or gas supply at all. They use water from the Amu-Bukhara canal for drinking by collecting it into concrete water tanks and settling it. For cooking, gas cylinders are used primarily.

4.5.7 Transport

The main road (4R78) is located north of the Project site and is mainly used by workers of the Khamza 1 substation and batch plant to travel to and from their place of work. The nearest local communities typically use the western part of the road to commute to the district centre. Therefore, there is a limited amount of traffic currently travelling on the road, which will be reduced further once the reconstruction of the Khamza 1 substation has been completed.

Local herders also use the road during the grazing period (March to May). Several dirt roads cross the Project site, as depicted in the figure below. Further information will be determined during the next site visit on the importance of these dirt roads to local community members.

Figure 51: Roads in the area

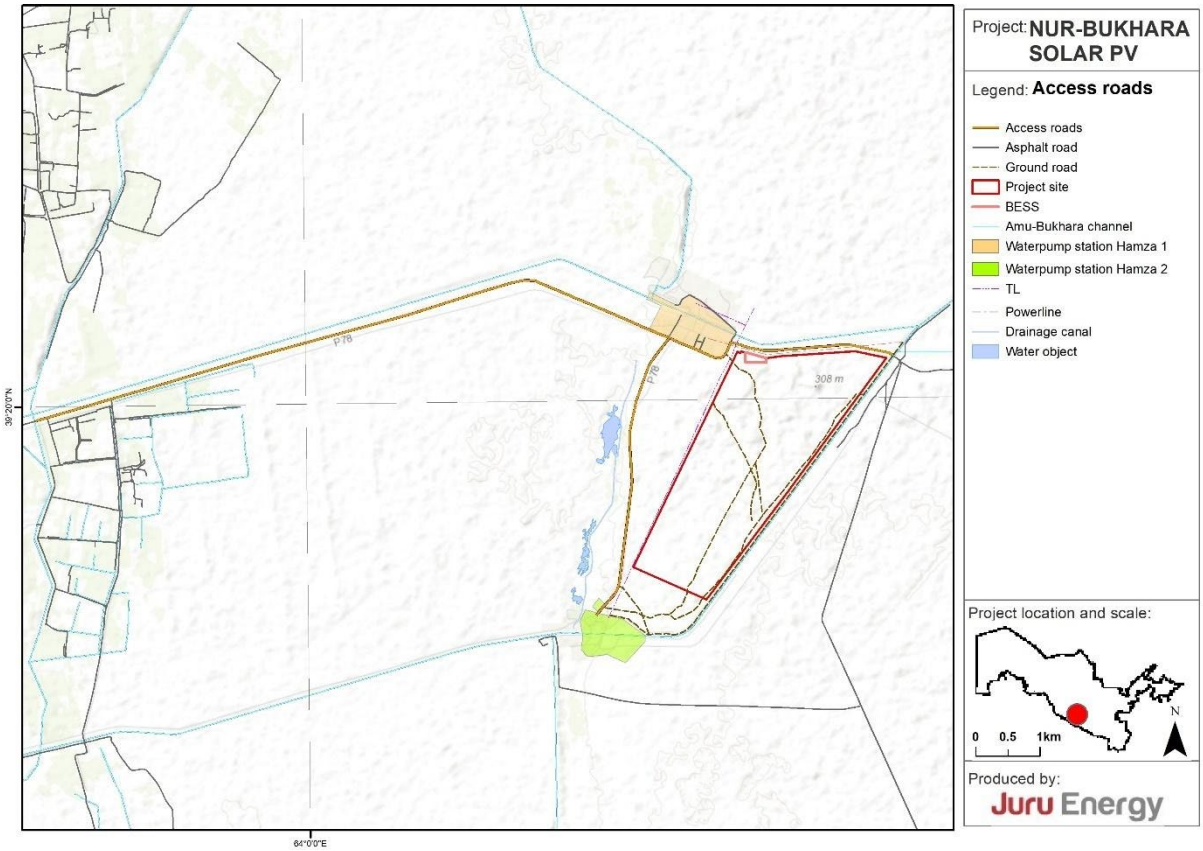


Figure 52: Existing Road used by local community members

4.5.8 Culture, tourism and recreation

There are no recreation facilities or cultural features of national and international importance. Significant objects of cultural heritage or international reputation are located in Bukhara city.

During the scoping site visit consultation with local khokimiyats representatives and community members, it was revealed that none of the intangible cultural heritages listed in the UNESCO list and local importance are practised within the Project site. Furthermore, no tangible cultural heritage objects of international or local importance were observed within the Project site. Telephone discussions with the Cultural Heritage Agency (CHA) identified that while it is unlikely that there are any items of unknown cultural heritage, the site has not been studied by experts from the authorities in charge of archaeology issues. Therefore, it is planned that the Institute of Archaeology (IoA) will complete a survey as part of the ESIA. A formal letter confirming this requirement was sent to both agencies in March 2023.

4.5.9 Indigenous Peoples

IFC PS8 defines Indigenous peoples (IPs) as a distinct social and cultural group possessing the following characteristics in varying degrees:

- Self-identification as members of a distinct indigenous social and cultural group and recognition of this identity by others.
- Collective attachment to geographically distinct habitats, ancestral territories, or areas of seasonal use or occupation, as well as to the natural resources in these areas.
- Customary cultural, economic, social, or political institutions that are distinct or separate from those of the mainstream society or culture.
- A distinct language or dialect, often different from the official language or languages of the country or region in which they reside.

No IPs were observed during the site visit or identified during communications with the nearest communities. IPs are not considered present in the AOI.

4.6 Biodiversity overview

4.6.1 Protected areas and internationally recognized Key Biodiversity Areas

Five areas with national protected area (PA) status and international protected status (Key Biodiversity Areas[29]) were identified in the 50km AOI (Figure 44 and Table 13). Further information about these areas is provided in Annex E.

29 Key Biodiversity Areas (KBAs) are the most important places in the world for species and their habitats. Faced with a global environmental crisis we need to focus our collective efforts on conserving the places that matter most. The KBA Programme supports the identification, mapping, monitoring and conservation of KBAs to help safeguard the most critical sites for nature on our planet – from rainforests to reefs, mountains to marshes, deserts to grasslands and to the deepest parts of the oceans (www. https://www.keybiodiversityareas.org/).

Table 15: Protected areas and KBAs

Name	National site (IUCN Management Category)	International site	Area (ha)	Distance to project site	Organisation	Purpose
Lake Dengizkul	Ornithological Nature Reserve[30] (IV Category)	Ramsar site N1108[31], IBA UZ021[32]	31,300	8 km	MNR	Ornithological Nature Reserve Protected Areas
Kumsultan	State wildlife sanctuary (IV Category)[33]	-	4,900	16.5 km	Bukhara regional Khokimiyat	Terrestrial and Inland Waters Protected Areas
Khadicha	State wildlife sanctuary (IV Category)[34]	-	11,300	30 km	Bukhara regional Khokimiyat	Terrestrial and Inland Waters Protected Areas
Khodzha-Davlet	-	IBA[35]	4,242	25 km	--	Bird conservation
Zekry	-	IBA[36]	1,555	48 km	-	Bird conservation

30 UNEP-WCMC (2023). Protected Area Profile for Lake Dengizkul from the World Database on Protected Areas, March 2023. Available at: www.protectedplanet.net

31 https://rsis.ramsar.org/ris/1108

32 BirdLife International (2023) Important Bird Areas factsheet: Dengizkul Lake. Downloaded from http://www.birdlife.org on 19/03/2023. http://datazone.birdlife.org/site/factsheet/dengizkul-lake-iba-uzbekistan

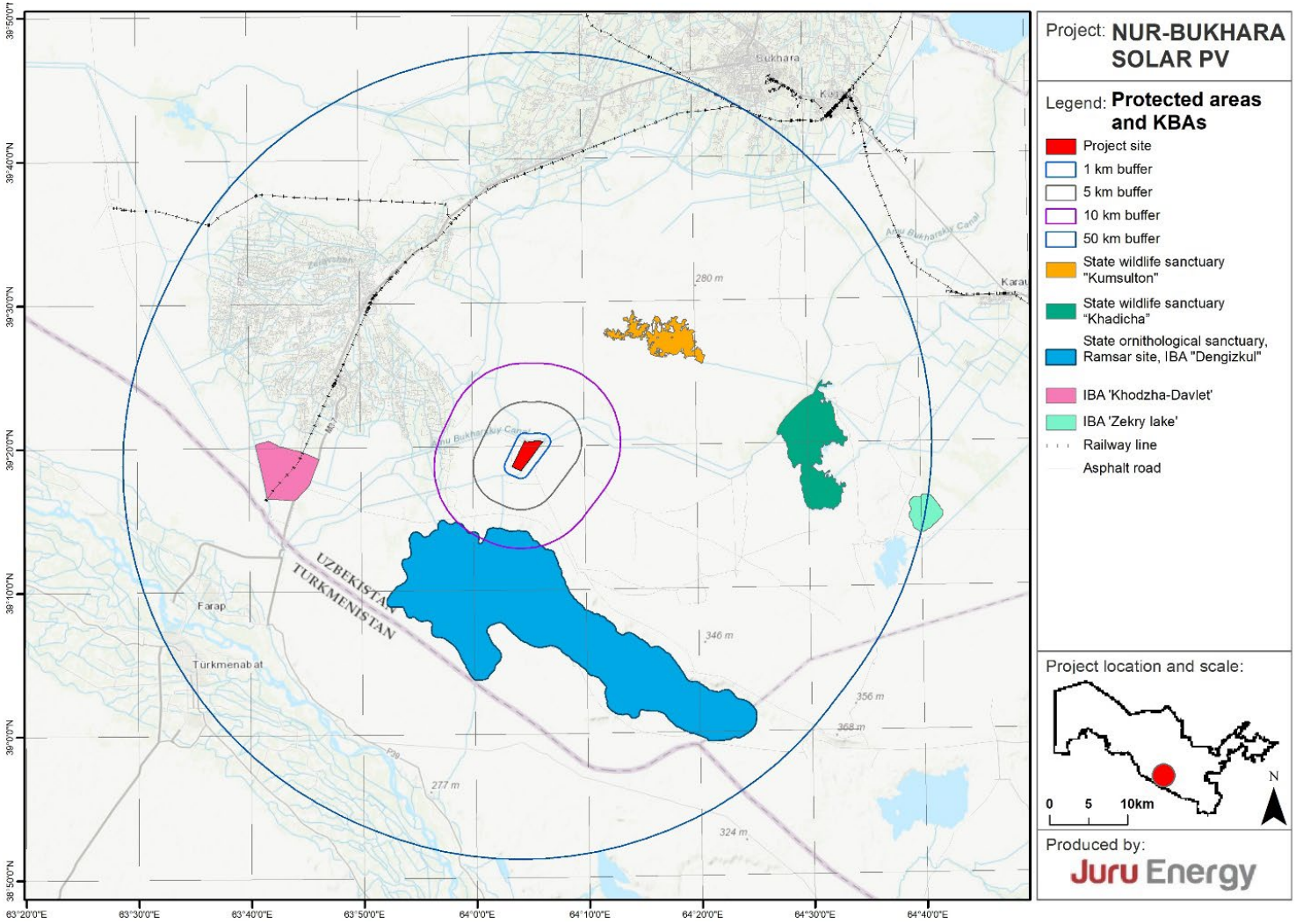
33 UNEP-WCMC (2023). Protected Area Profile for Kumsultan State Wildlife Sanctuary from the World Database on Protected Areas, March 2023. Available at: www.protectedplanet.net

34 UNEP-WCMC (2023). Protected Area Profile for Khadicha State Wildlife Sanctuary from the World Database on Protected Areas, March 2023. Available at: www.protectedplanet.net

35 BirdLife International (2023) Important Bird Areas factsheet: Khodzha-Davlet. Downloaded from http://www.birdlife.org on 19/03/2023. http://datazone.birdlife.org/site/factsheet/khodzha-davlet-iba-uzbekistan

36 BirdLife International (2023) Important Bird Areas factsheet: Zekry Lake. Downloaded from http://www.birdlife.org on 19/03/2023. http://datazone.birdlife.org/site/factsheet/zekry-lake-iba-uzbekistan

Figure 53: National protected areas and KBAs



4.6.2 Desk based review

A biodiversity screening exercise has been performed based on a review of the TYPSA Report and our own review of IBAT databases relevant to the area. The IUCN Red List of Threatened Species database searched[37] to determine potential at-risk species within a 50 km radius of the Project site. The search overlapped the range of no species listed as critically endangered, 5 species listed as endangered (EN), 7 one species listed as vulnerable (VU), and two species listed as near threatened (NT). These species are listed in the table below along with their Uzbekistan Red data book status.

Table 16: IUCN Red List of Threatened Species potentially occurring near the Project

Scientific Name	Common Name	IUCN Category	Uzbekistan Red data book Category
-	*Calligonum matteianum*	EN	Rare
-	*Calligonum molle*	EN	Rare
-	*Calligonum palezkianum*	VU	VU
Russian (Central Asian) Tortoise	*Testudo horsefieldii*	VU	VU
White-headed Duck	*Oxyura leucocephala*	EN	EN
Marbled Teal	*Marmaronetta angustirostris*	NT	EN
Dalmatian Pelican	*Pelecanus crispus*	NT	EN
Sociable Lapwing	*Vanellus gregarius*	CR	VU
Saker Falcon	*Falco cherrug*	EN	EN
Pallas's Fish- eagle	*Haliaeetus leucoryphus*	EN	
Steppe Eagle	*Aquila nipalensis*	EN	VU
Egyptian Vulture	*Neophron percnopterus*	EN	VU
Asian Houbara (or Macqueen's) Bustard	*Houbara bustard*	VU	VU
Goitered Gazelle	*Gazella subgutturosa*	VU	VU
Central Asian Otter	*Lutra lutra seistanica*	NT	EN

4.6.3 Vegetation

The AOI is a primarily brushy desert landscape with typical Kyzylkum shrub vegetation characterised by *Calligonum spp*., Saxaul (*Haloxylon ammodendron*), and saltwarts. Most of the area is represented by fixed and semi-fixed sands.

The main habitat within the project area, itself, is sandy desert with psammophilous shrubs. The dominant shrubs are *Xylosalsola arbuscula*, *X. richtery,* and *Calligonum* spp. in the northern, western and central parts of the project area; and *Haloxylon ammodendron,* and *Haloxylon persicum* in the eastern and southern parts of the project area. The grass cover is formed mainly by desert sedge (*Carex physodes*).

37 IUCN Red List of Threatened Species. http://www.iucnredlist.org . Downloaded on September 22, 2017 / National Red List

Figure 54: Common view of the project area - sandy desert with psammophilous shrubs

Figure 55: Saxaul shrubs are numerous in eastern and southern part of project area

Calligonum sp. is common on the project site. Species identification in *Calligonum* is based primarily on fruit morphology and anatomy[38] and can only be done during a roughly 3-week window in late May and early June, when seeds are fully mature, but have not yet dropped off of the parent plant. This genus includes

38 Mao, Z.-M. , Pan, B.-R. 1986. The classification and distribution of the genus Calligonum L. in China. Acta Phytotax Sin. 24: 98-107

several common, widespread, and non-redlisted species, but there are also 3 rare species[39] known to be present at the site, as follows:

1. *Calligonum matteianum* which is included in the IUCN Red List as Endangered and in the Red Data Book of Uzbekistan as Category 2 – Rare. It is endemic to south central Asian deserts of Uzbekistan and Turkmenistan, and is found in the surroundings of the lake Dengizkul. Several specimens were found in the northern part of project site, in surroundings of the quarry, and in the western part, between the pump station and small village Hamza.
2. *Calligonum mole* which is included in the IUCN Red List as Endangered (EN) and is listed in the Red Data Book of Uzbekistan as Category 2 – Rare. It is endemic to southern Central Asian deserts; however, it is not range-restricted or a national endemic. Several specimens were found in the northern part of project site, in surroundings of the quarry.
3. *Calligonum paletzkianum* which is included in the IUCN Red List as Vulnerable and in the Red Data Book of Uzbekistan as Category 3 – Vulnerable. This species is endemic to Irano-Turanian deserts and in Uzbekistan it is only known to occur from areas surrounding Lake Dengizkul. Several specimens were found in the northern part of project site, in surroundings of the quarry.

Figure 56: *Calligonum* sp. are numerous on project site. The species identification is possible only in end May-June.

The ABIS[40] channels surrounds the project area in the north, east and south, with narrow plots of riparian vegetation formed by Turanga (*Populus euphratica, P. pruinosa*.). The description of the riparian habitat in TYPSA report[41] was confirmed: Turanga (*Populus euphratica, P. pruinosa*.), Willow (*Salix wilhelmsiana*), Ravenna Grass (*Tripidium ravennae*) and Common Reed (*Phragmites australis*).

39 Environmental and Social Scoping Report – Bukhara Solar PV Project // SP6890 - Uzbek Solar 3. TYPSA 2022

40 Amu-Bukhara irrigation system

41 Environmental and Social Scoping Report – Bukhara Solar PV Project // SP6890 - Uzbek Solar 3. TYPSA 2022.

Figure 57: ABIS with riparian vegetation formed by Turanga (Populus sp.)

To the west from the project site the drainage channel forms 2-3 small ponds, 2 of them are shallow and probably temporary (Figure 24). Vegetation is represented by shrubs of Tamarix sp (local. 'yolgun') (Figure 23), Camel thorn (*Alhagi* sp.), saltworts.

Figure 58: Drainage channel

Figure 59: Saline habitat with *Elgun amarix sp*.

Figure 60: Pond with salty water

The detailed habitat map and vegetation description of the project site will be prepared during baseline botanical surveys at the ESIA stage.

4.6.4 Ornithofauna

During the site visit two Steppe Eagles Aq*uila nipalensis* (IUCN RL EN and UzRDB VU) were observed not far from the project site (N39.34226 E64.00116). On the project site we observed numerous Crested Lark *Alauda cristata*, Magpie *Pica pica*, and Marsh harrier *Circus aeruginosus*.

The sandy shrubs in this part of the Kyzylkum desert are suitable for breeding Great Grey (Desert) Shrike *Lanius excubitor meridionalis*, Desert Warbler *Curruca nana*, Desert finch *Rhodospiza obsoleta*, Streaked scrub warbler *Scotocerca inquieta*. The habitat is less suitable for Asian Houbara *Chlamydotis macqueenii* (IUCN VU, UzRDB VU), as this species prefers open areas, and this landscape is mostly shrubland.

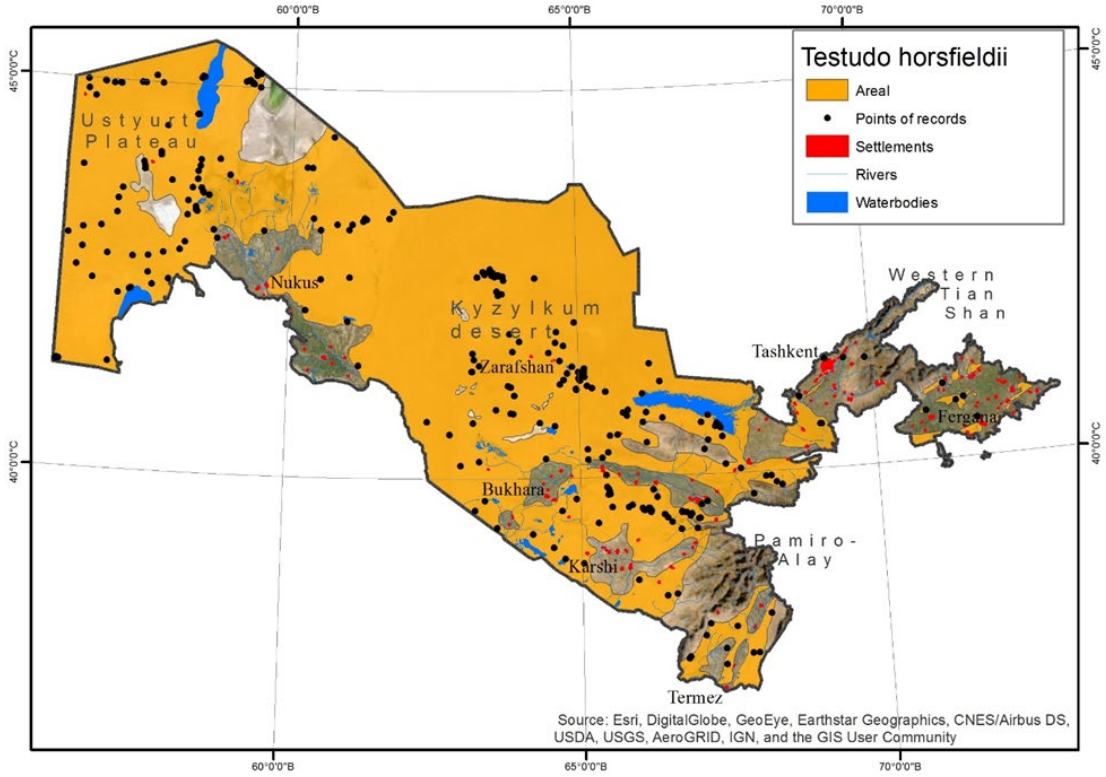
In riparian vegetation (trees and shrubs) along ABIS canals, the following bird species are common: Shikra *Accipiter badius*, White-winged woodpecker *Dendrocopos leucopterus*, Turkestan tit *Parus bokharensis*. The Scops Owl *Otus scops* is rare here.

One of the ponds to the west from the Project site is deep with reeds and tamarix vegetation. The Marbled teal *Marmaronetta angustirostris* (IUCN NT, UzRDB EN), or White-headed Duck *Oxyura leucocephala* (IUCN and UzRDB EN) could possibly nest here. This species is known to breed in small lakes in Bukhara region. Seasonal surveys are required to be conducted in April and May-June to confirm the breeding of Marbled Teal or White-headed Duck for the ESIA. A methodology is provided in Annex C.

4.6.5 Reptiles

Sand habitat which is dominant on the Project site is suitable for Desert Monitor (IUCN LC, UzRDB VU), Desert Sand Boa (IUCN LC, UzRDB NT), *Teratoscincus scincus* (IUCN LC, UzRDB EN), and *Phrynocephalus interscapularis* (IUCN LC, UzRDB unlisted). The habitat on site is also suitable for the Central Asian Tortoise *Testudo horsefieldii* (IUCN VU UzRDB VU) and the site is located within the known range of this species (see Figure 61).

Figure 61: Map of the area and known locations of the Russian tortoise in various regions of the Republic of Uzbekistan



During the site visit the potential holes of Russian (Central Asian) Tortoise *Testudo horsfeldii* (IUCN VU, UzRDB VU) were recorded.

Figure 62: Holes of Russian tortoise

Detailed herpetofauna surveys will be conducted in April when reptiles are likely to be most active and most obvious and in June 2023 when Desert Sand Boa could be recorded. Survey effort will include two visits (each 2-3 days) with transect count which will cover all project site to record all species of reptile present within the Project site. A detailed methodology is provided in Annex C.

4.6.6 Mammals

According to the IFC Environmental and Social Scoping Report prepared by Typsa from 07/02/2022, no mammalian species of conservation concern were recorded within the Bukhara Project site. Central Asian Otter is known to occur along the Amu-Bukhara Canal, however despite detailed searches for this species it was not recorded in the canal adjacent to the project site.

Figure 63: Nutria footprints

During the scoping site visit conducted by JE the following mammal species were recorded: Tolai hare *Lepus tolai* , Red fox *Vulpes vulpes*, holes of gerbils (Great gerbil *Rhombomys opimus)*, Mid-day Gerbil *Meriones meridianus*, Libyan Jird *Meriones libycus*). On the bank of ABIS the footprints of Nutria (or Coypu) *Myocastor coypus* were recorded (Figure 28). All of these species are classified as IUCN LC.

The psammophilous shrublands habitat is suitable for jerboas, gerbils, Long-clawed Ground Squirrel *Spermophilopsis leptodactylus* (IUCN LC), Tolai hare, Red fox and Brandt's Hedgehog *Paraechinus hypomelas* (IUCN LC, UzRDB NT). It is less suitable for the Goitered gazelle *Gazella subgutturosa* (IUCN VU, UzRDB VU), as this species prefers open areas.

The ABIS canals are suitable for invasive Nutria, and native Central Asian otter *Lutra lutra seistanica* (IUCN NT, UzRDB EN), Golden Jackal *Canis aureus*, Badger *Meles meles* (both species IUCN LC and nationally not redlisted) But during the scoping site visit it was observed that in the sections of the ABIS channels bordering the Project site, the water flow is too high, and current is too fast for the Central Asian otter. A rapid survey for the otter will be performed during the ESIA phase to confirm the absence of this species. Nutria is also considered an invasive species.

4.6.7 Fish

The ABIS is known habitat for two 2 critically endangered Shovelnose sturgeons: Amu-Darya Shovelnose Sturgeon *Pseudoscaphirhynchus kaufmanni*[42] (IUCN RL CR, UzRDB CR) and Small Amu-Darya Shovelnose Sturgeon *Pseudoscaphirhynchus hermanni*[43] (IUCN RL CR, UzRDB CR). The scoping site visit showed suitable habitat for both species – strong stream with muddy water, in the ABIS canals that border the project area on three sides. A further ichthyological survey will be conducted in April during baseline surveys at the ESIA stage.

42 Mugue, N. & Karimov, B. 2022. Pseudoscaphirhynchus kaufmanni. The IUCN Red List of Threatened Species 2022: e.T18601A120872031. https://dx.doi.org/10.2305/IUCN.UK.2022-1.RLTS.T18601A120872031.en. Accessed on 19 March 2023.

43 Mugue, N. & Karimov, B. 2022. Pseudoscaphirhynchus hermanni. The IUCN Red List of Threatened Species 2022: e.T18600A156719289. https://dx.doi.org/10.2305/IUCN.UK.2022-1.RLTS.T18600A156719289.en. Accessed on 19 March 2023.

4.6.8 Critical habitat Screening

Criterion 1. Highly threatened or unique ecosystems. This criterion is unlikely to be triggered. There have been no IUCN Red List of Ecosystems assessments of the area[44]. The area is located in the southwestern portion of the Kyzylkum Desert, within a flat plain characterized by "hilly sand" desert vegetation, between roughly 206 and 236m elevation. The botanical expert indicated that the vegetation communities of the broader region, including areas bordering, and to the south of Lake Dengizkul, contain some rare plant species and vegetation community types. However, based on available information, the ecosystem type of the Project site is widespread within the region, and is not distinctive, unique, or threatened enough to trigger CH criterion 1. This will be confirmed during the ESIA process.

Criterion 2. Habitats of significant importance to endangered or critically endangered species. According to IFC PS6 and EBRD PR6, the threshold for triggering CH under this criterion is that a Project's Ecologically Appropriate Area of Analysis (EAAA) must satisfy at least one of the three following conditions, or subcriteria:

> a) the EAAA contains ≥0.5% of the global population and ≥5 reproductive units of a species classified as globally Endangered (EN) or Critically Endangered (CR) by the IUCN.
>
> b) the EAAA contains a "globally important concentration" of a species classified as globally Vulnerable (VU) by the IUCN, the loss of which would likely result in the species' uplisting to global EN or CR status.
>
> c) the EAAA contains an "important concentration" of a species that is nationally or regionally listed as EN or CR, provided that the national redlist categories and criteria follow those of the IUCN.

The Project has a low-moderate potential to trigger CH criterion #2, with possible trigger species including two species of ducks, two species of shrubs, two species of fish, and one species of otter with EN or CR status at the international and/or national levels. Several additional bird species with EN or CR status at the national and/or international levels may also occur at the site, but these are all considered to have negligible potential to trigger CH.

The preliminary botanical analysis concluded that 4 species of nationally red-listed plants have potential to occur in the region, including two with a reasonable likelihood of occurring specifically at the site, but neither of them are classified with status equivalent to EN or higher (Uzbek redlist category 1), and none of these are currently listed with elevated conservation status by IUCN. The subsequent analysis of the site by TYPSA on behalf of IFC documented the presence of two species of shrubs with IUCN EN status (*Calligonum molle* and *Calligonum matteianum*), as well as a third species in the same genus with IUCN VU status, *C. paletzkianum*, and concluded that the two EN spp. of *Calligonum* present at the site were likely to trigger a CH determination for the project, based on the assumption that the global extent of these two species were 44,000 km^2 and 75,000 km^2 for *C. molle* and *C. matteianum*, respectively. With regard to the IUCN VU species of *Calligonum* that is present at the site (*C. paletzkianum*), given the high threshold for triggering CH subcriterion 2b (CH only triggered if the development of the Project would likely result in the species' uplisting from VU to EN or CR), the Project is not considered likely to trigger CH for this species.

The preliminary herpetological analysis concluded that no species of reptile or amphibian classified either nationally or internationally as CR or EN have potential to occur at the site. The analysis identified one reptile species classified as VU on the national and/or IUCN global redlists, which has potential to occur at the site,

44 https://iucnrle.org/assessments/ accessed 16 October, 2021

the Russian Tortoise (*Testudo horsefieldii* IUCN VU, Uzbek VU). Given the widespread geographic distributions of this species, and the high threshold for triggering CH subcriterion 2b (CH only triggered if the development of the Project would likely result in the species' uplisting from VU to EN or CR), the Project is not considered likely to trigger CH for this VU species.

The IBAT report identified 6 bird species classified by IUCN as globally EN or CR that could possibly occur at the site. The national bird expert's report included five of these species, and also identified two additional bird species listed either nationally or internationally as EN or CR with potential to occur in the Project area. Review of species-specific information on all 8 of these species indicated that two of them, specifically two species of ducks have low-moderate potential to satisfy one of the quantitative or qualitative thresholds required to trigger a CH determination under criterion 2. The rest have negligible potential to trigger CH for the Project.

It is important to note that while the Project is located within 10 km of Lake Dengizkul, which is classified by BirdLife International as an IBA largely on the basis of its importance for rare waterfowl and other water birds, the Project area, itself, is located far enough away from the Lake (at least 10 km from the Lake, at least 7 km from the border of the IBA) that significant impacts to the IBA or the bird species it protects from the Project are unlikely, and the Lake is effectively not included in the Project's EAAA for such species. This includes potential impacts to three species of water-affiliated birds that could potentially trigger CH criterion 2 (Pallas's Fish-Eagle, Dalmatian Pelican, Sociable Lapwing), but which are here assessed as having negligible potential for triggering CH, based on the distance of the Project to Lake Dengizkul. This exclusion also applies to wintering individuals of the White-headed Duck. This species is known to overwinter in significant numbers in Lake Dengizkul, but such activity is excluded from the Project's EAAA.

However, the key feature of concern with respect to possibly triggering CH, or more broadly impacts of the Project on biodiversity, are the smaller waterbodies and wetlands located in very close proximity to the site. Specifically, the site is bordered by small canals on three sides and there are several small ponds located just outside of the Project area (100-300m) to the west. The possible CH triggers for the Project are caused by these smaller, closer water bodies, as the small ponds could possibly host breeding activity of either the White-headed Duck (*Oxyura leucocephala*, IUCN EN, Uzbek EN) or the Marbled Teal (*Marmaronetta angustirostris*, IUCN NT, Uzbek EN). These are both extremely rare duck species whose breeding distributions within Uzbekistan are highly limited, and largely or exclusively restricted to wetlands within the Bukhara region[45]. According to the national ornithologists both species could potentially breed within the ponds adjacent to the Project site. If this were the case, even if such areas contained a very small number of breeding individuals, CH could potentially be triggered under CH criterion 2a (White-headed Duck) or 2c (Marbled Teal), as the national breeding populations of both species are extremely small, with as few as 200 pairs of Marbled Teal breeding in Uzbekistan in the 2000s and highly unstable and very small breeding (and wintering) populations of White-headed Duck in recent years.

Aside from these five water-affiliated species, the remaining three CR/EN bird species include two raptors (Saker Falcon, *Falco cherrug*, Uzbek EN, IUCN EN; and Steppe Eagle, *Aquila nipalensis*, Uzbek VU, IUCN EN) and a vulture (Egyptian Vulture, *Neophron percnopterus*, Uzbek VU, IUCN EN). All three of these species are known to occur within the Project region (Ten 2022, see Table 1) as breeders and/or migrants. However, none of them is likely to trigger the threshold of ≥0.5% of their global population plus ≥5 reproductive units (nesting pairs) required to trigger a CH determination under criterion 2a, based on their low densities within the region, and the wide geographic distributions and large estimated global population sizes of these species (minimum global population sizes of 12,000, 12,200, 50,000 for the vulture, falcon, and eagle, respectively, according to the most recent IUCN estimates, IUCN 2022). Baseline studies should, nonetheless be performed to confirm site-specific abundances of these species below CH Criterion 2 triggering thresholds,

45 Uzbekistan Red data book, 2019

as there is little information available on the abundance or nesting activity of these species within the Project region, specifically.

In addition to EN/CR species, there are a number of bird species classified as VU (Vulnerable) on the national and/or international red lists that could occur within the Project area, including various vultures and eagles, and the Asian Houbara (or Macqueen's) Bustard. Given the very high threshold required for a VU species to trigger a CH determination under Criterion 2, subcriterion b (status likely to change to EN or CR if the Project is built), and the low densities of such species expected to occur within the Project site, it is not considered likely for any of these species to trigger a CH determination for the Project under criterion 2. Nonetheless, potential impacts to these species should be a focus of baseline studies for the Project, whose results can be used to validate or confirm the preliminary conclusions of this CH screening analysis.

The preliminary mammalogy screening for the Project listed two mammal species with potential for triggering CH criterion 2. Both could only trigger subcriterion 2c, as neither one is classified as EN or CR at the global level. The two species are the Caracal (IUCN LC, Uzbek CR) and the Central Asian Otter (IUCN NT, Uzbek EN). While the former has been recorded along the shore of nearby Lake Dengizkul as recently as 2013, it is a relatively widespread, though extremely rare species within the country46, and it is considered unlikely that the Project area would trigger CH for this species. By contrast, the Central Asian Otter's distribution within Uzbekistan is restricted to a few river systems, and it is particularly rare in the Kyzylkum Desert region, where recent evident indicated that otters could potentially occur in the Amu Bukhara canal network, and therefore, potentially in close proximity to the Project site. If this were to be confirmed during baseline studies, it could potentially be viewed as an "important" concentration of the species at the national level, thereby triggering CH criterion 2c.

Finally, two species of IUCN CR fish, the Amu-Darya Shovelnose Sturgeon *Pseudoscaphirhynchus kaufmanni*[47] (IUCN RL CR, UzRDB CR) and Small Amu-Darya Shovelnose Sturgeon *Pseudoscaphirhynchus hermanni*[48] (IUCN RL CR, UzRDB CR), could potentially occur within the Project's EAAA, and specifically within the portions of the ABIS canal system that surround, or are otherwise potentially impacted by the Project. Therefore, either or both of these species could also possibly trigger a CH determination under Criterion 2, if their populations within the Project's EAAA surpassed 0.5% of the global population.

Criterion 3. Habitats of significant importance to endemic or geographically restricted species. The IFC49 defines restricted-range terrestrial species as species with a global Extent of Occurrence (EOO) smaller than 50,000 km^2. Neither the IBAT report nor the secondary data screening contained any indication that any species satisfying this criterion were likely to occur at the site, hence there is negligible potential for the Project to trigger CH criterion 3.

Criterion 4. Habitats supporting globally significant (concentrations of) migratory or congregatory species. This CH criterion may be triggered if a Project's EAAA includes significant concentration areas for migratory birds, or other species known to engage in seasonal, or otherwise regular concentrations/aggregations. Examples include significant wetlands or water bodies used seasonally by migratory water birds for breeding, migratory stopover, or wintering, or significant "bottleneck" points along major migration corridors. Given the lack of significant wetlands within the Project's EAAA, noting that the Lake Dengizkul, located roughly 10 km to the south of the Project area is considered to be outside of the

46 Uzbekistan Red data book, 2019

47 Mugue, N. & Karimov, B. 2022. Pseudoscaphirhynchus kaufmanni. The IUCN Red List of Threatened Species 2022: e.T18601A120872031. https://dx.doi.org/10.2305/IUCN.UK.2022-1.RLTS.T18601A120872031.en. Accessed on 19 March 2023.

48 Mugue, N. & Karimov, B. 2022. Pseudoscaphirhynchus hermanni. The IUCN Red List of Threatened Species 2022: e.T18600A156719289. https://dx.doi.org/10.2305/IUCN.UK.2022-1.RLTS.T18600A156719289.en. Accessed on 19 March 2023.

49 IFC, 2019. Guidance Note 6: Biodiversity conservation and sustainable management of living natural resources, June 27, 2019. International Finance Corporation, World Bank Group. Washington, DC, USA.

Project's EAAA, and the coverage of the Project area by relatively low diversity, low productivity desert habitat, it is highly unlikely that this criterion would be triggered, following the quantitative thresholds defined by IFC. Nonetheless, it is important to note that a wide variety of migratory bird species utilize Lake Dengizkul during their semi-annual migrations, and there is little information available about concentrations of migratory birds at the Project site, hence baseline bird surveys should be conducted to determine the species composition and intensity of bird migratory activity passing within, and near the Project site.

Criterion 5. Areas associated with key evolutionary processes. This criterion is rarely applied, and generally reserved for highly distinctive topographic features that support unique floristic and faunistic assemblages, as well as the ecological and evolutionary processes that are presumed to have given rise to the distinctive biodiversity elements. Examples include isolated volcanos or mountain ranges. There are no characteristics of the Project site or region that would indicate the presence of a possible CH criterion 5 trigger.

Criterion 6. Ecological functions that are vital to maintaining the viability of biodiversity features described (as critical habitat features). This criterion specifically applies to ecological functions that support CH-triggered biodiversity features, as opposed to the features, themselves. According to EBRD PR6, examples of such functions may include migratory corridors, hydrologic regimes, and seasonal refuges or food resources50. None of the project documents reviewed for this evaluation contain indications that such distinctive ecological functions are likely to be present within the Project site.

A critical habitat assessment (CHA) based on the findings of the seasonal survey work proposed and further assessment of global ranges for certain species (see ESIA TOR) will be performed to confirm the absence of critical habitat in the area.

50 EBRD. Guidance Note: EBRD Performance Requirement 6: Biodiversity Conservation and Sustainable Management of Living Natural Resources

5 Identification of Potential E&S Impacts

Table 17 provides the outcomes of the scoping review for potential E&S issues and impacts for the Project's construction, operation, and decommissioning phases. Table 17 indicates the potential source of impact, relevant nearby receptors (as determined during the scoping baseline review) and provides a scoping evaluation to identify those E&S issues that may give rise to significant impacts and require further assessment in the ESIA. Issues and impacts have been scoped in or out based on current understanding of the Project, the baseline environment and with reference to other projects in the region.

Where aspects are scoped in for further assessment, an outline of the requirements for further baseline studies and impact assessment are detailed in the terms of reference (TOR) for the ESIA provided in Chapter 7. For those issues scoped out, no further assessment is considered necessary in the ESIA. If new information becomes apparent during the ESIA process, issues scoped out may be scoped back in.

Table 17: ESIA Scoping

E&S Aspect (Construction (C), Decommissioning (D) / Operation (O))	Potential source of impact, receptors and scoping evaluation	Scoped In/Out		Requirements for ESIA /baseline data collection
Air quality (Construction/Decommissioning) (C/D)	There is little traffic and no industrial facilities in the site's immediate vicinity; therefore, current air quality (AQ) is considered good. The site may be subject to sandstorms and high winds at certain times of the year. The largest source of AQ emissions will be fugitive dust from vehicle movements and fugitive emission (NOx, SOx) from construction traffic on unpaved public and private roads and fugitive dust emissions from site preparation and general construction works. The nearest potential receptors are the two nearby communities, herders, ecological receptors (canal), workers and worker accommodation.	✓		The ESIA will include a high-level qualitative assessment of construction phase AQ impacts (traffic and dust within 500m of the proposed Project to understand impacts on potential receptors and define GIIP for managing construction dust and fugitive emissions in a framework ESMP. To support any future construction air quality benchmarking, spot check monitoring at two locations for the following parameters: Nitrogen dioxide (NO_2); Sulphur dioxide (SO_2); Carbon monoxide (CO), TSP (total suspended particles); PM2.5 and PM10 will also be performed.
Air quality, dust (Operation) (O)	No operational emissions are anticipated from the Project's operation (PV/BESS/OHTL). Project-related fugitive emissions will be intermittent and slight.		✗	This topic is scoped out for further assessment in the ESIA.
Noise and Vibration (C/D)	There is potential for noise impact on workers and residents of the villages near the site. Noise impact will arise due to the use of plant and machinery and construction-related traffic due to works at the substations and along the OHTL route. The nearest noise-sensitive human and ecological receptors are approximately 20 m and 1 km from the site boundary. There is unlikely to be any blasting requirement	✓		The ESIA will consider potential noise-generating sources and impacts and perform a qualitative assessment of potential impacts to define GIP for construction noise management in a framework ESMP. The existing noise baseline at the nearest sensitive receptors locations will be ascertained to support future noise benchmarking.

E&S Aspect (Construction (C), Decommissioning (D) / Operation (O))	Potential source of impact, receptors and scoping evaluation	Scoped In/Out		Requirements for ESIA /baseline data collection
	for the works; however, this is also a potential intermittent noise source.			
Noise and Vibration (O)	Operational noise impacts mainly arise from maintenance works during operation. These will be short-term and intermittent. Abnormal or emergency noise events will be short-term and temporary. Given the proximity of noise-sensitive receptors, operational noise impacts are not expected to be significant.		X	This topic is scoped out for further assessment in the ESIA.
Landscape and visual impact (C/D)	Construction activity may constitute a visible activity (presence of construction traffic, compound, plant and equipment and localised light pollution) that may modify the landscape in which they are set. These activities will be temporary, short-term/transient, reversible activities. Potential landscape and visual impacts from these sources are therefore regarded as negligible. This, combined with the general absence of receptors in the project zone of visible influence, means the impact is likely to be insignificant.		X	This topic is scoped out for further assessment in the ESIA.
Landscape and visual impact (O) (including glint and glare)	Generally, the height of the permanent installation of solar PV panels and BESS containers will be low (less ten 2.5m above ground level). The ~50 m LILO OHLT connection to the existing line is not considered to impact the surrounding visual receptors considering the current 500 kV line running		X	This topic is scoped out for further assessment in the ESIA.

E&S Aspect (Construction (C), Decommissioning (D) / Operation (O))	Potential source of impact, receptors and scoping evaluation	Scoped In/Out		Requirements for ESIA /baseline data collection
	north-south along the boundary of the site. In all cases, the project proposes to use standard/sensitive material choices for the structures on site, and minimise vegetation clearance. The permanent installation of solar panels can result in glint and glare impacts on airfields, road users and residential receptors south of the PV site. The absence of these receptors means that the significance of the expected impact will be insignificant.			
Surface water quality (C/D)	The scoping site visit did not identify any surface water features at the Project site. Surface water features are located adjacent to the site (canals ~ 50 to 70m from the site boundary at the closet point and wetlands situated approximately one kilometre from the site. There is no plan to use water for the controlled discharge of effluents into adjacent water bodies. There is a minimal risk that construction works may result in an unforeseen release into the canal.	✓		The ESIA will define GIIP construction management methods for controlling spills and unforeseen discharges in the ESMP. A specific impact assessment on water quality will not be performed.
Hydrogeology (C/D)	Although foundation works are shallow, the groundwater levels at the site and the connectivity with the canals are not confirmed. There is the potential to impact groundwater due to the foundation works.	✓		The EISA will qualitatively assess the potential to impact groundwater based on further geotechnical works to be performed for the Project. The ESIA will outline management and mitigation measures (GIIP and project-specific) in the framework ESMP.

E&S Aspect (Construction (C), Decommissioning (D) / Operation (O))	Potential source of impact, receptors and scoping evaluation	Scoped In/Out		Requirements for ESIA /baseline data collection
Hydrogeology use (O)	No groundwater will be used during the operation phase.		✗	This topic is scoped out for further assessment in the ESIA.
Waste (C/D)	Construction-related waste will be a mixture of inert material (soils), general/domestic construction waste and hazardous wastes (e.g. oils, paints, greases etc.) and some biomass resulting from the clearance of the site, site levelling, civil works, equipment installation (packaging, metals, paints, coatings), electrical cut-offs and domestic waste. The baseline review indicates that waste management options in the Project area for the transportation and disposal of waste in line with GIIP may be limited.	✓		The ESIA will confirm the waste generated during the Project construction phase and collect further baseline data on the availability of waste infrastructure following GIIP. Define in the ESMP a Site Waste Management Plan aligned with GIIP, including requirements for waste segregation, recycling options, and duty of care obligations,
Waste (O)	The operational phase will include general hazardous and non-hazardous waste connected with maintenance works. One key waste stream will be waste from electric and electronic equipment (WEEE), including PV panels and batteries. It is anticipated that any wastes will be removed from the site area by the engineers for offsite disposal, storage or decommissioning (in the case of old/obsolete equipment), but the final disposal route is not confirmed now, and options within Uzbekistan may be limited.	✓		The ESIA will identify requirements for operational waste management (general waste, hazardous waste and WEEE) and define management requirements for an operational WMP plan, including a framework for supplier policies and buyback schemes. Additional baseline information on suitable options for disposing of electrical equipment and other hazardous waste in line with GIIP will be identified and outlined in the ESIA.
GHG emissions (all phases)	The Project will not generate Scope 1 and Scope 2 emissions in excess of 100,000 tonnes of CO_2 equivalent annually.		✗	This topic is scoped out for further assessment in the ESIA.

E&S Aspect (Construction (C), Decommissioning (D) / Operation (O))	Potential source of impact, receptors and scoping evaluation	Scoped In/Out		Requirements for ESIA /baseline data collection
Climate (all phases)	The Project's location is in an arid area susceptible to physical climate change risks, including (among other things) extremes of temperature, high winds, and sand storms, which in the long term may have adverse consequences on the Project that must be considered in the design and for the management or worker welfare during construction and operation.	✓		The ESIA will include a Climate Change Risk Assessment of relevant physical risks (following the methodology outlined by the TCFD). Suitable design and other mitigation in the final design specification will be outlined in the ESMP.
Soils and land quality (erosion potential/ land contamination) (C/D)	Sand and desert sand soils dominate the western part of the Bukhara region, where the Kyzyl-Kum is located, and the southern part, near the Uzbek-Turkmen border. These soils have a humus content of about 0.5% and nitrogen contents between 0.04% and 0.05%. Lacking both humus and nutrition elements, these soils are usually free of vegetation and thus are exposed to increased degradation and deflation. Grey-brown soils dominate the northern and eastern parts of the region. Takyr soils, interlocked with grey-brown and sandy soils. They are formed in shallow depressions with high clay contents, which collect water. Given the susceptibility to erosion and degradation of the minimal humus layers, there is potential for the Project to exacerbate this during clearance and construction works. Soil contamination is a risk at all construction sites and industrial facilities where hazardous substances are handled and stored. Exposure to hazardous substances in the	✓		The ESIA will consider the erosion susceptibility of the soils in the Project area to assess the soil structure (topsoil) to identify mitigation or enhancement measures to manage soil degradation. Specific soil and erosion management requirements and requirements for site clearance and rehabilitation/reinstatement of land aligned with GIIP will be outlined in the ESMP. Conduct soil sampling at six locations within site corresponding to representative land-use types to confirm contamination levels and potential risks to workers. Define GIIP for managing construction soil contamination risks in the ESMP.

E&S Aspect (Construction (C), Decommissioning (D) / Operation (O))	Potential source of impact, receptors and scoping evaluation	Scoped In/Out		Requirements for ESIA /baseline data collection
	workplace puts workers at risk. Hazardous substance spills at the project site could adversely impact soils, surface water, groundwater/well water, community health and biodiversity.			
Soils and land quality (erosion potential/land contamination) (O)	There will be no impact on the soil during the operation phase. The potential for contamination may occur during abnormal operating scenarios.	✓		GIIP for managing operational contamination risks will be outlined in the ESMP. A specific operational impact assessment is scoped out from the ESIA.
Water resource use (C/D)	Water availability in the AOI area is assumed to be scarce. Water requirements during construction are not huge, and the construction works will be tankered in from offsite sources. Given the water scarcity in the local area, water suppliers may have limited capacity for even small additional water use needs resulting in a potentially significant impact on competing water users.	✓		The ESIA will include a water use assessment for construction water use impacts on other water users and will define requirements for water minimisation aligned with GIP in the ESMP.
Water resource use (O)	Water availability in the AOI area is assumed to be scarce. Potable water needs are low based on the limited number of on-site personnel. Operational water use requirements are expected to be negligible, given that water will not be used for panel cleaning.		✗	This topic is scoped out for further assessment in the ESIA.
Socio-economic (all phases)	There are small numbers of community members and construction workers for the substation upgrades at the northern and southern borders of the Project site. Some	✓		A socio-economic survey will be undertaken as part of the ESIA to identify Project impacts and benefits and any groups vulnerable to project impacts (e.g. grazing herders).

E&S Aspect (Construction (C), Decommissioning (D) / Operation (O))	Potential source of impact, receptors and scoping evaluation	Scoped In/Out		Requirements for ESIA /baseline data collection
	herders also unofficially use the site for grazing livestock during the early spring months. These people are the most likely to have contact with the Project and its workforce. Other community members are located at a distance that they are unlikely to be impacted by construction nuisance. Community members may have contact with Project workers should workers be accommodated in the nearby communities (understood to be unlikely at this stage), travel through the communities (traffic and transportation impacts are discussed further below) or visit the communities during their rest periods. However, community members may benefit from the Project through employment or by providing goods and services.			The ESIA will also include an assessment of accommodation options in local communities. The ESIA will include consultations and focus group discussions with local communities and their representatives to identify possible risks and inform the ESIA. Outputs will be outlined in the ESMP, including preparing a worker code of conduct.
Labour and working conditions (including labour risks in the supply chain) (C/D)	While there is evidence of child labour in Uzbekistan, it is mainly restricted to the agricultural industry, particularly cotton picking. There have been allegations of forced labour in the solar panel supply chains, particularly in the mining of polysilicon. Additionally, there are general concerns with labour and working conditions in the construction industry, particularly for migrant workers. Some areas that need to be addressed are retention of passports, payment of workers (particularly overtime payments), provision of adequate accommodation (where relevant)	✓		The ESIA will determine the risk of forced labour in the supply chain and child labour in the construction phase (secondary data and consultations). The ESIA will identify requirements for managing and monitoring workers on-site, in the supply chain and accommodation facilities. A Human Rights Due Diligence will be prepared to support the outcomes of the ESIA.

E&S Aspect (Construction (C), Decommissioning (D) / Operation (O))	Potential source of impact, receptors and scoping evaluation	Scoped In/Out		Requirements for ESIA /baseline data collection
Labour and working conditions (O)	Labour and working conditions are less of a concern during operations, given that workers are usually higher skilled and better paid. However, there continue to be risks, particularly with the most vulnerable workers, such as security guards and cleaning staff.	✓		The ESIA will identify labour and working condition risks and requirements for the operation phase and outline management and monitoring requirements in the ESMP.
Occupational Health and Safety (all phases)	Occupational health and safety is a risk for all Projects; some possible occupational health and safety concerns related to the Project include slips, trips and falls; electrocution; falls from heights' working in enclosed spaces; and weather extremes. Given the distance from the project site to local communities, access to medical care in the case of an emergency will need to be carefully discussed.	✓		The ESIA will consider OHS risks and the provision of medical care and outline management and monitoring requirements in the ESMP.
Electromagnetic field (EMF) and electrostatic impacts (operation)	The proposed LILO connection from the project substation to the existing line is 30m and requires a 30 m setback for OHL up to 500 kV. No residential receptors are located within the 30 m corridor on either side of the OHL. Workers in the area will not be within the setback area long enough for significant exposure periods to arise		✗	This topic is scoped out for further assessment in the ESIA.
Community, heath, safety and security (communicable diseases, public access, GBV/H.)	The distance between the local communities and the Project site minimises the risk of impacts on the local community. There is a possibility that workers may be housed either in temporary accommodation at the project site or existing accommodation within nearby communities, the latter of	✓		The ESIA will identify project requirements for accommodation and assess the risk concerning local communities. The assessment will also determine whether worker influx is a concern and if an influx management plan will be required.

E&S Aspect (Construction (C), Decommissioning (D) / Operation (O))	Potential source of impact, receptors and scoping evaluation	Scoped In/Out		Requirements for ESIA /baseline data collection
	which represents a greater community health and safety risk. The potential for incidents of GBV/H was raised during the scoping phase, but insufficient information was received; therefore, this will be more fully addressed during future consultations. There is not expected to be a large influx of workers, but this will be further assessed in the ESIA, and the need for an influx management plan will be determined.			During the socioeconomic survey work, consultation with local communities about community health and safety risks, including GBV/H, will be performed to inform the socio-economic risk assessment and definition of mitigation measures in the ESIA.
Traffic and Transportation (C/D)	A main road that runs past the north of the Project site will likely be used to transport project components to (or from) the site during construction and decommissioning. The route will pass through nearby local communities before reaching a major trunk road. It is not expected that significant impacts will occur due to the size of the Project components and the fact that the road is a main road and communities will be accustomed to traffic. However, a further review of possible vulnerable receptors will be required to confirm this assumption. There will also need to develop a traffic management plan to reduce the risk of accidents on site from transporting workers to and from the site.	✓		The ESIA will identify potential transportation routes and determine if there are any vulnerable receptors that the transportation of Project components might impact. The ESIA will also assess safety risks related to increased road traffic and define requirements for management and monitoring in a traffic management plan.
Traffic and Transportation (O)	Traffic during the operations phase will be limited to no more than ten workers and maintenance vehicles. It is		✗	This topic is scoped out for further assessment in the ESIA.

E&S Aspect (Construction (C), Decommissioning (D) / Operation (O))	Potential source of impact, receptors and scoping evaluation	Scoped In/Out		Requirements for ESIA /baseline data collection
	unlikely that there will be significant impacts on the local communities from operational traffic and transportation activities.			
Security (C/D)	The Project site will be fenced to stop local community members from accessing the site. Nevertheless, security guards are expected to be used during the Project's construction phase. The distance between local communities and the site reduces the risk of security concerns for the Project or between local community members and security personnel. However, there is a small risk should herders bring their livestock near the Project, but this is considered manageable with the use of training, vetting of guards and consultation with herders. This potential impact is still scoped in as measures must be identified to reduce these minor security risks.	✓		The ESIA will identify measures to reduce security risks on site and outline management and monitoring requirements for developing a security management plan.
Security (operation)	During the operation phase, security provision will be remote (no permanent security presence); nevertheless, a security management strategy will be required.	✓		The ESIA will outline an operational security management strategy as part of the operational ESMP.
Emergency preparedness and response (all phases)	Possible natural disasters and climate-related risks relevant to the project location include earthquakes, wildfires, dust storms, drought and heat waves. There may also be project related emergences related to spills, release of chemicals or other accidents. Given the distance from the project site to	✓		The ESIA will review potential emergencies through a review of secondary data and outline the requirements of an emergency preparedness and response plan.

E&S Aspect (Construction (C), Decommissioning (D) / Operation (O))	Potential source of impact, receptors and scoping evaluation	Scoped In/Out		Requirements for ESIA /baseline data collection
	local communities and the type of technologies used, it is unlikely that emergencies on-site will impact local communities, but workers could be affected. Access to medical care in the case of an emergency will need to be carefully considered in determining the risk. The consideration of additional risks from the BESS will also be required.			
Land acquisition, land use and livelihoods (all phases)	There is only one landowner for the Project, the State Committee on Sericulture and Wool Development. This landowner will transfer the rights to use the land to Masdar. One legal land user uses 4ha of his land to the south of the Project. Herders from the nearest communities use the Project site during the early spring (March to May) to graze livestock (approximately 380 sheep, 130 cows and seven camels). It is understood that alternative grazing land may need to be found for these herders. It is, as yet, unclear what rights those undertaken previous mining activities may have on site, had, and still have. Further consultations are required to determine if there will be any resettlement impacts on the mining activities.	✓		The ESIA process will include consultations, focus groups and socioeconomic surveys, including specific discussions with the nearby land user and the herders. A Livelihood Restoration Plan Grievance Mechanism (GM) is required to outline provisions for livelihood restoration aligned with PS5. Further consultation is to be undertaken to understand the land rights of the mining entities.
Protected Areas and Internationally Recognized Key	Five areas with national (PA) and international protected status (KBA) were identified in AOI: • State wildlife sanctuary 'Lake Dengizkul'		✗	Considering the baseline review, the Project is not expected to have any direct or indirect impacts on PAs. Impact on

E&S Aspect (Construction (C), Decommissioning (D) / Operation (O))	Potential source of impact, receptors and scoping evaluation	Scoped In/Out		Requirements for ESIA /baseline data collection
Biodiversity Areas (Priority Biodiversity Features)	• State wildlife sanctuary 'Kumsulton' • State wildlife sanctuary 'Khadicha' • IBA 'Khodzha-Davlet' • IBA 'Zekry'			protected areas is scoped out from further assessment in the ESIA.
Invasive Species	One invasive mammal species (Nutria) was identified on the Project site or in the vicinity of the site during preliminary survey works. The nutria is a large, herbivorous, semiaquatic rodent. No invasive plant species were identified.	✓		The ESIA will address the management of invasive species.
Threatened Habitats	Potential impacts will arise from the clearance of the PV area, Improvement of access roads, clearance of areas for workers' camps and other support facilities, poaching. Overall, the habitats potentially impacted by the project have historically been utilized for low density livestock grazing, and do not include highly restricted or threatened habitat types	✓		The ESIA will assess the impact on habitats, and potential habitat-related Critical Habitat triggers (e.g. based on CH criteria i, v, vi per EBRD PR6) will be addressed in the Critical Habitat assessment that will be incorporated into the ESIA. The assessment will also consider the relevant of ecosystem services. As a natural habitat the ESIA will include a determination of requirements for no-net loss.
Reptiles	The habitat on site is suitable for and located within the range of the Central Asian Tortoise (Testudo horsfieldii, IUCN and nationally VU). This species was not recorded	✓		Tortoise surveys will be completed between March and the end of April / early May when tortoises are likely to be most active and most obvious. However peak periods of activity

E&S Aspect (Construction (C), Decommissioning (D) / Operation (O))	Potential source of impact, receptors and scoping evaluation	Scoped In/Out		Requirements for ESIA /baseline data collection
	during the field surveys however it should be considered as being potentially present within the project area.			are dependent on temperature and prevailing weather conditions. Determination of requirements for no-net loss and species relocation plan.
Plants	Two EN/CR plant species were registered in and near project site. • *Calligonum matteianum* which is included in the IUCN Red List as Endangered and in the Red Data Book of Uzbekistan as Category 2 – Rare. It is endemic to sandy deserts within Uzbekistan and Turkmenistan, and is found in the surroundings of the lake Dengizkul. Several specimens were found in the northern part of project site, in surroundings of the quarry, and in the western part, between the pump station and small village Khamza. • *Calligonum mole* which is included in the IUCN Red List as Endangered (EN) and is listed in the Red Data Book of Uzbekistan as Category 2 – Rare. It is endemic to southern Central Asian deserts; however, it is not range-restricted or a national endemic. Several specimens were found in the northern part of project site, in surroundings of the quarry.	✓		Detailed botanical surveys will be completed across the project site in April and June. The whole site would need to be surveyed in order to register plant species of conservation concern. In order to overcome the substantial knowledge gaps in both of these species' global distributions, the botanist will also model these species' global distributions using Maxent, which creates an extrapolated global range based on known localities for the species, using available geospatial data sets on the ecological parameters associated with suitable habitat for the species (e.g. soi type, elevation, rainfall, temperature). These modelled global ranges will then serve as the basis to perform a Critical Habitat Assessment for these species, and incorporate the appropriate mitigation and management plans into the ESIA and ESMS.

E&S Aspect (Construction (C), Decommissioning (D) / Operation (O))	Potential source of impact, receptors and scoping evaluation	Scoped In/Out		Requirements for ESIA /baseline data collection
Fish	Two CR/EN fish species may be present in the canals of the Amu-Bukhara Irrigation System that partially surround the site: The Amu Darya Shovelnose Sturgeon *Pseudoscaphirhynchus kaufmanni* (IUCN and nationally CR) and the Small Amu Darya Shovelnose Sturgeon *Pseudoscaphirhynchus hermanni* (IUCN and nationally CR).	✓		A fish survey will be conducted in end of April by experienced ichthyologist. The permission from MNR is needed to conduct this survey. The survey will be conducted in Amu-Bukhara channel and in 5 km buffer around this site. The survey results will feed into the Critical Habitat Assessment for these species, presented within the ESIA, with appropriate mitigation and species management measures included, as required.
Birds	Two CR/EN bird species are considered to possibly breed within wetlands in close proximity to the site, the Marbled Teal (*Marmaronetta angustirostris*, IUCN NT, nationally EN) and the White-headed Duck (*Oxyura leucocephala*, IUCN EN, nationally EN). A third bird species, the Asian Houbara, or MacQueen's Bustard (*Chlamydotis macqueeni*, IUCN and nationally VU) is also considered a sensitive species that potentially breeds within the project area.	✓		Additional bird surveys will be conducted for Houbara bustard, White-headed Duck, and Marbled Teal (IUCN: NT and UzRBD: EN) the two duck species may breed within small wetlands located within 3 km of the Project area to the west. The optimal period for Houbara bustard survey is mid-March – mid-May, while the optimal period for the breeding duck surveys is May-1 to mid of June, in this period ducks females with broods may be easily detected. Results of these surveys will inform the Critical Habitat Assessment to be included within the ESIA, which will drive the incorporation of mitigation and monitoring measures and plans for these species, as necessary.
Mammals	There is potential for Central Asian Otter in the area IUCN NT, UzRDB EN).	✓		Additional mammal surveys will be conducted to confirm presence or absence of the Central Asian Otter, which will inform the Critical Habitat Assessment for this species, to

E&S Aspect (Construction (C), Decommissioning (D) / Operation (O))	Potential source of impact, receptors and scoping evaluation	Scoped In/Out		Requirements for ESIA /baseline data collection
				be incorporated into the ESIA, along with mitigation and monitoring plans, as appropriate.
Indigenous peoples	It is not expected that the Project will impact indigenous peoples. No indigenous peoples were identified during the scoping site visit. There may be some Turkmen ethnic minorities living in the communities surrounding the project site. There is a possibility that they will be considered vulnerable people, but they would not be regarded as indigenous peoples.		✗	This topic is scoped out for further assessment in the ESIA [NB - Numbers of ethnic minority peoples and their vulnerability will be identified during the socioeconomic survey collection. This will determine if special measures are required].
Cultural heritage (C)	There are no areas of UNESCO cultural heritage significance near the Project site. The Institute of Archaeology under the Academy of Sciences of the Republic of Uzbekistan has stated that they have not surveyed the Project location and that it is not expected that items of cultural heritage will be found. Further assessment is required to confirm this point.	✓		The Institute of Archaeology (IoA) will perform a survey to identify any archaeological or cultural heritage receptors. The scope of this assessment will be defined by the IOA. In addition, a desktop review of secondary data combined with consultations with the local community will be performed to confirm any potential tangible or intangible cultural heritage risks. The ESIA will include an impact assessment to determine the potential significance of archaeological and cultural heritage risks.
Cultural Heritage (O/D)	There will not be any additional earthworks associated with the operation or decommissioning of the Project. Therefore, the impacts on cultural heritage during these phases are highly unlikely and insignificant.		✗	This topic is scoped out for further assessment in the ESIA.

E&S Aspect (Construction (C), Decommissioning (D) / Operation (O))	Potential source of impact, receptors and scoping evaluation	Scoped In/Out		Requirements for ESIA /baseline data collection
Cumulative impacts (C/D)	The site is located close to some small construction projects. The scoping assessment has identified potential for combined effects (where construction programmes may overlap), combined impacts arising from temporary labour influx, potential spatial and temporary crowding, cumulative effects on land use, and community health and safety.	✓		The EISA will include a cumulative impact assessment for the construction phase.
Cumulative impacts (O)	During operation, cumulative effects are not deemed relevant.		✗	This topic is scoped out for further assessment in the ESIA.
Transboundary Impacts	The Project site is located more than 20 km from the border with Turkmenistan and is considered outside the direct and indirect AOI for the Project. There will be no water abstraction from transboundary water courses and there are no transboundary air quality considerations.		✗	This topic is scoped out for further assessment in the ESIA.

6 Scoping Stakeholder Engagement

6.1 Stakeholder engagement approach

A Stakeholder Engagement Plan (SEP) has been prepared as part of the scoping phase that outlines legal and lender obligations, detailed stakeholder mapping, an overview of engagement performed to date (also summarised below), stakeholder engagement principles, the requirements for the ESIA phase and beyond and the Project Grievance Mechanism.

6.2 Scoping Engagement

During the scoping site visit, several consultations were conducted with stakeholders at the following locations:

- Alat district municipality;
- Khamza 1 substation – CNTIC company;
- Khamza 2 substation - CNNC Ind. Company;
- Shaxram omad LLC farm;
- Main Electricity Grids of Bukhara Department;
- Alat District Power Grids Department;
- Alat District Cadastral Department;
- Alat District Construction Department;
- Alat District Sanitary Epidemiological Wellbeing Department;
- Alat District Natural Resources Department;
- Kirlishon and Kulchovdur communities' representatives
- Amu Bukhara Main Canal Department.

Figure 64: Scoping Engagement

a. CNTIC company workers

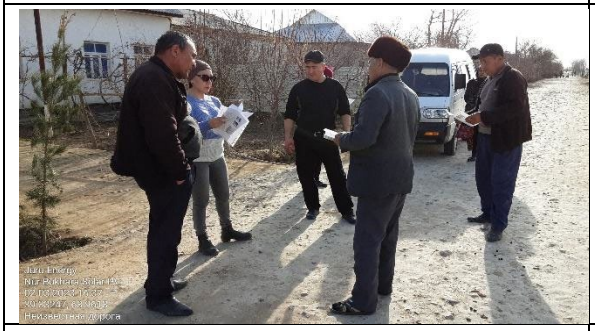
b. Farmer within the Project site

c. CNNC Ind. company workers

d. Main Electricity Grids Department worker

e. ABMC workers (pumping station 16 of Khamza 1 substation)

f. Kirlishon community members



g. Kirlishon community members

h. Chairman of Kirlishon community

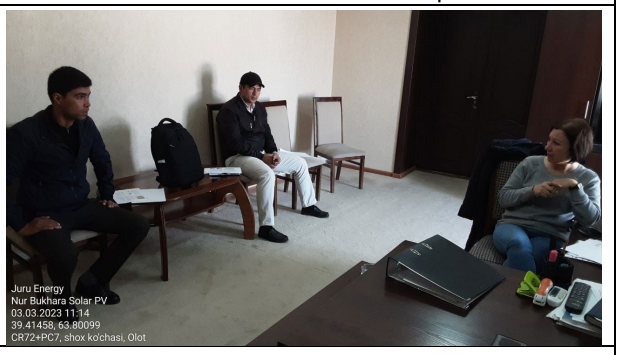
i. Chairman of Kulchovdur community

j. Kulchovdur community members

k. Kulchovdur community members

l. Alat District Power Grids Department

m. Alat District Natural Resources Department



n. Alat District Cadastral Department

o. Alat District Construction Department

During the meetings, participants were provided with leaflets with key information about the planned project as well as contact details of the ESIA Consultant. A sample of the leaflet is provided in Annex A.

A summary of meetings with local social receptors is provided in Table 18 below:

Table 18: Summary of the scoping stage meetings

Stakeholder	Date and place of meeting	Summary of discussion
Khamza 1 substation – CNTIC company	March 2, 2023	Met with construction foreman and interpreter of CNTIC and provided information on upcoming project, shared project leaflet.
Khamza 2 -CNNC Ind. company	March 2, 2023	Met with the workers of CNNC Ind.. Current renovation has not been completed yet. Construction works started in 2019 and operation is planned for December, 2023.
Farm - Shaxram omad LLC	March 2, 2023	Met with the farmer and shared information about upcoming project and shared the Project leaflet. As farmer stated, this land leased for 49 year and the overall leased land is 20 ha. 4 ha of it is developed as a farm. Land lease agreement was concluded between the farmer and Alat District Municipality.
Main Electricity Grids of Bukhara Department	March 2, 2023	Met with electrician on duty at the substation and provided information on upcoming project and shared the Project leaflet. Consultation was conducted regarding existing OHTL within the Project site.
Alat District Power Grids Department	March 3, 2023	Met with head of Alat district Power grid department and provided information on the upcoming Project and shared the Project leaflet. Consultation was conducted regarding existing OHTL within the Project site.
Alat District Cadastral Department	March 3, 2023	Met with head of Alat District Cadastral Department and provided information on upcoming Project and shared the Project leaflet. Consultations regarding land use issues was conducted. According to the consultations, the main part of the Project site is under SWID Committee. Furthermore, one farmer leases 20 ha of land under a land lease agreement valid for 49 years.
Alat District Construction Department	March 3, 2023	Met with head of Alat district construction department and provided information on upcoming Project and shared the Project leaflet. Consultation was conducted regarding existing structures as well as planned construction works near the Project site. According to the consultations, there are not any planned structures to be constructed near the Project site.

Stakeholder	Date and place of meeting	Summary of discussion
Alat District Sanitary Epidemiological Wellbeing Department	March 3, 2023	Consultation conducted via telephone and information on upcoming Project was provided. Consultation was conducted regarding sanitation facilities. It was advised that all sanitation facilities related Project workers' temporary facilities should be constructed under supervision of the Sanitary Epidemiological Wellbeing Department.
Alat District Natural Resources Department	March 3, 2023	Met with representative of Alat District Natural Resources Department and provided information on upcoming Project and shared the Project leaflet. Consultations regarding potentially affected trees was conducted. Consultations revealed that there are not any trees within the Project site that may be affected due to the Project.
Alat District Amu Bukhara Main Canal Department	March 3, 2023	Consultation conducted via telephone and information on upcoming Project was provided. Consultation was conducted regarding buffer zone of the canal and water use during Project construction. Consultations revealed that buffer zone of 150-200 m should be obeyed from the canal bed. Furthermore, it was stated that the department has no objections regarding water use during the Project construction.
Agency on preservation of Cultural heritage	Business correspondence Request letter sent on 14.03.2023 Waiting for response Follow up phone call 31.03.2023	Request on presence of any cultural heritage at Project footprint and AoI, as well as data on previous surveys that were conducted. Agency informed that no surveys have been conducted at requested area. Moreover, it was stated by representative of Agency that Project area should be surveyed to ensure the absence of undiscovered archaeological heritage.

7 ESIA Terms of Reference

The proposed terms of reference (TOR) for the ESIA is outlined in the following subsections:

7.1 Objectives

The ESIA aims to achieve the following objectives:

- Review applicable local environmental and social rules and regulations, and establish environmental and social requirements to be met by the Project
- Establish an environmental and social baseline for the Project and the Area of Impact (AoI) based on the information available
- Identify and assess potential environmental and social impacts of the Project
- Conduct an impact assessment and determination of significance for Project environmental, social, health, and safety impacts during construction, operation, and decommissioning phases and describe mitigation measures
- Develop a stakeholder engagement plan (SEP) and grievance mechanism aligned with national requirements and EBRD PR10
- Develop an Environmental and Social Management Plan (ESMP)

7.2 Structure of the ESIA

The ESIA report will contain the following volumes:

- Volume I: Non-Technical Summary
- Volume II: ESIA Main Report
- Volume III: ESIA Technical Appendices and Supporting Documents
- Volume IV: Environmental and Social Management Plan (ESMP)
- Volume V: Livelihood Restoration Plan (LRP)
- Volume VI: Stakeholder Engagement Plan (SEP)

7.3 Non-technical summary

A non-technical summary (NTS) will be prepared in English and Uzbek. This will provide a high-level overview identifying the scope and nature of the Project and predicted environmental and social impacts. The NTS will be used as a tool to aid consultation and information disclosure.

7.4 ESIA technical scope

The ESIA process will investigate relevant environmental and social aspects, as defined by this Scoping Report and summarised in Table 20 below.

The outcomes will the documented in an ESIA report as set out in Table 19.

Table 19: Proposed structure of ESIA report

Chapter	Description of Content
Introduction	Presents a brief overview of the Project, a description of the developer and a brief outline of contents of the report, etc.
Project Description	Describes the Project, including its main elements and activities for construction and operation.

Project Need and Analysis of Alternatives	Presents the purpose and rationale of the Project and examines alternatives to the proposed project site and generation technology including the no project alternative.
Policy, Legislative and Institutional Context	Description of legislative and institutional context in Uzbekistan including: ● Institutional Framework and National Regulators ● National EIA process ● Relevant laws, regulations and applicable guidance for each environmental and social topic contained in the ESIA ● International conventions The chapter will also refer to the applicable EBRD standards and guidelines.
ESIA methodology	Sets out the stages of the ESIA process. Robust criteria for determination of the significance of the anticipated impacts will be developed. Definitions of significance will be clearly defined and make reference as applicable to the magnitude, geographic extent, duration and frequency, irreversibility and ecological, social, and economic context.
Information Disclosure, Consultation and Participation	Provides an overview of the consultation processes as defined in the stakeholder engagement process and summarises results including specific reference to comments made during consultation and how they were addressed in the ESIA.
Topic-specific impact assessment	With reference to this Scoping Report and the activities required to be undertaken as part of the construction and operation of the Plant. Each impact assessment chapter will contain the following sub-headings: ● Introduction ● Methodology and assessment criteria (specific legislation, a summary of relevant consultation comments, criteria for determining significance and associated limitations ● Baseline summary ● Impact identification and assessment ● Cumulative and transboundary impacts ● Mitigation and enhancement measures ● Residual impact summary
Conclusions	Conclusions
References	List of references cited in the report.

In accordance with international lender requirements for environmental and social impact assessment, the scope of works for this ESIA will consider the following scope:

- Environmental, social, labour, gender, health, safety, risks and impacts
- Project and related and associated facilities (where relevant)
- Risks and impacts that may arise for each project activity
- Role and capacity of the relevant parties, including government, contractors and suppliers
- Potential third-party impacts including supply chain considerations

This ESIA will identify beneficial and adverse, direct and indirect, and cumulative impacts of the Project related to the biophysical and socio-economic environment.

The following topics are scoped in and out of the ESIA

Table 20: Topics scoped in and out of the ESIA

Environment and Health	Social	Labour
• Air quality (C/D); • Noise and vibration (C/D) • Waste (including hazardous waste) (C/O/D) • Climate resilience (O) • Soil and (C/D) • Water resources (C/D); • Hydrogeology (C/D) • Biodiversity (habitat loss, impact on critical habitat and PBF) (C, O) • Cumulative impacts (C)	• Community health and safety (C/O/D) • Traffic and Transportation (C/D) • Security (C/D) • Livelihood and land use (C) • Cultural heritage (C)	• Occupational Health and Safety (C/O/D) • Emergency preparedness and response (C/O/D) • Labour rights (C/O/D) • Employment (positive) (C/D) • Gender-Based Violence and Harassment (GBVH) (C/O/D) • Human rights (C/O/D) • Procurement/supply chain (C/O/D)
Scoped out: Air quality (O) Noise (O) Soils (O) Landscape and visual impact (C, D) (including glint and glare) Radio and TV interference (C, O, D)) Traffic and transportation (O) Greenhouse gases (C, O) Cultural heritage (O) Cumulative impacts (O) Indigenous Peoples (C, O) Transboundary impacts (C, O) Security (O) EMF/EMC (C, O)		
Note: C = Construction, O = Operations, D = Decommissioning		

For the topics scoped into the ESIA, the impact assessment process will consider the magnitude of the impact and the sensitivity of the receiving environment to evaluate the overall significance of the impact. A framework for assigning magnitude, sensitivity and impact significance is described below. For each E&S topic the proposed mitigation and management measures are considered to give an overall residual impact significance conclusion.

Sensitivity criteria for receptors are categorised into high, medium, or low. Generic criteria used to determine the receptor sensitivity are provided in Table 21. Each topic-specific chapter of the ESIA will define the relevant receptors and assign a receptor sensitivity based on topic-specific criteria.

Table 21: Generic criteria for the allocation of Receptor sensitivity – criteria for allocation

Sensitivity	Physical Receptor	Human Receptor	Biodiversity Receptor	Climate (physical)
High	Little or no capacity to absorb proposed changes and has national or international value, e.g. receptors where people or operations are particularly susceptible to noise or air quality changes)	Receptors with high vulnerability and permanent presence within the direct or indirect AOI (e.g. school, poor or vulnerable household, hospital). No capacity to absorb project changes or no opportunity for mitigation.	Substantial loss of ecological functionality	Climate variability will threaten the sustainability of the project (e.g. work may be precluded from taking place during certain months of the year).
Medium	Moderate capacity to absorb proposed changes, e.g. where it may cause some discomfort, distraction or disturbance	Receptors with moderate to high vulnerability and or somewhat affected by project impacts. Limited capacity to absorb changes. Potential opportunities for mitigation	Moderate but sustainable change which stabilises under the constant presence of impact source, with ecological functionality maintained	Management actions can address potential impacts (e.g. design, implementation management).
Low	Good capacity to absorb proposed changes and not protected or has low value, e.g. receptors where the disturbance is minimal.	Receptors with low to moderate vulnerability are infrequently located in the AOI. Good capacity to absorb changes with no lasting effects, or good access to mitigation measures.	Species or communities unaffected or marginally affected	Potential impact does not affect the sustainability of the Project.

The magnitude of the potential impact is determined based on the professional judgement of the specialist undertaking the assessment or by quantitative means where possible (e.g. modelling and comparison against legislative standards) considering the five criteria provided in Table 22.

Table 22: Determination of magnitude – example criteria for allocation

Magnitude	Intensity / Compliance	Duration	Spatial extent	Reversibility	Likelihood/Frequency
High	High intensity / non-compliant / large numbers of people affected/ very disruptive/noncompliant with legal standards	Beyond the construction phase or permanent change	Direct AOI & Indirect AOI	Permanent impact	Continuous
Medium	Medium intensity/ actions need to be taken to become fully compliant/medium disruption or disruption to vulnerable groups or sectors of the community or workforce / Quality of life diminished due to change in character / borderline compliant with legal standards.	> 3 months up to the completion of the construction phase	Indirect AOI	Reversible but requires mitigation and/or compensation	Intermittent
Low	Low intensity /legally compliant/affects small	One-off event or occurs for	Direct AOI	Reversible following the	Infrequent/one-off event

	numbers of people / non-intrusive or does not cause changes in quality of life	Three months or less		end of the phase under consideration	

The temporal influence of the Project will be assessed by comparing the existing baseline conditions (environmental, socio-economic and biological) over the expected duration of the Project activities.

Based on impact magnitude and receptor sensitivity as defined above, the significance of the impact is classed as insignificant, minor, moderate, major or critical, as presented in Table 23. Those that are deemed moderate, major or critically significant are considered the main focus of the management and implementation framework going forward based on the following considerations:

- **Critical**: These effects represent key factors in the decision-making process. They are generally, but not exclusively, associated with impacts where mitigation is impractical or ineffective.
- **Major**: These effects are likely to be important considerations but where mitigation may be effectively employed such that resultant adverse effects are likely to have a Moderate or Slight significance.
- **Moderate**: These effects, if adverse, while important, are not likely to be key decision-making issues and can be managed effectively with appropriate plans and monitoring.
- **Minor**: These effects may be raised but are unlikely to be important in the decision-making process and can be managed effectively with appropriate plans and monitoring.
- **Neutral**: No effect, not significant; need not be considered as a determining factor in the decision-making process.

Impacts are typically considered adverse, but it is also possible for positive impacts to be realised. Where positive impacts are identified, these are assigned a degree of positive impact based on the sustainability (duration) and scale (number of receptors) of the positive outcomes.

Table 23: Significance evaluation

Significance		**Magnitude**					
		Negative			Positive		
		Low	Medium	High	Low	Medium	High
Receptor Sensitivity	Low	Insignificant	Minor	Moderate	Insignificant	Minor	Moderate
	Medium	Minor	Moderate	Major	Minor	Moderate	Major
	High	Moderate	Major	Critical	Moderate	Major	Critical

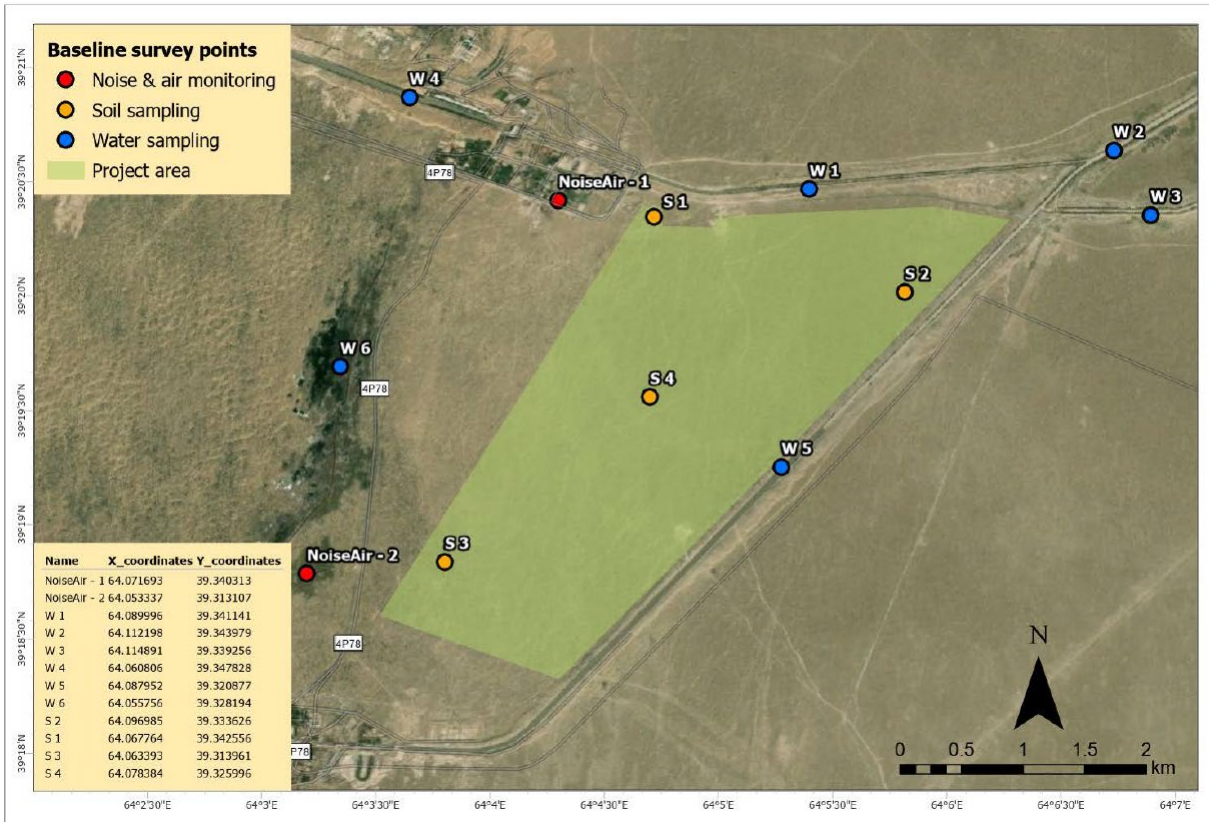
Baseline data collection to inform the impact assessment shall be generated through a combination of approaches for all specialist areas and include primary and secondary source information as defined in the scoping report. The baseline data collection approach shall be underpinned by stakeholder consultation consisting of public meetings with affected communities and interviews and focus groups with key informants such as representatives from local authorities and the local community.

Baseline studies and assessment locations are outlined below and in Figure 65.

- Air quality –24 hours continuous monitoring at two locations: one near the residential area, another at the herder` building for the following parameters: Nitrogen dioxide (NO_2); Sulphur dioxide (SO_2); Carbon monoxide (CO), TSP (total suspended particles); PM2.5 and PM10.

- Noise - day and night-time noise measurements for two representing the nearest sensitive receptors: one near the residential area, another at the herder` building for 24 hours continuously each location for i) A-weighted equivalent continuous noise level in decibels - L_{Aeq} dB(A); ii) minimum and maximum A-weighted sound pressure level in decibels (Lmax (A), Lmin (A). Final locations will be determined after receiving preliminary coordinates of the Project layout.
- Soil sampling (at 6 locations) to confirm the composition of the topsoil and the presence of any elevated contaminants.
- Water sampling (at 6 locations) from the two existing channels surrounding the site.
- Socio-economic surveys.
- Flora, avifauna, mammal, reptile and fish surveys - the biological terms of reference and work plan are provided in Annex C.

Figure 65: Preliminary locations for the baseline surveys



The significance of impacts will be discussed before and after mitigation (i.e. residual impact) for each aspect. Based on the above approach, major, moderate or critical impacts will be classified as significant.

For each significant impact, the ESIA will define the mitigation and management actions in the form of a framework Environmental and Social Management Plan (ESMP). In general, the following hierarchy of mitigation measures will be applied to reduce, where possible, the significance of impacts to acceptable levels:

- Avoidance and reduction through design (embedded mitigation)
- Abate impacts at source or receptor
- Repair, restore or reinstate to address temporary construction effects
- Compensation for loss or damage, such as replacement planting elsewhere

- Once the application of mitigation and management measures has been defined, the residual significance will be determined.

Significant residual impacts are those impacts that remain acceptable after applying mitigation and enhancement measures.

Any uncertainties associated with impact prediction or the sensitivity of receptors due to the absence of data or other limitations will be considered and articulated in the final report.

The ESIA will make commitments concerning monitoring measures that should be implemented in the ESMP.

7.5 Critical Habitat Assessment

A Critical Habitat Assessment (CHA) will be performed which will be based both of review of desktop-level information, the Maxent modelling of EOOO (as described in section 4.6) as well as the results of the biodiversity baseline surveys, and which will be incorporated into the biodiversity baseline section of the ESIA. This CHA will be conducted in a manner that is consistent with both IFC PS6 and EBRD PR6. While these two lender policy documents are largely aligned with respect to CHA methodologies, and criteria for triggering a CH determination, they are divergent with respect to the "second tier" of sensitive biodiversity receptors that trigger a "no net loss where feasible" mitigation requirement (Natural Habitat in the case of IFC; Priority Biodiversity Features in the case of EBRD). This is important for the CHA because our recent experience working with EBRD in Uzbekistan, including the development of imminent nationwide guidance for solar project development, has shown that EBRD regards the identification of PBF as an essential component of CHA. This means that in addition to identifying biodiversity features that trigger a CH determination, the CHA and ESIA will also be expected to identify the biodiversity features that trigger a PBF determination, under the EBRD's separate criteria for such (there is no analogue in IFC PS6), and while CH features will be subject to a "net positive gain" mitigation standard and other requirements (e.g. preparation of a BAP), PBF will be subject to a "no net loss where feasible" mitigation standard. By contrast, the IFC ascribes the "no net loss where feasible" mitigation standard to "Natural Habitat," which is defined in IFC in a manner for which there is no analogue in EBRD PR6. Even though the concepts of PBF and Natural Habitat are not shared between IFC PS6 and PR6, they both trigger the "no net loss where feasible" mitigation requirement, according to the policies of one or the other of these lenders. Therefore, in order to be bankable to both of these lenders, the Project's CHA will need to identify both CH features and PBFs, and the ESIA will need to identify the presence of both PBF and Natural Habitat, in addition to Critical Habitat features, and to include proposed mitigation and management measures for these resources, accordingly.

If Critical Habitat (CH) is triggered for any of the species present within the Project site, a Biodiversity Action Plan (BAP) in line with IFC PS6, EBRD PR6 and associated guidance notes will be required, in order to demonstrate a net gain strategy for each of the receptors for which CH has been triggered.

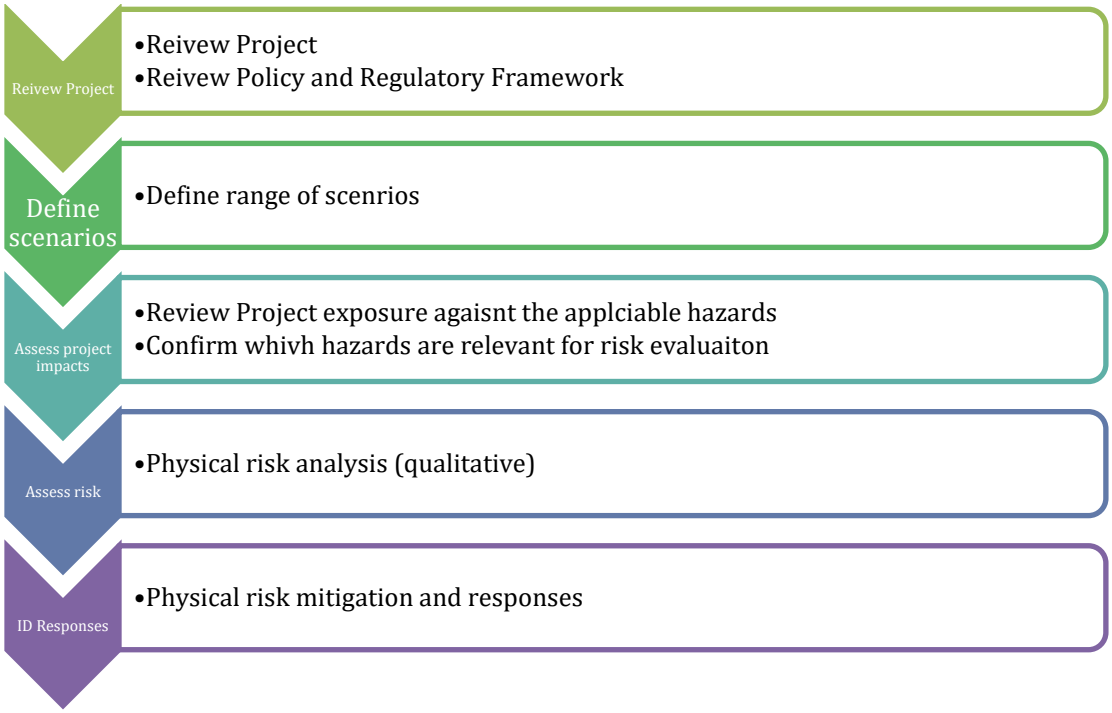
7.6 Climate change risk assessment

The ESIA will include a Climate Change Risk Assessment following requirements set out in Equator Principles 4 to identify, appraise and demonstrate physical climate risks,[51] vulnerabilities and opportunities for the primary elements of the proposed development and its long-term climate resilience and the impact of the Project on wider receptor vulnerability and capacity to adapt to climate change. The main steps undertaken

51 For all projects, in all locations, when combined Scope 1 (direct) and Scope 2 (indirect electricity) emissions are expected to be more than 100,000 tonnes of CO2 equivalent annually. For these projects the CCRA is to include consideration of climate-related 'Transition Risks' (as defined by the TCFD). Theis project will not trigger an exceedance of this threshold.

to complete the assessment for physical risks will be aligned with Taskforce for Climate Related Financial Disclosures (TCFD) process for applying scenario analysis of climate-related risks and opportunities.[52] We will follow the procedure outlined in Figure 66.

Figure 66: Process for climate change risk assessment



The CCRA will facilitate the integration of climate resilience considerations into decision-making early on in project design and prioritization of resilience needs and budget. Inputs from the engineering design team will inform the CCRA to determine levels of climate risk and vulnerability (low, medium or high) and identify appropriate adaptation responses for integration within the proposed development design, the ESMP and the SEP. The CCRA will be a stand-alone annexe to the ESIA with relevant referencing in the main body of the report.

7.7 Human rights risk assessment

Human Rights are described in international standards is aimed at securing dignity and equality for all. Every human being is entitled to enjoy their human rights without discrimination. The HRRA will be prepared to guide the project to respect human rights within its area of influence and monitor that third party companies are respecting human rights too.

The United Nations Guiding Principles (UNGPs) are the key framework for assessment of human rights and to set management systems. The UNGPs state that the responsibility to respect human rights is a global standard of expected conduct for all business enterprises wherever they operate.

Addressing adverse human rights impacts requires taking adequate measures for their prevention, mitigation and, where appropriate, remediation. The Guide to Human Rights Impact Assessment and

52 June 2017, TCFD recommendations report

Management (HRIAM) states that the scope of a human rights risks and impact assessment should consider, at the very minimum:

- The key human rights risks associated with the country of operation
- The human rights risks of key business relationships, including associated facilities and third-party organizations
- The human rights risks and impacts relating to the business activity itself
- The range of stakeholders (potential and actual) that are directly or indirectly affected by the business activity
- The nature and level of the risks and impacts, at different key stages of the project's lifecycle

The HRRA will identify rights holders and duty bearers and the possible risks the project will have on them. Contrary to an ESIA where significance of a risk or impact is identified, UNGP Principle 14 requires that the severity of human rights impacts are identified. As per Principle 14 'severity of impacts will be judged by their scale, scope and irremediable character"[53]. The HRRA will rank risks per their significance and identify possible mitigation measures. Many of these will align with mitigation measures identified elsewhere in the ESIA. The HRRA will be a stand-alone annex to the ESIA with relevant referencing to and from the main body of the report.

7.8 Volume III: Technical Appendices

Supporting baseline studies and other documentation will be provided in Volume III.

7.9 Volume IV: Framework ESMP

The primary aim of the ESMP is to safeguard the environment, site staff and the local population against site activity which may cause harm or nuisance. The ESIA will include an ESMP including the following content:

- Project Description – overview of the Project description.
- Applicable Regulatory Standards and Guidelines – legal and other relevant standards and guidelines for the Project.
- Environmental and Social Management – provides the environmental and social aspects and impacts along with proposed outline mitigation measures for the construction and operational phases.
- Environmental and Social Monitoring – this section will outline the physical environmental and social monitoring and measurement activities and indicators for the construction and operational phases.

7.10 Volume V: Livelihood Restoration Plan

A Livelihood Restoration Plan will be developed based on the following guiding principles:

- Land acquisition and resettlement will be minimized or avoided where possible;
- All livelihood restoration activities will be managed through the LRP and implementation will be documented and monitored;
- All Project affected persons (PAPs) will be meaningfully consulted and be active participants throughout the design and implementation of the LRP;
- PAPs will be assisted in their efforts to improve their livelihoods and standards of living, or at least to restore them to pre-Project levels; and
- All compensation will be paid prior to the commencement of civil works in affected areas.

53 guidingprinciplesbusinesshr_en.pdf (ohchr.org)

7.11 Volume VI: SEP

A stakeholder engagement plan (SEP) will be developed to coordinate the public participation process following national and IFC PS1. The SEP will guide the following activities:

- Identify all affected people (i.e. by construction activities or during operation) and facilitate the spread of information to relevant authorities and interested and affected parties (IAPs).
- Consult with relevant NGOs and government departments and agencies that may have a stake in the Project and its impacts.
- Prepare a stakeholder consultation plan that provides an opportunity for relevant authorities and IAPs to voice concerns and issues related to the project and allow for the identification of additional alternatives or recommendations. The stakeholder consultation plan will also describe a schedule for public consultation with the relevant groups including the frequency and method of communication (i.e. media announcements, town hall meetings, questionnaires, etc.). Results of the public consultation process will be summarized in an appendix to the ESIA.

References

1. https://www.iucnredlist.org/
2. https://protectedplanet.org/
3. http://datazone.birdlife.org/country/uzbekistan
4. https://reptile-database.reptarium.cz/
5. Red Data Book of the Republic of Uzbekistan (2019) Vol. 1. Plants. Tasvir, Tashkent. (in Uzbek, Russian and English).
6. Red Data Book of the Republic of Uzbekistan (2019) Vol. 2. Animals. Tasvir, Tashkent. (in Uzbek, Russian and English).
7. Bobrinsky N.A., Kuznetsov B.A., Kuzyakin A.P. Guide book of the mammals of the USSR, Moscow, 1944 - 468 p. (in Russian) [Бобринский Н.А., Кузнецов Б.А., Кузякин А.П. Определитель млекопитающих СССР, Москва, 1944 - 468 с.]
8. Bogdanov O. P. Rare animals of Uzbekistan: Encyclopedic reference book. Tashkent, 1992. 400 p. (in Russian) [Богданов О.П. Редкие животные Узбекистана: Энциклопедический справочник. Ташкент, 1992. 400 с.}
9. Bykova E.A., Marmazinskaya N.V., Esipov A.V., Gritsyna M.A. A brief overview of the state of rare ungulates in Uzbekistan. "Ecosystems of Central Asia: Research, Conservation, Rational Use". Krasnoyarsk, 2020. P. 199-205. (in Russian) [Быкова Е.А., Мармазинская Н.В., Есипов А.В., Грицына М.А. Краткий обзор состояния редких копытных Узбекистана. "Экосистемы Центральной Азии: исследование, сохранение, рациональное использование". Красноярск, 2020. С. 199-205.]
10. Gritsina Mariya The Caracal Schreber, 1776 (Mammalia: Carnivora: Felidae) in Uzbekistan. Journal of Threatened Taxa | www.threatenedtaxa.org | 12 March 2019 | 11(4): 13470–13477.
11. Gritsina, M.A., D.A. Nuridjanov, N.V. Marmazinskaya, T.V. Abduraupov, V.A. Soldatov & A.N. Barashkova Some rare faunistic findings related to the mammals in the Territory of Uzbekistan]. Some rare faunistic findings related to the mammals in the Territory of Uzbekistan. Tashkent, 2016, pp. 77–82. (in Russian) [Грицына М.А., Нуриджанов Д.А., Мармазинская Н.В., Абдураупов Т.В. Солдатов В.А., Барашкова А.Н. Некоторые редкие фаунистические находки млекопитающих на территории Узбекистана // Современные проблемы сохранения редких, исчезающих и малоизученных животных Узбекистана, Ташкент. 2016. - С.77-82.]
12. Gritsyna M.A., Esipov A.V., Abduraupov T.V., Soldatov V.A. Review of encounters of rare species of vertebrates in North-West Kyzyl Kum. Modern problems of conservation of rare, endangered and poorly studied animals in Uzbekistan. Tashkent, 2016. P. 82-86. (in Russian) [Грицына М.А., Есипов А.В., Абдураупов Т.В., Солдатов В.А. Обзор встреч редких видов позвоночных на территории Северо-Западного Кызылкума. Современные проблемы сохранения редких, исчезающих и малоизученных животных Узбекистана. Ташкент, 2016. С. 82-86.]
13. Heptner, V.G. & A.A. Sludskii (1972). Karakal (in Russian) [Caracal] Felis (Lynx) caracal Schreber, 1776, Mammals of the Soviet Union. Vol. 1, Part 2. Carnivora (Hyenas and Cats)]. Vysshaya Shkola, Moscow, 1972, pp. 366–384. (in Russian) [Гептнер В.Г., Слудский А.А. Млекопитающие Советского Союза. Том второй. Хищные (гиены и кошки). - Москва: Высшая школа, 1972. - С. 457 – 477.]
14. Ishunin, G. I. Mammals (Predators and Ungulates). The Fauna of Uzbek SSR. V.3. Tashkent, 1961. 230 p. (in Russian) [Ишунин Г.И. Млекопитающие (хищные и копытные). Фауна Узбекской ССР. Т.3. Ташкент, 1961. 230 с.]
15. Kolesnikov I.I. Mammals (Ridents). The Fauna of Uzbek SSR. V 3, Issue.5. Tashkent, 1953. 137 p. (in Russian) [Колесников И.И. Млекопитающие (грызуны). Фауна Узбекской ССР. Т.3, вып.5. Ташкент, 1961. 137 с.]
16. Marmazinskaya N.V., Gritsyna M.A. Modern distribution of goitered gazelle Gazella subgutturosa Güldenstädt, 1780 in the Kyzylkum desert (Uzbekistan). Spatial-temporal dynamics of biota and ecosystems of the Aral-Caspian basin. Orenburg, 2017. P. 261-267. (in Russian) [Мармазинская Н.В., Грицына М.А. Современное распространение джейрана Gazella subgutturosa Güldenstädt, 1780 в пустыне Кызылкум (Узбекистан). Пространственно-временная динамика биоты и экосистем Арало-Каспийского бассейна. Оренбург, 2017. С. 261-267.]
17. Pavlenko T.A., Davletshina A.G. On the biocenotic role of the Brandt's hedgehog (Paraechinus hypomelas Brandt) on the pastures of the Southwestern Kyzyl Kum. Zoological journal, vol. XLVII, no. 6. Moscow, 1958. P. 958-959. (in Russian) [Павленко Т.А, Давлетшина А.Г. О биоценотической роли длинноиглого ежа (Paraechinus hypomelas Brandt) на пастбищах Юго-Западного Кызылкума. Зоологический журнал, т. XLVII, вып. 6. Москва, 1958. С.958-959.]
18. Volozheninov N.N. Insectivores of the south of Kyzylkum. Ecology of some species of mammals and birds of the plains and mountains of Uzbekistan. Tashkent, 1981. P. 58-69. (in Russian) [Воложенинов Н.Н. Насекомоядные юга Кызылкумов // Экология некоторых видов млекопитающих и птиц равнин и гор Узбекистана. Ташкент, 1981. С.58-69.]

19. Zakhidov T.Z. Biocenoses of the Kyzyl Kum Desert (experience of the ecological and faunistic analysis and synthesis). Tashkent, 1971, 304 p. (in Russian) [Захидов Т.З. Биоценозы пустыни Кызылкум (опыт эколого-фаунистического анализа и синтеза). Ташкент, 1971. 304 с.
20. Andrushko A.M., Ecological and faunal essay of reptiles of the central part of the Kyzylkum desert, Bulletin of LGU, 1953, No. 7. [Андрушко А.М., Эколого-фаунистический очерк пресмыкающихся центральной части пустыни Кызылкум, Вестник ЛГУ, 1953, № 7.]
21. Bogdanov O.P. Fauna of the Uzbek SSR. Part 1. Amphibians and reptiles. - Tashkent: Publishing House of the Academy of Sciences of the Uzbek SSR, 1960. – 260p. [Богданов О.П. Фауна Узбекской ССР. Ч.1. Земноводные и пресмыкающиеся. – Ташкент: Изд-во АН УзССР, 1960. – 260с.]
22. Bogdanov O. P. Ecology of reptiles of Central Asia. Tashkent: Nauka, 1965. - 257 p. [Богданов О. П. Экология пресмыкающихся Средней Азии. Ташкент: Наука, 1965. - 257 с.]
23. Bogdanov O. P. Reptiles // Rare animals of Uzbekistan. Encyclopedic reference. - Tashkent: Gl. ed. Encyclopedias, 1992. C. 303-371. [Богданов О. П. Пресмыкающиеся // Редкие животные Узбекистана. Энциклопедический справочник. - Ташкент: Гл. ред. энциклопедий, 1992. С. 303-371.]
24. Bondarenko D. A. Distribution and population density of the Russian tortoise in Central Kyzylkums (Uzbekistan) // Byul. Mosk. about the nature testers. Ed. biol. 1994. Vol. 99, issue I. pp. 22-26. [Бондаренко Д. А. Распределение и плотность населения среднеазиатской черепахи в Центральных Кызылкумах (Узбекистан) // Бюл. Моск. о-ва испытателей природы. Отд. биол. 1994. Т. 99, вып. I. С. 22-26.]
25. Bondarenko D.A., Peregontsev E.A. Distribution of the Russian tortoise Agrionemys horsfieldii (Gray, 1844) in Uzbekistan (area, regional and landscape distribution, population density) // Modern herpetology. 2017. Vol. 17, issue 3/4. pp. 124 - 146. [Бондаренко Д.А., Перегонцев Е.А. Распространение среднеазиатской черепахи Agrionemis horsfieldii (Gray, 1844) в Узбекистане (ареал, региональное и ландшафтное распределение, плотность населения) // Современная герпетология. 2017. Т. 17, вып. 3/4. С. 124 – 146.]
26. Esanov H.K. (2017) Analysis of the flora of Bukhara Oasis. Abstr. PhD Diss. Tashkent. 45 p. (In Uzbek and Russian)
27. Esanov H.K. (2019) Flora of Bukhara Oasis. Durdona Publishers, Bukhara. 128 p. (In Uzbek)
28. Flora of Uzbekistan. In 6 vol. (1941–1963) Academy of Sciences of the Uzbek SSR, Tashkent. (In Russian).
29. Geographical atlas of Uzbekistan. (2012) Goskomgeodeskadastr, Tashkent. 119 p. (In Russian).
30. Tojibaev K.Sh., Beshko N.Yu., Shomurodov Kh.F. & al. (2019) Inventory of the flora of Uzbekistan: Navoi Province. Fan Publishers, Tashkent. 216 p. (In Russian).
31. Tojibaev K.Sh., Beshko N.Yu., Shomurodov Kh.F. & al. (2020) Inventory of the flora of Uzbekistan: Bukhara Province. O'kituvchi Publishers, Tashkent. 128 p. (In Russian).
32. Zakirov P.K. (1971) Botanical geography of low mountains of Kyzylkum and Nuratau ridge. Fan Publishers, Tashkent. 203 p. (In Russian).

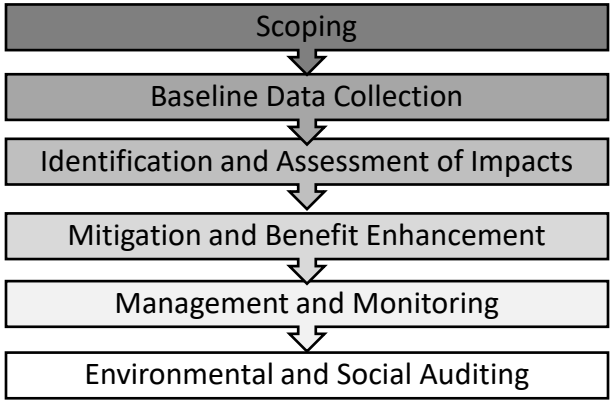
Annex A: Scoping Notification Leaflet

Juru Energy

ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT (ESIA)

The Project is currently in the scoping phase of the ESIA process. Next steps include collecting physical, biological and socio-economic baseline data within the Project site and nearby communities. Potential positive and negative impacts for the construction, operation and decommissioning phases will then be assessed for significance and management and mitigation measures identified to reduce risk to acceptable levels. The ESIA process will:

- Identify actions that can be taken to eliminate, or at least reduce any negative impacts as a result of the Project, to acceptable levels, and enhance Project benefits.
- Confirm that costs are not levied on the public or individuals that are greater than the benefits they will receive.
- Sequence of Tasks for ESIA Study



NUR BUKHARA SOLAR PV INTRODUCTION

Abu Dhabi Future Energy Company PJSC ("Masdar") has been awarded by the Ministry of Energy, Government of Uzbekistan to design, build, finance, construct, commission and operate & maintain the Nur Bukhara Solar photovoltaic (PV) project with a capacity of 250 MW_{AC} and 63 MW and 2 hours of energy capacity ("**Project**"). The Project will be implemented through a long term i.e., 25 years power purchase agreement (a "**PPA**") with JSC National Electric Grid of Uzbekistan ("NEGU"). The Project will be designed to meet national regulations and international standards.

The Project will support Uzbekistan to:

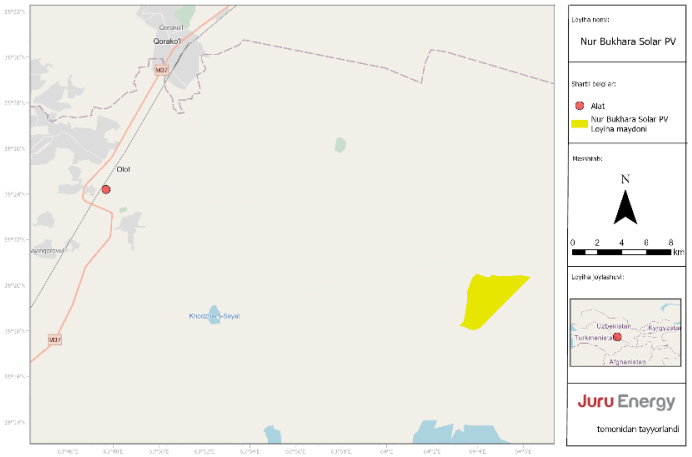
- Reduce energy dependence on carbon-based fuels.
- Meet renewable energy targets.
- Reduce greenhouse gas emission rates.

This leaflet has been produced to provide information about the basic

characteristics of the Project and its surroundings, and how the environmental and social impacts will be assessed and managed.

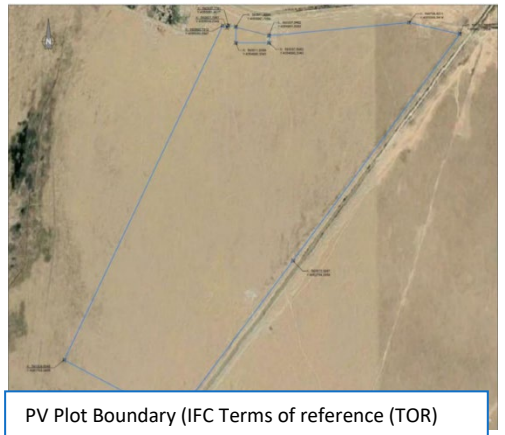
PROJECT DESCRIPTION AND LOCATION

The proposed site covers approximately 691 Ha area of land located in Alat District of Bukhara region, of the Republic of Uzbekistan. It is located 24 km southeast of Alat city, close to the border on Turkmenistan which at the closest point lies around 25 km southeast of the site. The proposed site is flat and is surrounded by the Amu-Bukhara canal to the North, South and East. The site has existing road access.



Construction of the Project will consist of the following basic infrastructure components:

- Foundations for the mounting structures for PV panels, and installation of the panels, cabling and hydraulic fittings;
- An inverter and transformer station and substation;
- Construction of internal access roads and maintenance paths, as well as storm water drainage system;
- Construction of temporary construction camp/offices and construction lay-down area;
- The Battery System including the batteries themselves and a control and monitoring system (BMS);
- Operation and maintenance rooms, offices and parking areas;
- Security fence, lightning and accommodation for workers (including water and sanitation).
- The Project will be connected to the national grid system via a short (300m) connection to an existing overhead transmission line (OHTL) that crosses near the Project site.



PV Plot Boundary (IFC Terms of reference (TOR) for environmental and social impact assessment (ESIA) – Bukhara Solar PV Project

The preliminary layout is presented in Figure 2. Stakeholder engagement shall be undertaken during the preparation of the scoping report and ESIA in accordance with national regulations and good practice. Stakeholder engagement activities will include Project Affected Persons ("PAP") and communities concerned by the Project e.g., local and traditional leaders, representatives of the communities, land users, potential vulnerable groups such as youth and women.

CONTACT DETAILS

All complaints, comments or queries relating to the ESIA for the Nur Bukhara Solar PV Project should be sent to:

JURU ENERGY CONSULTING LLC, UZBEKISTAN

Name: Viktoriya Filatova, Zilola Kazakova

Address: 10A, Chust Str., Tashkent, Uzbekistan, 100077

Email: esia_alat_spp@juruenergy.com

Phone: +998 90 515 03 92

Annex B: Project Grievance Form

Ref No.		
1	Name (indicate if complainant preferred to be anonymous)	Full name (if applicable): Gender: Age: Address (if applicable): Occupation (if applicable): I wish my identity not to be disclosed: ____
2	Contact information (need to specify the way to get back to complainant)	Mob phone: Fax: Email: Other (specify):
3	How compliant/ feedback/request was received and by whom	Phone call: Text/WhatsApp applications: Verbal communication: Letter/Email: Receiver's name:
4	Purpose of contact	Make a compliant: Give a feedback: Request information: Other (specify):
	Date application was received	Date: Time:

5	Text of applicant's message	
6	Response message (after receipt of application)	Dear _____ We confirm that we have received your application. We would like to inform you that your application is under review. You will receive the response within two weeks of submission of the application. We also would like to inform you that you will get written response for the issues you have raised in your request. We will keep you updated. Thank you for your understanding. *This message was delivered to the applicant by*_____ *on* _____ *at* __ *via* _____
7	Summary of the response provided to the applicant	
8	Follow up actions required:	
9	Date the application was closed	Date:

The message was addressed by _____

Date/Month/Year _____

The response was delivered by _____

Date/Month/Year _____

Signature and stamp _____

Annex C: Biodiversity Survey Work Plan

As part of the ESIA, biodiversity baseline surveys are needed to validate assumed status and fill any information gaps.

Stage 1 – Desktop Assessment

The ESIA will include a comprehensive desktop assessment, which consists of a review of existing information from platforms including but not limited to, International Union for Conservation of Nature, Birdlife International, World Database on Protected Areas, Global Critical Habitat Screening Layer, Integrated Biodiversity Assessment Tool, Global Biodiversity Information Facility, World Database of Key Biodiversity Areas, Global Invasive Species Database, grey literature and published research articles, national Biodiversity Strategy and Action Plan(s), regional Red List(s), citizen science reports, and any other relevant and verifiable documents.

The outcomes of the Desktop Assessment will include:

- Identification of the boundaries of the baseline study area, taking into account the principles of Area of Influence (AoI) as well as Ecologically Appropriate Area of Analysis (EAAA);
- Preparation of a Land Cover/Land Use map covering the baseline study area boundaries, identifying preliminary habitats and sensitive receptors using remote sensing techniques; and
- A consolidated narrative compiling the findings of data review and consultation, inclusive of:
    - mapping spatially relevant information, such as the boundaries of IBAs, KBAs, protected areas, and/or known species distributions;
    - listing relevant biodiversity values that may or do exist within the study area, such as habitats, species, and unique ecosystems, focusing on those that could constitute Critical Habitat features or Priority Biodiversity Features, per EBRD PR6;
    - provision of an initial assessment of biodiversity status of the study area, with focus on habitats and species that could trigger a Critical Habitat determination, per EBRD PR6;
    - identification of any information gaps or weaknesses that should be addressed through field surveys; and
    - proposed detailed field surveying methodology tailored and updated as per the findings of the desktop assessment.

Stage 2 – Field Surveying

The following surveys are planned to capture information ranging across biodiversity values such as habitat, flora, and additional terrestrial fauna species (birds, reptiles and fishes).

The field surveying methodology may be further tailored once the comprehensive desktop assessment has been undertaken. However, the below field surveying methodology has been proposed given the general lack of detailed information present throughout the project site and surrounding area.

The below sub-sections outline the completed and proposed field survey methodology.

Habitat and Flora Surveying

A specialist will undertake a walkover for two days in April to broadly categorise the habitat types of the project site and compile flora species lists, and two days in June to conduct the *Calligonum* identification.

A report will be prepared detailing the methods and results, including details of habitat types present, basic habitat maps, and any status of particular protected plant species (IUCN and Uzbekistan Red Data Book) will be required.

The report will, in part, compare the results of the 2023 survey to the results and assessment of any previous surveys undertaken (where applicable) to note changes in habitats and species recorded.

The main tasks of expert-botanist are following:

- field botanical survey and processing of field data;
- Maxent modelling for *Calligonum mole* and *Calligonum matteianum*;
- analysis of any previous botanical surveys and other available data (publications, reports, etc.) compared with the results of the 2023 survey;
- detailed description and GIS-based mapping of habitat types present within the project site;
- compilation of the check-list of plant species recorded within the project site (in particular, threatened species included in the Rad Data Book of Uzbekistan and/or the IUCN Red List).

The field research on the project area will be conducted using the traditional methods of botanical survey commonly used for sampling and mapping of native non-forest vegetation, recognition of floristic composition and spatial patterns of plant communities.

Vegetation structure and species composition will be described from 50x50 m geobotanical sample plots (squares) chosen in an area with homogeneous vegetation. Sample plots (squares) will be located away from roads and boundaries between different vegetation communities (coordinates of these boundaries observed during the survey were recorded separately). For each square, photographs of the landscape and vegetation were taken using a digital camera, and following data will be recorded: location and physical environment (including GPS coordinates, elevation, topography, and soil), state of vegetation and disturbance factors (grazing, etc.), plant association, canopy cover (%), canopy height, all plant species present at the plot, their cover and abundance, phenological stage and height. Microcomplexes (e.g. along dry riverbeds) will be described separately. Coordinates of populations of endemic, red listed or alien species, number of individuals and area occupied by population also will be recorded.

Species cover and abundance will be determined using the Braun-Blanquet cover-abundance scale (1965) widely used in geobotanical and ecological studies as rapid visual assessment technique

Esri ArcGIS 10.1 software will be used for vegetation mapping. The vegetation map will be compiled in ArcGIS by visual interpretation of the satellite image using the field data, a topographical map (1:100.000) and a soil map of the region.

Results will be presented as per the tables provided below:

Botanical survey results for every survey location

Plant species	Life form	Height, cm	Abundance	Phenol. stage	Conservation status

Summary of botanical survey results

Plant species	Life form	Family	Abundance	Habitat type	Conservation status

Herpetological survey

The aim of the field herpetological survey is to assess the status of reptiles in the study area of the project territory (specification of the species and quantitative composition, territorial distribution, including places of concentration, the state of habitats).

The main tasks of the herpetological survey are the following:

- Field herpetological survey and processing of field data for two days in April;
- Russian tortoise counts during two days in April,
- Desert Sand Boa (UZRD NT) count during two days in June,
- analysis of any previous herpetological surveys and other available data (publications, reports, etc.) compared with the results of the 2023 survey;
- Compilation of the checklist of species recorded within the project site (in particular, threatened species included in the Red Data Book of Uzbekistan and/or the IUCN Red List).

The research will combine static and transect survey methods. Locations for stationary surveys and transects will be selected following different types of habitats and will be determined during preparatory work based on the maps and literature data.

The quantitative assessment of reptiles and amphibians will be mainly based on the transect survey. The transect method consists in counting individuals along a fixed long line (transect), on both sides of it, with the duration of the survey determined by the known distance, which is selected depending on the type of reptile and the area, but does not exceed 1 km in one way. In this case, all individuals encountered on the transect are registered, regardless of the distance they are identified at. The perpendicular distance is measured between the transect axis and each individual. The results obtained are used to calculate the density of recorded reptiles.

The list of reptile species inhabiting the project territory will be presented in the following form:

The list of reptile species

No	Species name	Species name acc. to literary sources	Author's earlier personal data	April, June 2023 field expedition data	Species abundance	Endemism	Nature conservation status		
							UzRDB	IUCN	CITES

Bird survey

The aim of the field ornithological survey is to assess the status of bird in the study area of the project territory (specification of the species and quantitative composition, territorial distribution).

The main tasks of the survey are the following:

- Asian Houbara survey (point count) during one day in April;
- Marbled Teal breeding survey during one day in April/May and end of May/early June;
- Analysis of any previous ornithological surveys and other available data (publications, reports, etc.) compared with the results of the 2023 survey; and
- Compilation of the checklist of species recorded within the project site (in particular, threatened species included in the Red Data Book of Uzbekistan and/or the IUCN Red List).

The list of bird species inhabiting the project territory will be presented in the following form:

The list of bird species

No	Species name	Data	Number	Nature conservation status		
				UzRDB	IUCN	CITES

Fish survey

The aim of the field fish survey is to assess the status of shovelnose sturgeons: Amu-Darya Shovelnose Sturgeon *Pseudoscaphirhynchus kaufmanni* (IUCN RL CR, UzRDB CR) and Small Amu-Darya Shovelnose Sturgeon *Pseudoscaphirhynchus hermanni* (IUCN RL CR, UzRDB CR) in the study area of the project territory.

The main tasks of the survey are following:

- Shovelnose sturgeon survey during 4 days in April/May;
- Analysis of any previous fish surveys and other available data (publications, reports, etc.) compared with the results of the 2023 survey;
- Compilation of the check-list of species recorded within the project site (in particular, threatened species included in the Red Data Book of Uzbekistan and/or the IUCN Red List).

The list of fish species inhabiting the project territory will be presented in the following form:

The list of fish species

No	Species name	Data	Number	Nature conservation status		
				UzRDB	IUCN	CITES

Mammals Survey

The survey for terrestrial mammals will aim to establish the presence and absence of mammal species within the project territory and its surrounding areas. To accomplish this, the following steps will be taken:

- Conduct a ground survey on mammal species throughout the study area, which will take into account AoI and EAAA;
- Collecting questionnaire data from local people on mammal species presence/absence, status and threats;
- Analysis of the preliminary field data, including the number of species and distribution; and
- Compiling a mammal species list based on field data, questionnaire data and data from literature sources, including endangered and non-endangered species.

The ground survey will be conducted in April. During the ground survey, the mammal species composition will be studied by walking survey transects. The whole length of the ABIS canal bordering the Project site will also be surveyed for the presence of Central Asian Otter.

During the field research, a non-invasive methodology will be used, not related to the capture and killing of wild animals, including:

- Visual observation of mammals both by eye and using 10x binoculars;
- Registration of tracks of the vital activity of wild mammals, including animal tracks (paw footprints on the ground), faeces, digging, burrows, dead animals, etc.
- Taking photos of the animals, their tracks and traces of their vital activity, typical habitats.

Characteristics of mammals found in the project area will be presented in the table provided below:

Mammal species

№	Species	Status of threat IUCN / Uzbekistan RDB	Sources

Annex D: Preliminary Permit Register

Permit / Required Activity	Permit Title	Issuing Authority	Implementing Law	Responsible Party for Obtaining License
Pre-construction				
Construction activities	Construction Permit	Khokimiyats of Project region	• Resolution of the Oliy Majlis of the Republic of Uzbekistan "On the list of activities for which a license is required" No. 222-II of 12.05.2001; • Resolution of the Cabinet of the Republic of Uzbekistan No. 54 of 02/25/2013. Appendix 1 "Regulations on the procedure for granting land plots in populated areas for the implementation of urban planning activities of design and registration of construction objects, as well as the acceptance into operation of objects"	Masdar
Construction activities	The Positive Conclusion of SEE for the national EIA report (Stage I and/or Stage II)	MNR	• Law «On Nature Protection» (1992); • Law of the Republic of Uzbekistan "On Ecological Expertise" (2000); and • Regulations "On the State Environmental Expertise" (SEE), approved by the Resolution of Cabinet of Ministers No. 541 "On further improvement of the environmental impact assessment mechanism' (2020).	Masdar
Construction activities	Cultural Heritage Clearance	Ministry of Culture of Uzbekistan	• Law on the Protection and Use of Cultural Heritage Objects (2001)	Masdar

Permit / Required Activity	Permit Title	Issuing Authority	Implementing Law	Responsible Party for Obtaining License
			-	
Pre-construction activities	Ecological permits Permission of the MNR to obtain rare and endangered plant species listed in the Red Book of the Republic of Uzbekistan from the natural environment Approval of the Protocol of pre-construction surveys and relocation by MNR)	MNR	• Law «On Nature Protection» (1992); • Law "On the Protection and use of flora" No. 409 dated 21.09.2016 • Law "On the Protection and use of wildlife" No. 408 dated 19.09.2016	Masdar
Pre-commissioning				
Construction activities	The Positive Conclusion of SEE for the national EIA report (Stage III)	SCEEP	- Law «On Nature Protection» (1992); - Law of the Republic of Uzbekistan "On Ecological Expertise" (2000); and - Regulations "On the State Environmental Expertise" (SEE), approved by the Resolution of Cabinet of Ministers No. 541 "On further	EPC contractor

Permit / Required Activity	Permit Title	Issuing Authority	Implementing Law	Responsible Party for Obtaining License
			improvement of the environmental impact assessment mechanism' (2020).	

Annex E: Information about protected areas in the scoping AOI

State wildlife sanctuary 'Lake Dengizkul' (39°07'N 064°10'E).

The largest saline wastewater closed water body in the SW part of the Kyzylkum desert, with typical ecological conditions of natural lakes situated in the deserts of Central Asia. The water is strongly salty and supplied by a collector-drainage channel. In former times it was the final reservoir of the Zarafshan river. The lake, dried up by the mid-1950s because of overuse for irrigation, has been refilled since 1966 and is very important for maintaining a biodiversity of wetland-dependent species in a largely arid region. It is of crucial importance for migrating and wintering waterfowl, as it is situated on the route of bird migrations on Central Asian Flyway.

It is surrounded by mainly sandy desert with large sand dunes and bushes of saxaul and acacia – the northern part of the Sundukli sands. Hilly sands are most typical for the boundary region with Turkmenistan. The lake is situated in a natural low-lying landscape. The IBA consists of the open water area and coastal strip 500 metres wide.

The list of birds of Dengizkul Lake was compiled from personal records and the literature and includes 133 species: 53 species breed, 9 are resident, 14 wintering and 57 migrants. The total number of birds always exceeded 20,000. Important wintering species are *Pelecanus crispus, Marmaronetta angustirostris*, *Aythya nyroca* and Oxyura leucocephala. Lake Dengizkul is also the habitat of many vulnerable and endangered species, especially as it supports more than 1% population of the endangered White-headed Duck *Oxyura leucocephala*[54].

Mammals include badger and jackal and there are colonies of gerbils and jerboas. Reptiles include *Teratoscincus scincus, Varanus griseus* and *Phrynocephalus interscapularis*. Amphibians include *Bufo viridis*. There are many different spiders here including karakurt and Sun spider. Fish checklist includes *Stizostedion lucioperca, Pseudoscaphirhynchus kaufmanni* and *Cyprinus carpio*. There are numerous small sandhoppers which provide plentiful food for fish and birds. Vegetative associations consist of coastal thickets of reed and reed mace. On the shore there are several associations of desert vegetation and a poorly developed tugai association.

Commercial mining of gas in the vicinity of and on Lake Dengizkul is the main human activity, and this enabled the provision of the population with fuel and thus preserved trees and shrubs, which are important components of the desert ecosystem.

State wildlife sanctuary 'Kumsulton'

State Wildlife Sanctuary (without formation of a legal entity) '**Kumsulton'** (IV IUCN category) was created in 2010. The site consists of sand desert with a drainage waterbody.

State wildlife sanctuary 'Khadicha'

State Wildlife Sanctuary (without formation of a legal entity) 'Khadicha' (IV IUCN category) was created in 2010 The site consists of sand desert with a drainage waterbody. This site is important for wintering White headed duck (in winter 2018 over 2000 indiv. were observed here).

54 BirdLife International (2023) Important Bird Areas factsheet: Dengizkul Lake. Downloaded from http://www.birdlife.org on 19/03/2023.

http://datazone.birdlife.org/site/factsheet/dengizkul-lake-iba-uzbekistan

IBA 'Khodzha-Davlet'[55]

The site consists of sand desert with an irrigation canal system and saxaul forests. People seldom visit this area because of its proximity to the state border. As a result, the saxaul forest is not subject to much felling. An abundance of water enables it to produce a good harvest of fruits. These conditions attract *Passer simplex* to the Khodjzha-Davlet sands area. There is a complex of desert and semidesert biome species in the saxaul forest. 36 species were recorded during two seasons' fieldwork in May 2004 and June 2007. Nine were biome species, 9 commercial and game species and the others. Species recorded included *Ardea purpurea, Phalacrocorax pygmaeus* (UzRDB), *Accipiter badius, Circus aeruginosus*, *Himantopus himantopus, Actitis hypoleucos, Charadrius dubius, Tringa ochropus, Sterna nilotica, Sterna hirundo, Columba livia, Streptopelia turtur, Pterocles orientalis, Caprimulgus aegyptius, Merops persicus, Upupa epops, Apus apus, Galerida cristata, Calandrella rufescens, Hirundo rustica, Riparia diluta, Cercotrichas galactotes, Hippolais languida, Sylvia nana, Sylvia mystacea, Scotocerca inquieta, Acrocephalus stentoreus, Parus bokharensis, Passer simplex, Passer indicus, Pica pica, Corvus monedula, Emberiza bruniceps and Emberiza rustica*.

Mammals: *Gazella subgutturosa* (UzRDB, IUCN) is found very rarely and *Cricetulus migratorius* (IUCN RL). Reptiles: *Testudo horsfieldi* (UzRDB, IUCN RL)

IBA 'Zekry'[56]

This site is situated 30 km to the SE of Bukhara city. Zekry was formed in the beginning of the 1990s as a result of emergency evacuation of water from a drainage network to the naturally low sand desert. Currently it is a shallow reservoir with a gently sloping shore and well developed reedbeds. There are tamarix bushes along the lakeside. The water is brackish and comes to the lake through the collector channel. The lake floods extensively during times of high water levels. The site is important for concentrations of migrating and wintering waterbirds.

During four winter counts 42 species were recorded including the globally endangered species - *Pelicanus crispus, Aythya nyroca, Oxyura leucocephala*, *Aegypius monachus* and *Larus ichthyaetus* are included in the National Red Book. *Fulica atra* and *Anser anser* are dominant wintering species in different years. Subdominant species are *Aythya ferina, Netta rufina* and *Anas clypeata*.

Jackal, Steppe Cat and Libyan Jird are common in the area. In the adjoining sand desert are Tolai hare, Great gerbil, Brandt's hedgehog, Corsac fox, Steppe tortoise, Desert monitor, *Phrynocerhalus interscapularis*. Desert monitor is included on the IUCN Red List. Plants are represented by typical desert associations.

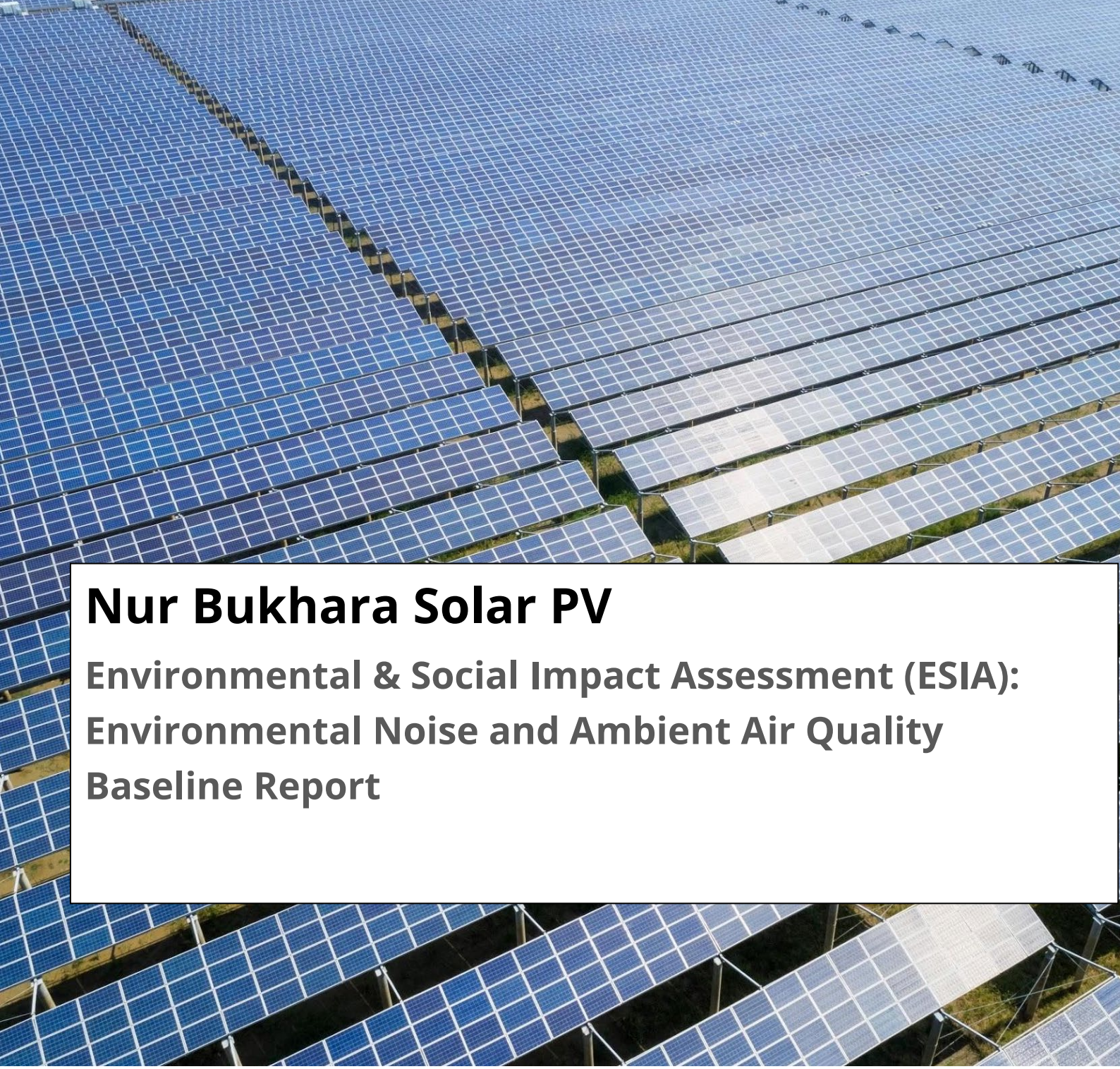
55 BirdLife International (2023) Important Bird Areas factsheet: Khodzha-Davlet. Downloaded from http://www.birdlife.org on 19/03/2023.

http://datazone.birdlife.org/site/factsheet/khodzha-davlet-iba-uzbekistan

56 BirdLife International (2023) Important Bird Areas factsheet: Zekry Lake. Downloaded from http://www.birdlife.org on 19/03/2023.

http://datazone.birdlife.org/site/factsheet/zekry-lake-iba-uzbekistan

Technical appendix 4: Environmental Noise and Ambient Air Quality Baseline Report



Nur Bukhara Solar PV

Environmental & Social Impact Assessment (ESIA): Environmental Noise and Ambient Air Quality Baseline Report

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1	April 2023	ESIA Technical Appendix: Environmental noise and air quality baseline report	Oleg Khegay	Viktoriya Filatova	Nicola Davies

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1. Introduction

In order to characterise the sound and air profile of the area of the proposed development to support future monitoring obligations or noise grievances, a continuous environmental noise and air quality (AQ) monitoring was carried out from the 07 April 2023 to 08 April 2023 at two nearest sensitive receptors (NSRs) for daytime and night-time noise (24hr). In addition wind speed and direction, were also measured.

Two monitoring locations were chosen based on proximity to the proposed Solar PV and BESS area and to provide representative conditions for the NSR that may be affected by the Project. AQ and noise monitoring locations were at the same places (Figure 1). The noise measurement locations and the distance from the proposed project to the site are depicted in Figure 2.

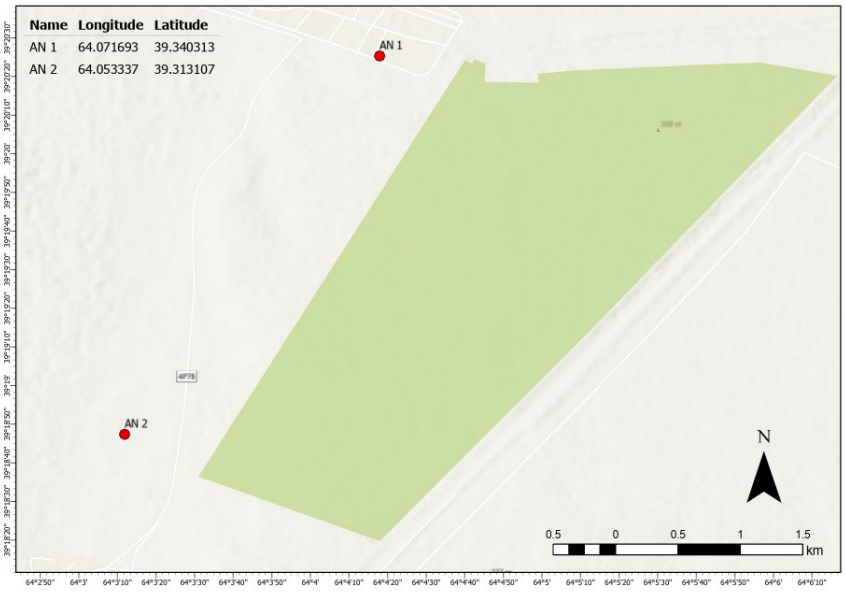


Figure 1: Noise monitoring locations (AN1 and AN2)

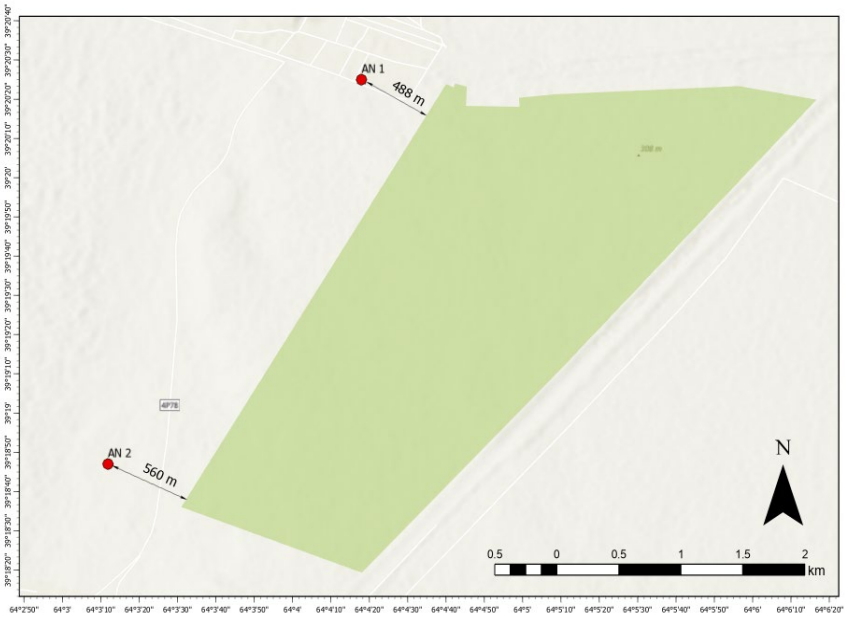


Figure 2: Distance from monitoring locations to the Project site boundary

2. Measurement methodology

2.1. Noise

For the noise measurement an unattended noise meter Class 1 (Type 1) per IEC 61672-1. It was placed in the vicinity of NSR's, at 1.7 m above the ground level with no nearby reflective surfaces in minimum 5 m distance. The following parameters were recorded: LAeq, LAmax, LAmin, LA_{10}, LA_{90}. The LAeq level is the equivalent continuous sound pressure level over at the measurement period 15 min. LAmax is an indicator of the highest sound level during the measurement period; the LAmin is the lowest level during the measurement period; LA90 is used as a descriptor of background noise levels and LA10 is the noise level which is achieved for 10% of the monitoring period and is often used to describe road traffic noise.

2.2. Air quality

For the air measurement AQ Mesh was used. It was placed in the vicinity of NSR's, at 2.5 m above the ground level with no nearby reflective surfaces in minimum 15 m distance. The following parameters were recorded: carbon monoxide (CO), sulphur dioxide (SO2), nitrogen oxide (NO), nitrogen dioxide (NO2), particular matter (PM2.5, PM10). The characteristics of the NSR's are described in Table 1.

Table 1: Location of nearest sensitive receptors

Location	Description	Coordinates Latitude	Coordinates Longitude
AN 1	The location is closed to the existing substation Khorezm 1 and nearby community	39.340312°	64.071697°
AN 2	A measurement point is located at herder building.	39.313105°	64.053337°

3. Measurement equipment

The following equipment was use for the monitoring exercise.

Table 2: The measurement equipment used for noise monitoring

Item	Meter Model	Serial Number
Sound Level Meter	Rion NL 52	00410152
Calibrator	Calibrator Rion NL 75	34313059
Microphone	All-weather windscreen WS-15	Does not have SN

Table 3: The measurement equipment used for air monitoring

Item	Meter Model
Air quality monitoring system	AQ Mesh
Accumulator	Solar panel pack
Anemometer	Scarlet Tech anemometer

All equipment used during the survey was field calibrated at the start and end of the measurement period with a negligible deviation of ≤0.5 dB. Sound meter fitted with a protective windshield for the entire measurements period. UKAS certificates are attached in Annex.

4. Monitoring results

4.1. Summary table results - noise

The data provided in Table 4 includes measurements of noise levels at AN01 and AN02 during two-time intervals: 07:00-23:00 (daytime) and 23:00-07:00 (night-time). The measurements were taken at 10-minute intervals and are reported in decibels (dBA).

Table 4: Summary of average noise values for 24 hr measurement per location

Location	Date	Measurement interval	LAeq, [dBA]	LAmax, [dBA]	LAmin , [dBA]	LA90, [dBA]	LA10, [dBA]
AN 1	07:00-23:00	10 min	49.57	67.21	36.73	40.76	50.89
AN 2	07:00-23:00	10 min	38.03	55.18	30.74	32.68	39.40
AN 1	23:00-07:00	10 min	38.26	52.18	31.09	33.54	5.31
AN 2	23:00-07:00	10 min	39.45	52.04	34.56	36.13	41.76

4.2. Summary table results - AQ

The data provided in Table 5 summarises the average and maximum concentrations at AN01 and AN02 for each parameter CO, CO_2, SO_2, NO, NO_2, $PM_{2.5}$, PM_{10}. measured in µg/m^3 over a 24 hours period at 15-minute intervals and displayed for daytime and night-time (07:00-23:00 and 23:00-07:00),

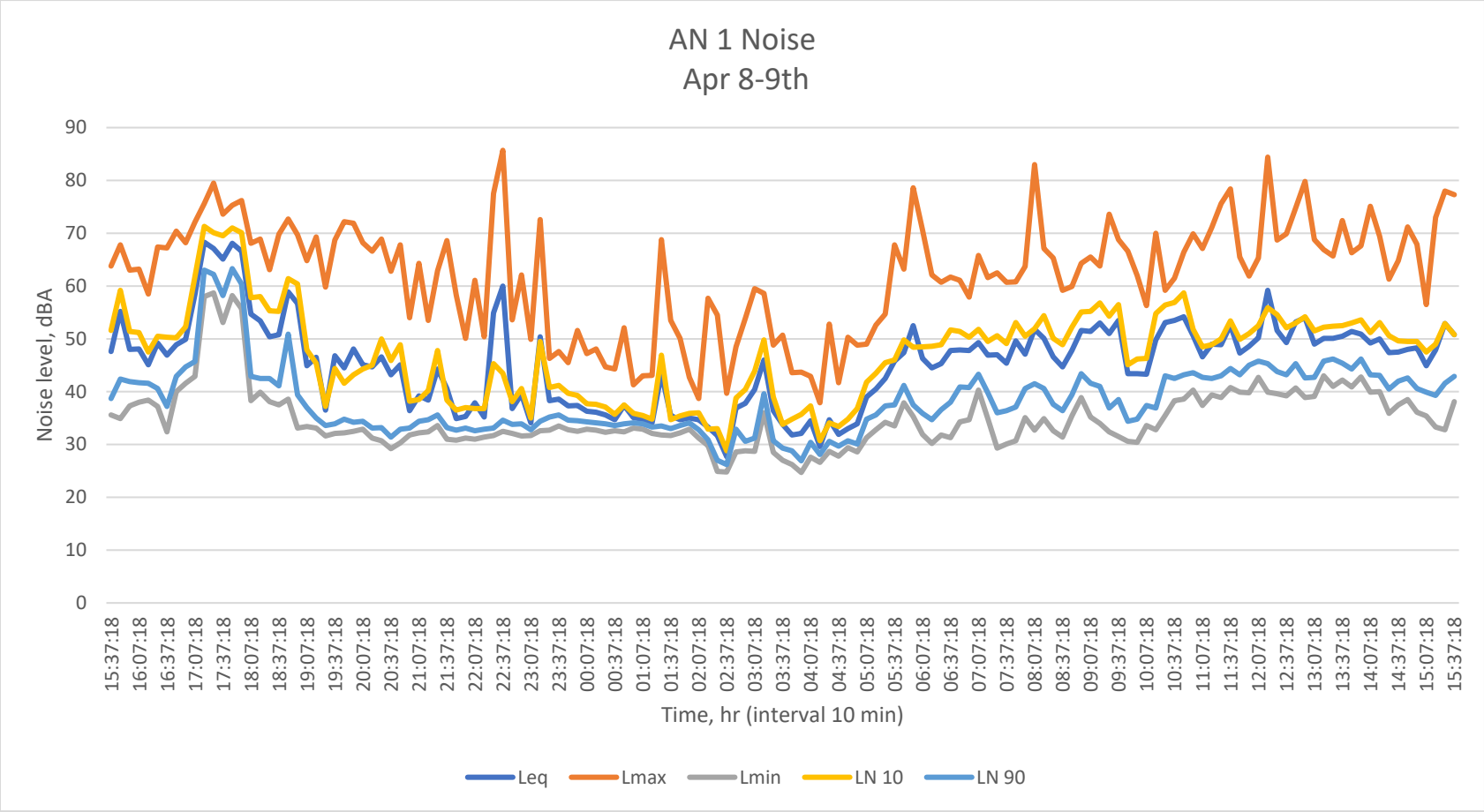
Table 5: 15-minute average concentrations for 24 hr measurement per location (*in µg/m3*)

Location Date Time Period		AN 1 07:00-23:00 15 minutes	AN 2 07:00-23:00 15 minutes	AN 1 23:00-07:00 15 minutes	AN 2 23:00-07:00 15 minutes
CO	**avg**	0	0	0	0
CO	**max**	0	0	0	0
CO_2	**avg**	702.04	702.96	720.45	701.22
CO_2	**max**	719.44	741.52	730.48	715.76
NO	**avg**	0.8	0.07	0	0
NO	**max**	9.28	2.21	0	0
NO_2	**avg**	24.94	27.97	12.24	19.35
NO_2	**max**	37.67	44.12	14.48	22.27
SO_2	**avg**	0	0	0	0

Location Date Time Period		AN 1 07:00-23:00 15 minutes	AN 2 07:00-23:00 15 minutes	AN 1 23:00-07:00 15 minutes	AN 2 23:00-07:00 15 minutes
SO_2	**max**	0	0	0	0
$PM_{2.5}$	**avg**	5.71	19.14	4.35	4.01
$PM_{2.5}$	**max**	17.05	38.19	5.39	22.22
PM_{10}	**avg**	19.75	156.89	12.79	96.45
PM_{10}	**max**	58.99	353.52	16.03	189.31

4.3. Summary graph results

The following figure provide a graphical representation of results over 24 hour period.


AN 1 Noise
Apr 8-9th
Noise level, dBA
90
80
70
60
50
40
30
20
10
0
15:37:18
16:07:18
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Time, hr (interval 10 min)
Leq
Lmax
Lmin
LN 10
LN 90

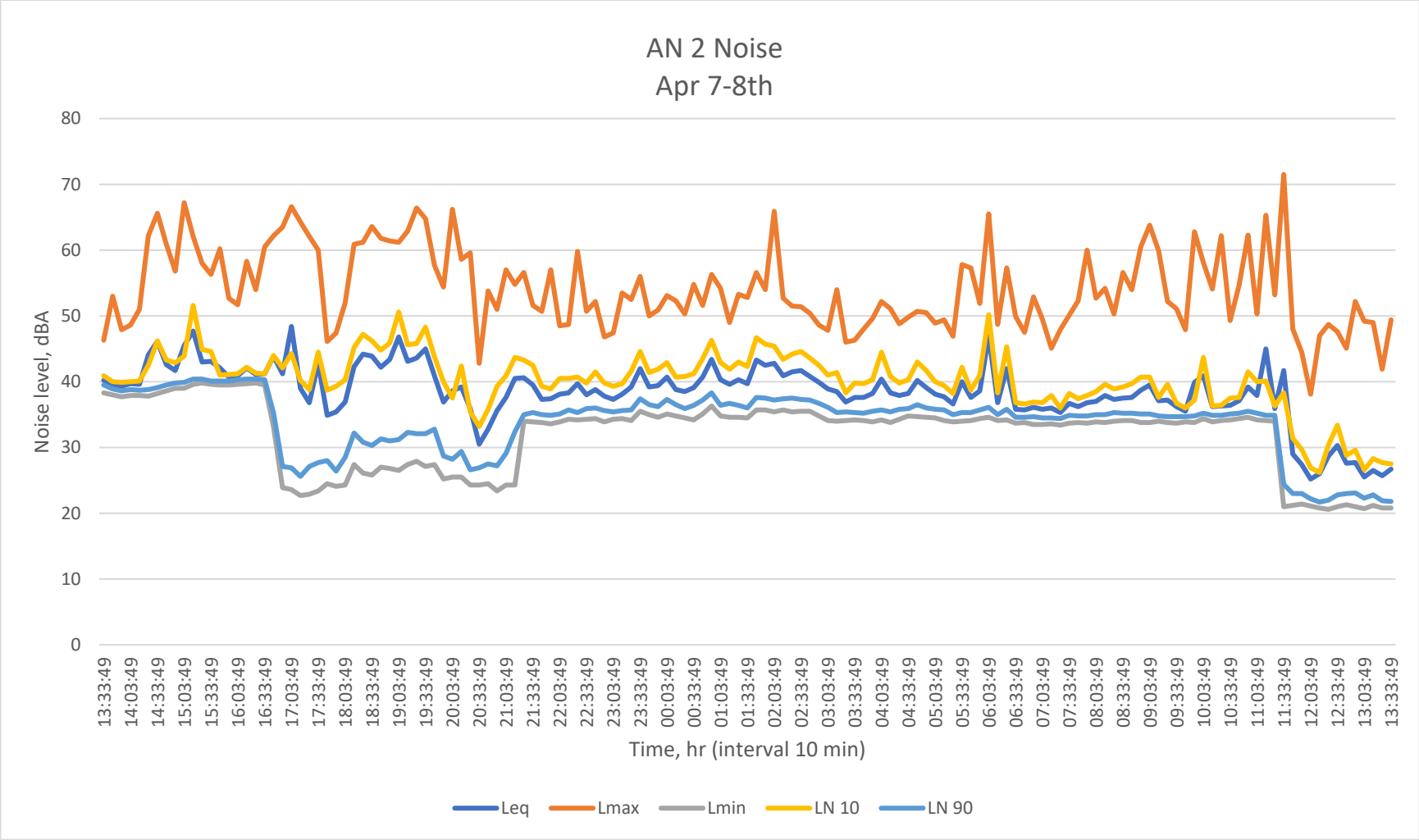
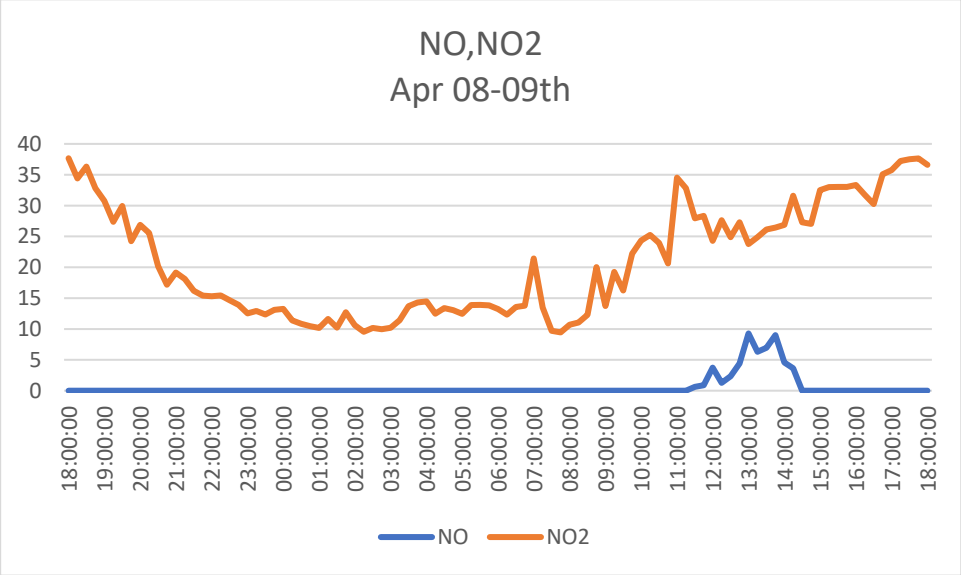
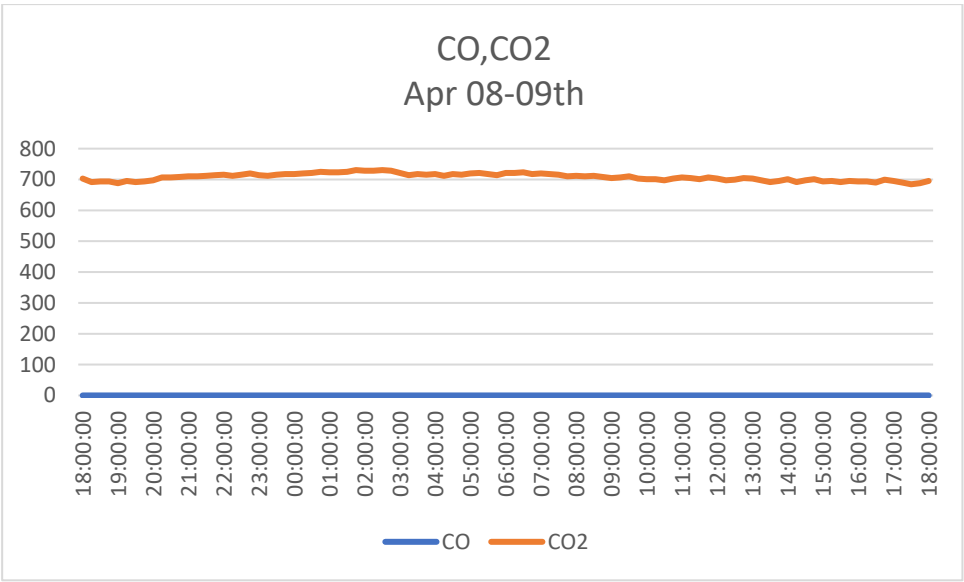


Figure 3: Variations of noise levels during daytime

Figure 4: Air quality data AN 1





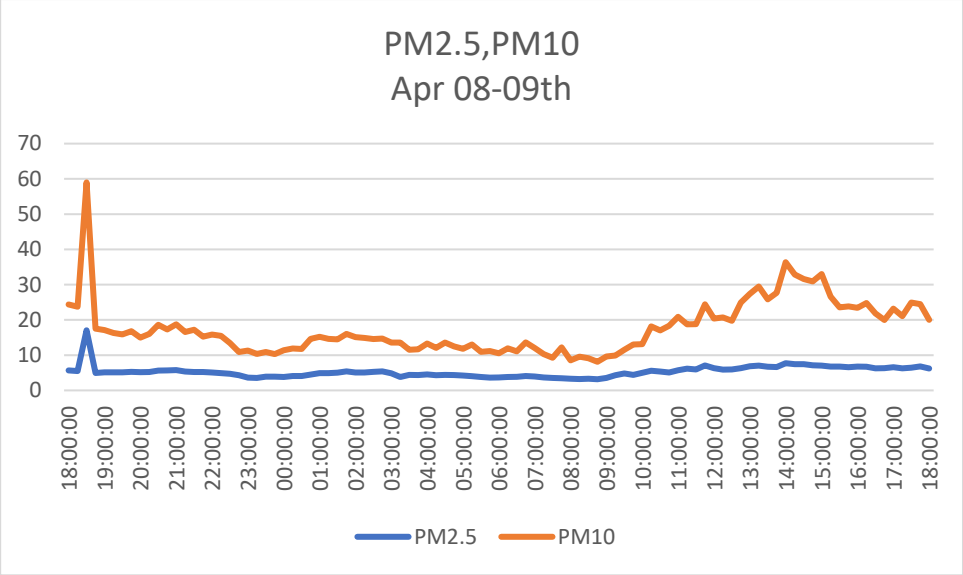
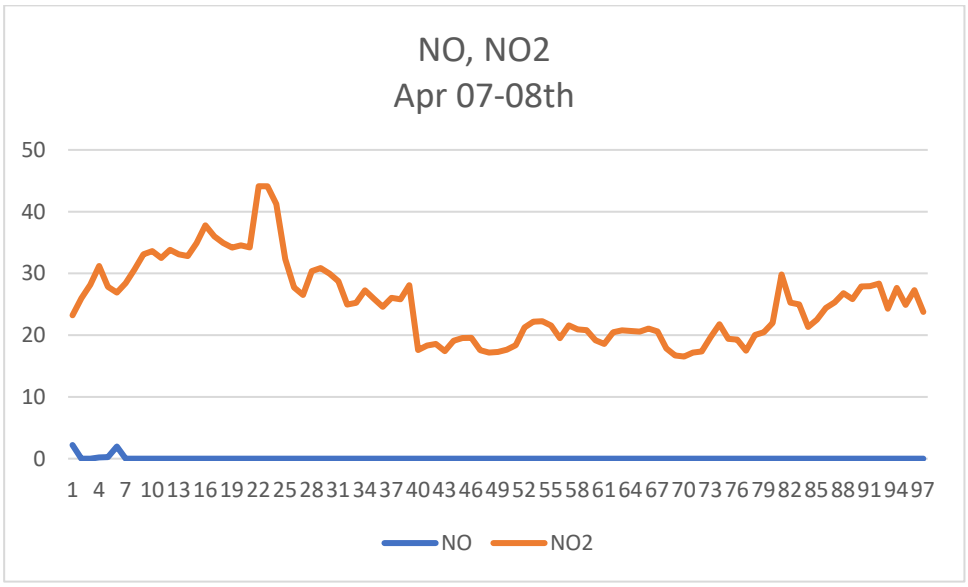
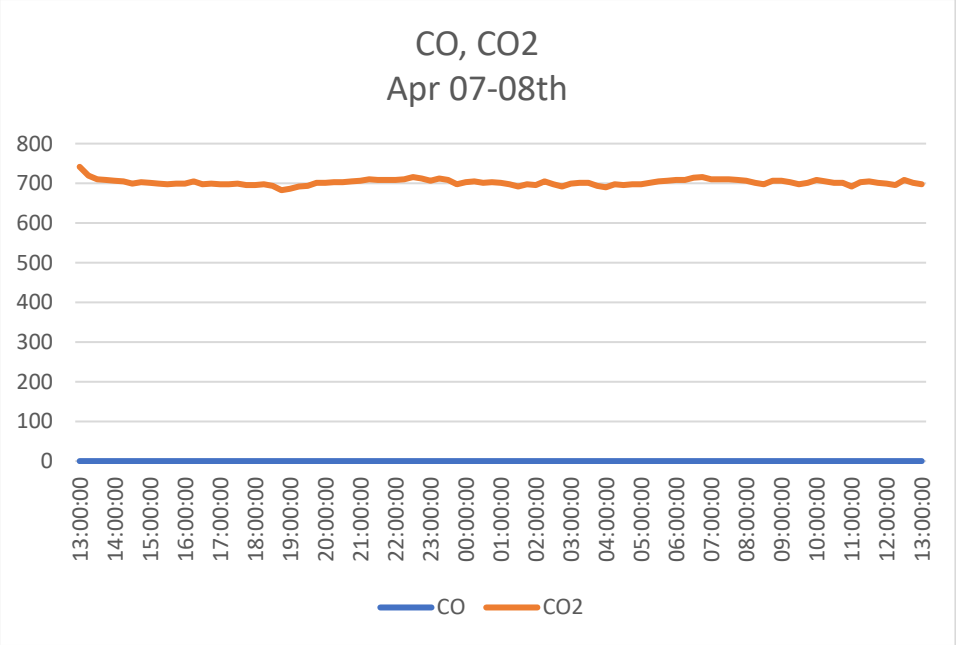


Figure 5: Air quality data AN 2




CO, CO2
Apr 07-08th
800
700
600
500
400
300
200
100
0
13:00:00
14:00:00
15:00:00
16:00:00
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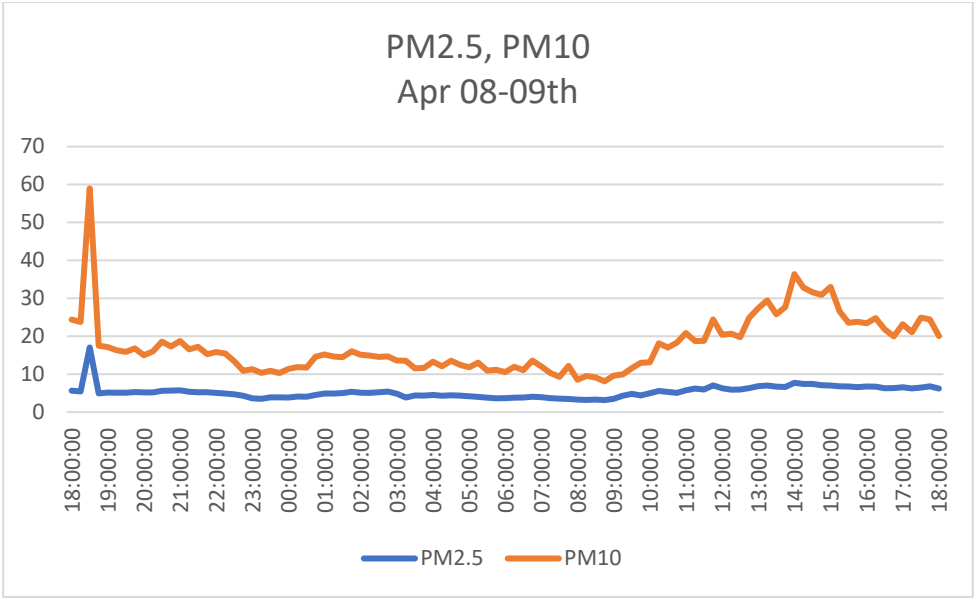
08:00:00
09:00:00
10:00:00
11:00:00
12:00:00
13:00:00
CO
CO2


PM2.5, PM10
Apr 08-09th
70
60
50
40
30
20
10
0
18:00:00
19:00:00
20:00:00
21:00:00
22:00:00
23:00:00
00:00:00
01:00:00
02:00:00
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13:00:00
14:00:00
15:00:00
16:00:00
17:00:00
18:00:00
PM2.5
PM10

Figure 6: Noise equipment at AN 1

Figure 7: Additional noise at AN 1

Figure 8: Installed noise equipment at AN 2

Figure 9: Background noise sources at AN 2

Figure 10: Air monitoring system at AN 1

Figure 11: Air monitoring system at AN 2

5. Conclusion

5.1. Noise

For location AN 1 during the 07:00-23:00 interval, the LAeq (equivalent continuous sound level) is 49.57 dBA, indicating the daytime average noise level over the measurement period.

The LAmax (maximum sound level) recorded is 67.21 dBA, while the LAmin (minimum sound level) is 36.73 dBA.

The LA90 (noise level exceeded 90% of the time) is 40.76 dBA, and the LA10 (noise level exceeded 10% of the time) is 50.89 dBA.

For location AN 2 during the 07:00-23:00 interval, the LAeq is 38.03 dBA, the LAmax is 55.18 dBA, the LAmin is 30.74 dBA, the LA90 is 32.68 dBA, and the LA10 is 39.40 dBA.

During the 23:00-07:00 interval, for location AN 1, the LAeq is 38.26 dBA, the LAmax is 52.18 dBA, the LAmin is 31.09 dBA, the LA90 is 33.54 dBA, and the LA10 is 5.31 dBA. For location AN 2, the LAeq is 39.45 dBA, the LAmax is 52.04 dBA, the LAmin is 34.56 dBA, the LA90 is 36.13 dBA, and the LA10 is 41.76 dBA.

The background noise at AN 1 included construction works in a pumping area (Figure 11) connected with the modernisation of an existing Khamza-1 pumping station. Construction works were sometimes even at night-time, as can be seen in noise graph (Figure 3), particular 02:30-03:30 am. However, construction noise was only dominant source of noise there.

Receptor AN 2, is located far from any existing facilities (the closest water substation Khamza-2 is located 1 km to a AN 2) therefore there was minimal background noise at this location except the sounds made by the livestock. The herder takes his pasture outside of his territory during the day and drives them back in the evening. The rest of the time, the livestock is in the cattle pen and noise is constantly being made from them.

Overall, the measurements suggest that location AN 1 has higher noise levels during the day than at night, while location AN 2 has relatively consistent noise levels throughout the day and night, with slightly higher noise levels during the day. The differences between the LAmax and LAmin values indicate the variability in noise levels over the measurement period.

5.2. Air quality

The data includes the average and maximum concentrations of various pollutants, such as CO, CO_2, NO, NO_2, SO_2, $PM_{2.5}$, and PM_{10}. The average CO concentration is 0 µg/m3 for both locations and time periods. The average CO_2 concentration is higher during the night-time period for AN 1, while for AN 2, it is slightly higher during the daytime period.

The average NO concentration is higher during the daytime period for both locations, while the maximum NO concentration is significantly higher during the daytime period for AN 1. The average and maximum NO_2 concentrations are higher for AN 2 compared to AN 1, especially during the daytime period. The average and maximum SO_2 concentrations are 0 µg/m3 for all measurements.

The $PM_{2.5}$ and PM_{10} concentrations show a significant difference between the two locations and time periods. The average and maximum $PM_{2.5}$ and PM_{10} concentrations are higher for AN 2 compared to AN 1, especially during the daytime period. The maximum PM_{10} concentration for AN

2 during the daytime period is very high, reaching 353.52 µg/m3. No significant air emission sources, such as stacks or campfires, were observed in the overall measurements.

Annex

Weather summary

Table 6 below presents the average temperature, wind speed and wind direction for each period (15 min) during the entire measurement for each monitoring location.

Table 6: AN 1 Weather data

Date	Time	Wind speed average	Wind Speed maximum	Temperature	Wind Direction
08/04/2023	15:37:00	1.9	2.9	31	316
08/04/2023	15:38:00	1.7	2.6	31	321
08/04/2023	15:39:00	1.8	3	31	323
08/04/2023	15:40:00	0.8	1.5	31	328
08/04/2023	15:41:00	0.7	1.5	31	301
08/04/2023	15:42:00	1.4	2.4	31	320
08/04/2023	15:43:00	1.6	2.8	31	322
08/04/2023	15:44:00	1.9	2.9	31	309
08/04/2023	15:45:00	1.7	3	31	318
08/04/2023	15:46:00	2.6	4.2	31	320
08/04/2023	15:47:00	1.3	2	31	316
08/04/2023	15:48:00	1.8	2.3	31	310
08/04/2023	15:49:00	0.7	2.2	31	290
08/04/2023	15:50:00	1	2	31	290
08/04/2023	15:51:00	1.5	2.7	31	292
08/04/2023	15:52:00	1.4	2.2	31	289
08/04/2023	15:53:00	1.5	2.3	31	286
08/04/2023	15:54:00	2.1	3.5	31	312
08/04/2023	15:55:00	2.3	3.4	31	320
08/04/2023	15:56:00	2	3.2	31	313
08/04/2023	15:57:00	1.5	2.5	31	297
08/04/2023	15:58:00	1.2	1.6	31	298
08/04/2023	15:59:00	1.6	2.7	31	306
08/04/2023	16:00:00	1.3	1.8	31	307
08/04/2023	16:01:00	1.1	1.6	31	317
08/04/2023	16:02:00	1.1	1.9	31	275
08/04/2023	16:03:00	1.2	2.4	31	284
08/04/2023	16:04:00	1.3	1.9	31	290
08/04/2023	16:05:00	1.2	2.2	31	283
08/04/2023	16:06:00	1	2.1	31	228
08/04/2023	16:07:00	1.1	2.6	31	267
08/04/2023	16:08:00	1	1.6	31	305
08/04/2023	16:09:00	1.8	3.8	31	306
08/04/2023	16:10:00	1.7	2.4	31	310
08/04/2023	16:11:00	1.2	2	31	305
08/04/2023	16:12:00	1.5	2.9	31	314
08/04/2023	16:13:00	1.2	2.3	31	315
08/04/2023	16:14:00	1.6	2.1	31	302
08/04/2023	16:15:00	1.3	2.3	31	299
08/04/2023	16:16:00	1.4	2.5	31	304
08/04/2023	16:17:00	1.5	3.4	31	306
08/04/2023	16:18:00	2.4	4.3	31	321
08/04/2023	16:19:00	2.6	4	31	309
08/04/2023	16:20:00	2.6	4.6	31	316
08/04/2023	16:21:00	2.3	3.3	31	319
08/04/2023	16:22:00	1.5	2.4	30	319
08/04/2023	16:23:00	2	2.6	30	314
08/04/2023	16:24:00	1.6	3.1	30	311
08/04/2023	16:25:00	1.7	2.8	30	315
08/04/2023	16:26:00	2	3.4	30	311
08/04/2023	16:27:00	2.5	4.8	30	324

Date	Time	Wind speed average	Wind Speed maximum	Temperature	Wind Direction
08/04/2023	16:28:00	2.7	5	30	311
08/04/2023	16:29:00	1.4	2	30	306
08/04/2023	16:30:00	2	4.1	30	294
08/04/2023	16:31:00	1.5	2.3	30	285
08/04/2023	16:32:00	1.2	2	30	284
08/04/2023	16:33:00	0.8	1.7	30	288
08/04/2023	16:34:00	0.9	1.4	30	289
08/04/2023	16:35:00	1	2.2	30	293
08/04/2023	16:36:00	1.3	2	30	299
08/04/2023	16:37:00	2	3.5	30	314
08/04/2023	16:38:00	1.9	3.1	30	313
08/04/2023	16:39:00	2.2	3.1	30	317
08/04/2023	16:40:00	1.5	2.6	30	316
08/04/2023	16:41:00	1.1	1.6	30	302
08/04/2023	16:42:00	0.9	1.4	30	299
08/04/2023	16:43:00	1	1.9	29	305
08/04/2023	16:44:00	1.9	3.3	29	317
08/04/2023	16:45:00	1.6	2.5	29	291
08/04/2023	16:46:00	2.1	2.9	29	289
08/04/2023	16:47:00	2.3	4	29	282
08/04/2023	16:48:00	1.9	3.1	29	288
08/04/2023	16:49:00	2.1	3.5	29	303
08/04/2023	16:50:00	2	3.1	29	297
08/04/2023	16:51:00	1.7	2.4	29	302
08/04/2023	16:52:00	2.6	4.7	29	298
08/04/2023	16:53:00	2.4	3.6	29	307
08/04/2023	16:54:00	1.9	2.8	29	308
08/04/2023	16:55:00	1.8	3	29	288
08/04/2023	16:56:00	1.8	3.2	29	286
08/04/2023	16:57:00	2.8	3.9	29	309
08/04/2023	16:58:00	2.7	4.3	29	304
08/04/2023	16:59:00	3.3	4.6	29	314
08/04/2023	17:00:00	2.5	3.6	29	310
08/04/2023	17:01:00	2.4	3.7	29	303
08/04/2023	17:02:00	2.5	3.6	29	295
08/04/2023	17:03:00	2.7	5.3	29	311
08/04/2023	17:04:00	3.1	7.4	28	310
08/04/2023	17:05:00	2.3	4.3	28	301
08/04/2023	17:06:00	2.1	3.2	28	288
08/04/2023	17:07:00	2.5	3.9	28	292
08/04/2023	17:08:00	2.5	6.3	28	302
08/04/2023	17:09:00	3.6	6.8	28	314
08/04/2023	17:10:00	2.7	4.3	28	302
08/04/2023	17:11:00	2.3	4	28	298
08/04/2023	17:12:00	2.5	3.8	28	286
08/04/2023	17:13:00	2.6	5	28	299
08/04/2023	17:14:00	3	4.8	28	315
08/04/2023	17:15:00	2.8	4.6	28	312
08/04/2023	17:16:00	1.9	3.1	28	301
08/04/2023	17:17:00	2	3.5	28	294
08/04/2023	17:18:00	3.1	4.8	28	313
08/04/2023	17:19:00	2.2	3.2	28	307
08/04/2023	17:20:00	1.6	2.8	28	295
08/04/2023	17:21:00	1.9	3.9	28	291
08/04/2023	17:22:00	1.7	2.6	28	290
08/04/2023	17:23:00	1.5	2.1	28	294
08/04/2023	17:24:00	2	3.4	28	284
08/04/2023	17:25:00	2.1	3.4	28	286
08/04/2023	17:26:00	2.3	4.4	27	303
08/04/2023	17:27:00	3.6	6.2	27	317
08/04/2023	17:28:00	3.1	5.2	27	310
08/04/2023	17:29:00	2.4	3.9	27	288

Date	Time	Wind speed average	Wind Speed maximum	Temperature	Wind Direction
08/04/2023	17:30:00	3	4.2	27	312
08/04/2023	17:31:00	2.5	3.9	27	308
08/04/2023	17:32:00	2.6	4.5	27	295
08/04/2023	17:33:00	3.1	6.1	27	312
08/04/2023	17:34:00	2.8	4.9	27	315
08/04/2023	17:35:00	2.5	4.1	27	313
08/04/2023	17:36:00	2.1	3.9	27	306
08/04/2023	17:37:00	2.8	6.3	27	306
08/04/2023	17:38:00	2.1	3.5	27	307
08/04/2023	17:39:00	1.9	3.6	27	290
08/04/2023	17:40:00	2.2	4.4	27	300
08/04/2023	17:41:00	1.9	2.8	27	287
08/04/2023	17:42:00	2	2.8	27	280
08/04/2023	17:43:00	2	2.8	27	292
08/04/2023	17:44:00	2	3.2	27	296
08/04/2023	17:45:00	2.1	3.5	27	293
08/04/2023	17:46:00	2.1	4.3	27	285
08/04/2023	17:47:00	2.1	3.4	27	289
08/04/2023	17:48:00	2	3	27	279
08/04/2023	17:49:00	2	3	27	298
08/04/2023	17:50:00	1.6	2.5	27	297
08/04/2023	17:51:00	2	3	27	296
08/04/2023	17:52:00	1.8	2.6	27	282
08/04/2023	17:53:00	1.7	2.8	27	292
08/04/2023	17:54:00	2	3.1	27	302
08/04/2023	17:55:00	1.8	2.5	26	302
08/04/2023	17:56:00	1.8	3.3	26	301
08/04/2023	17:57:00	2.3	5.1	26	316
08/04/2023	17:58:00	2.3	3.6	26	312
08/04/2023	17:59:00	2	2.9	26	306
08/04/2023	18:00:00	2.2	3.1	26	309
08/04/2023	18:01:00	1.8	3	26	305
08/04/2023	18:02:00	2.3	4.4	26	301
08/04/2023	18:03:00	2	3	26	293
08/04/2023	18:04:00	1.7	2.7	26	294
08/04/2023	18:05:00	2.6	5.3	26	307
08/04/2023	18:06:00	2.2	3.7	26	300
08/04/2023	18:07:00	1.5	2.5	26	296
08/04/2023	18:08:00	1.3	2.2	26	298
08/04/2023	18:09:00	2.2	3.6	26	301
08/04/2023	18:10:00	1.8	2.4	26	294
08/04/2023	18:11:00	1.3	2.2	26	288
08/04/2023	18:12:00	2.2	3.9	26	306
08/04/2023	18:13:00	2.5	3.9	26	308
08/04/2023	18:14:00	2.9	5.4	26	308
08/04/2023	18:15:00	3	5.5	26	313
08/04/2023	18:16:00	3.1	4.7	26	313
08/04/2023	18:17:00	3.2	5.7	26	313
08/04/2023	18:18:00	2.7	3.9	26	317
08/04/2023	18:19:00	2.9	4	26	307
08/04/2023	18:20:00	2.5	3.2	26	305
08/04/2023	18:21:00	2.4	4	26	316
08/04/2023	18:22:00	2.1	3.4	26	318
08/04/2023	18:23:00	2.2	3.5	26	319
08/04/2023	18:24:00	2.5	4	25	311
08/04/2023	18:25:00	2.5	4	25	307
08/04/2023	18:26:00	2.8	4.5	25	313
08/04/2023	18:27:00	2.8	4	25	311
08/04/2023	18:28:00	3.3	4.8	25	320
08/04/2023	18:29:00	3	4.8	25	320
08/04/2023	18:30:00	2.2	3.5	25	317
08/04/2023	18:31:00	2.9	4.9	25	314

Date	Time	Wind speed average	Wind Speed maximum	Temperature	Wind Direction
08/04/2023	18:32:00	2.3	3.8	25	322
08/04/2023	18:33:00	2.6	3.8	25	321
08/04/2023	18:34:00	2.9	4.3	25	315
08/04/2023	18:35:00	2.5	3.7	25	317
08/04/2023	18:36:00	2.7	4.3	25	317
08/04/2023	18:37:00	2.8	4.2	25	311
08/04/2023	18:38:00	2.3	4.3	25	312
08/04/2023	18:39:00	2.7	4.3	24	313
08/04/2023	18:40:00	2.9	4.9	24	313
08/04/2023	18:41:00	2.2	2.7	24	317
08/04/2023	18:42:00	2.3	3.9	24	315
08/04/2023	18:43:00	2.3	4.1	24	311
08/04/2023	18:44:00	2.7	4.3	24	312
08/04/2023	18:45:00	2.4	3.7	24	313
08/04/2023	18:46:00	2.9	4.9	24	317
08/04/2023	18:47:00	2.7	4.6	24	315
08/04/2023	18:48:00	2.2	3.2	24	315
08/04/2023	18:49:00	2	3.2	24	315
08/04/2023	18:50:00	2	3.2	24	320
08/04/2023	18:51:00	2	3.2	24	316
08/04/2023	18:52:00	2.4	3.8	24	312
08/04/2023	18:53:00	2.4	3.8	24	317
08/04/2023	18:54:00	2.4	3.4	24	313
08/04/2023	18:55:00	2	2.9	24	317
08/04/2023	18:56:00	2.8	4.2	24	313
08/04/2023	18:57:00	2.2	3.6	24	321
08/04/2023	18:58:00	2	3.1	24	312
08/04/2023	18:59:00	2.4	3.5	24	314
08/04/2023	19:00:00	2.2	3.3	24	318
08/04/2023	19:01:00	2.1	3.4	24	318
08/04/2023	19:02:00	1.8	2.7	24	312
08/04/2023	19:03:00	1.7	2.8	24	313
08/04/2023	19:04:00	1.5	2.6	24	303
08/04/2023	19:05:00	1.8	3.6	23	308
08/04/2023	19:06:00	1.5	2.7	23	315
08/04/2023	19:07:00	1.7	2.4	23	311
08/04/2023	19:08:00	1.6	2.3	23	319
08/04/2023	19:09:00	1.4	1.8	23	316
08/04/2023	19:10:00	1.6	2.4	23	316
08/04/2023	19:11:00	1.5	2.2	23	314
08/04/2023	19:12:00	1.9	2.9	23	317
08/04/2023	19:13:00	1.7	2.9	23	320
08/04/2023	19:14:00	1.9	3.1	23	319
08/04/2023	19:15:00	1.6	2.8	23	318
08/04/2023	19:16:00	1.4	2.1	23	326
08/04/2023	19:17:00	1.6	2.3	23	323
08/04/2023	19:18:00	1.6	2.6	23	326
08/04/2023	19:19:00	1.3	2.1	23	322
08/04/2023	19:20:00	1.2	2	23	323
08/04/2023	19:21:00	1.3	1.8	23	321
08/04/2023	19:22:00	1.5	2.5	23	319
08/04/2023	19:23:00	1.1	1.8	23	319
08/04/2023	19:24:00	1.1	1.7	23	319
08/04/2023	19:25:00	1.6	2.7	23	318
08/04/2023	19:26:00	1.3	2	23	317
08/04/2023	19:27:00	1.1	1.9	22	316
08/04/2023	19:28:00	1.4	2.2	22	316
08/04/2023	19:29:00	1.4	2	22	312
08/04/2023	19:30:00	1.2	2.3	22	315
08/04/2023	19:31:00	1.4	2.3	22	316
08/04/2023	19:32:00	1.2	1.6	22	314
08/04/2023	19:33:00	1.2	1.9	22	316

Date	Time	Wind speed average	Wind Speed maximum	Temperature	Wind Direction
08/04/2023	19:34:00	1.2	1.8	22	315
08/04/2023	19:35:00	1.2	2.1	22	315
08/04/2023	19:36:00	1.1	1.5	22	315
08/04/2023	19:37:00	1.4	2	22	315
08/04/2023	19:38:00	1.2	1.8	22	316
08/04/2023	19:39:00	1.5	2.2	22	315
08/04/2023	19:40:00	1.3	2.1	22	316
08/04/2023	19:41:00	1.2	1.7	22	316
08/04/2023	19:42:00	1	1.6	22	314
08/04/2023	19:43:00	1.3	1.9	22	316
08/04/2023	19:44:00	1.2	1.8	22	315
08/04/2023	19:45:00	1.3	1.8	22	313
08/04/2023	19:46:00	1	1.8	22	315
08/04/2023	19:47:00	1	1.4	22	314
08/04/2023	19:48:00	1	1.9	22	315
08/04/2023	19:49:00	0.9	1.7	22	316
08/04/2023	19:50:00	1.2	1.7	22	315
08/04/2023	19:51:00	1	1.3	22	313
08/04/2023	19:52:00	1.1	1.7	22	316
08/04/2023	19:53:00	1	1.5	21	314
08/04/2023	19:54:00	0.9	1.5	21	315
08/04/2023	19:55:00	0.9	1.5	21	316
08/04/2023	19:56:00	1	1.6	21	314
08/04/2023	19:57:00	0.7	1.4	21	314
08/04/2023	19:58:00	0.8	1.5	21	316
08/04/2023	19:59:00	0.6	1.5	21	314
08/04/2023	20:00:00	0.5	1.3	21	314
08/04/2023	20:01:00	0.9	1.3	21	315
08/04/2023	20:02:00	0.2	0.8	21	314
08/04/2023	20:03:00	0.4	1	21	314
08/04/2023	20:04:00	0.6	1.1	21	314
08/04/2023	20:05:00	0.6	1.1	21	314
08/04/2023	20:06:00	0.1	0.9	21	314
08/04/2023	20:07:00	0.8	1.3	21	314
08/04/2023	20:08:00	0.3	1.2	21	314
08/04/2023	20:09:00	0.1	0.9	21	314
08/04/2023	20:10:00	0.3	0.8	21	314
08/04/2023	20:11:00	0.2	0.6	21	314
08/04/2023	20:12:00	0.2	0.9	21	314
08/04/2023	20:13:00	0	0	20	nW
08/04/2023	20:14:00	0	0	20	nW
08/04/2023	20:15:00	0	0	20	nW
08/04/2023	20:16:00	0	0	20	nW
08/04/2023	20:17:00	0	0	20	nW
08/04/2023	20:18:00	0	0	20	nW
08/04/2023	20:19:00	0	0	19	nW
08/04/2023	20:20:00	0	0	19	nW
08/04/2023	20:21:00	0	0	19	nW
08/04/2023	20:22:00	0	0	19	nW
08/04/2023	20:23:00	0	0	19	nW
08/04/2023	20:24:00	0	0	19	nW
08/04/2023	20:25:00	0	0	19	nW
08/04/2023	20:26:00	0	0	19	nW
08/04/2023	20:27:00	0	0	19	nW
08/04/2023	20:28:00	0	0	19	nW
08/04/2023	20:29:00	0.1	0.7	18	314
08/04/2023	20:30:00	0.1	0.8	18	315
08/04/2023	20:31:00	0	0	18	nW
08/04/2023	20:32:00	0	0	18	nW
08/04/2023	20:33:00	0	0	18	nW
08/04/2023	20:34:00	0	0	18	nW
08/04/2023	20:35:00	0	0	18	nW

Date	Time	Wind speed average	Wind Speed maximum	Temperature	Wind Direction
08/04/2023	20:36:00	0.1	0.9	18	315
08/04/2023	20:37:00	0.4	1.1	18	336
08/04/2023	20:38:00	0.8	1.1	18	335
08/04/2023	20:39:00	1	1.4	18	336
08/04/2023	20:40:00	0.8	1.1	18	335
08/04/2023	20:41:00	0.5	1.3	18	336
08/04/2023	20:42:00	0.9	1.3	18	335
08/04/2023	20:43:00	0.8	1	18	335
08/04/2023	20:44:00	1	1.3	18	336
08/04/2023	20:45:00	1.1	1.5	18	338
08/04/2023	20:46:00	0.6	1.4	18	336
08/04/2023	20:47:00	0	0	18	nW
08/04/2023	20:48:00	0.6	1.1	18	336
08/04/2023	20:49:00	1	1.3	18	337
08/04/2023	20:50:00	0.8	1.3	18	337
08/04/2023	20:51:00	1	1.5	18	350
08/04/2023	20:52:00	0.2	0.9	18	346
08/04/2023	20:53:00	0.3	1	18	344
08/04/2023	20:54:00	0.1	1	18	345
08/04/2023	20:55:00	0	0.7	18	nW
08/04/2023	20:56:00	0.1	0.7	18	342
08/04/2023	20:57:00	0	0.6	18	nW
08/04/2023	20:58:00	0	0.8	18	nW
08/04/2023	20:59:00	0	0	18	nW
08/04/2023	21:00:00	0	0	18	nW
08/04/2023	21:01:00	0	0	18	nW
08/04/2023	21:02:00	0	0	18	nW
08/04/2023	21:03:00	0.2	0.7	18	342
08/04/2023	21:04:00	0.9	1.4	18	347
08/04/2023	21:05:00	0.3	0.9	18	345
08/04/2023	21:06:00	0.7	0.9	18	345
08/04/2023	21:07:00	0.6	0.9	18	346
08/04/2023	21:08:00	0.7	1	18	347
08/04/2023	21:09:00	0	0.7	18	nW
08/04/2023	21:10:00	0.6	1	18	346
08/04/2023	21:11:00	0.6	1.3	18	347
08/04/2023	21:12:00	0.7	1.2	18	345
08/04/2023	21:13:00	0.8	1	18	346
08/04/2023	21:14:00	0.1	0.8	18	342
08/04/2023	21:15:00	0	0.7	18	nW
08/04/2023	21:16:00	0	0	18	nW
08/04/2023	21:17:00	0	0	18	nW
08/04/2023	21:18:00	0	0.7	18	nW
08/04/2023	21:19:00	0.6	1	18	344
08/04/2023	21:20:00	0.6	0.9	18	345
08/04/2023	21:21:00	0.1	0.8	18	342
08/04/2023	21:22:00	0.1	0.8	18	341
08/04/2023	21:23:00	0.2	1	18	341
08/04/2023	21:24:00	0	0	18	nW
08/04/2023	21:25:00	0	0	18	nW
08/04/2023	21:26:00	0	0	18	nW
08/04/2023	21:27:00	0.2	1.1	18	346
08/04/2023	21:28:00	0.2	0.9	18	342
08/04/2023	21:29:00	0.4	0.9	17	345
08/04/2023	21:30:00	1	1.5	17	358
08/04/2023	21:31:00	0.8	1.4	17	358
08/04/2023	21:32:00	0.8	1.2	17	358
08/04/2023	21:33:00	0.6	1.3	17	359
08/04/2023	21:34:00	0.4	0.8	17	356
08/04/2023	21:35:00	0.1	0.8	17	356
08/04/2023	21:36:00	0.5	1.1	17	356
08/04/2023	21:37:00	0.3	1	17	352

Date	Time	Wind speed average	Wind Speed maximum	Temperature	Wind Direction
08/04/2023	21:38:00	0.2	0.9	17	346
08/04/2023	21:39:00	0.8	1.1	17	351
08/04/2023	21:40:00	0	0	17	nW
08/04/2023	21:41:00	0.1	0.6	17	355
08/04/2023	21:42:00	0.3	0.9	17	355
08/04/2023	21:43:00	0.2	0.7	17	356
08/04/2023	21:44:00	0	0.7	17	nW
08/04/2023	21:45:00	0.1	0.7	17	356
08/04/2023	21:46:00	0.3	0.8	17	355
08/04/2023	21:47:00	0.6	0.9	17	355
08/04/2023	21:48:00	0.9	1.3	17	349
08/04/2023	21:49:00	0.8	1.1	17	356
08/04/2023	21:50:00	1	1.7	17	360
08/04/2023	21:51:00	0.7	1.6	17	352
08/04/2023	21:52:00	0.8	1	17	348
08/04/2023	21:53:00	0.7	1	17	348
08/04/2023	21:54:00	1	1.4	17	356
08/04/2023	21:55:00	0.7	1	17	357
08/04/2023	21:56:00	0.6	1	17	357
08/04/2023	21:57:00	0.6	0.8	17	357
08/04/2023	21:58:00	0.6	1	17	357
08/04/2023	21:59:00	0.5	1.1	17	358
08/04/2023	22:00:00	0.4	0.9	17	355
08/04/2023	22:01:00	0.2	0.7	17	356
08/04/2023	22:02:00	0	0	17	nW
08/04/2023	22:03:00	0	0	17	nW
08/04/2023	22:04:00	0	0	17	nW
08/04/2023	22:05:00	0	0	17	nW
08/04/2023	22:06:00	0	0	17	nW
08/04/2023	22:07:00	0	0	17	nW
08/04/2023	22:08:00	0.3	1.1	17	356
08/04/2023	22:09:00	0.3	0.9	17	356
08/04/2023	22:10:00	0.7	1.2	17	357
08/04/2023	22:11:00	0.8	1.1	17	357
08/04/2023	22:12:00	0.7	1.1	17	357
08/04/2023	22:13:00	0.8	1	17	357
08/04/2023	22:14:00	0.7	1	17	357
08/04/2023	22:15:00	0.6	0.8	17	356
08/04/2023	22:16:00	0.1	0.7	17	356
08/04/2023	22:17:00	0	0	17	nW
08/04/2023	22:18:00	0	0.6	17	nW
08/04/2023	22:19:00	0.5	0.9	17	357
08/04/2023	22:20:00	0.1	0.8	17	356
08/04/2023	22:21:00	0.5	0.9	16	357
08/04/2023	22:22:00	0.7	1	16	357
08/04/2023	22:23:00	0.6	0.8	16	357
08/04/2023	22:24:00	0.6	0.9	16	357
08/04/2023	22:25:00	0.4	1	16	356
08/04/2023	22:26:00	0.2	0.7	16	357
08/04/2023	22:27:00	0	0	16	nW
08/04/2023	22:28:00	0	0	16	nW
08/04/2023	22:29:00	0	0	16	nW
08/04/2023	22:30:00	0	0	16	nW
08/04/2023	22:31:00	0	0	16	nW
08/04/2023	22:32:00	0	0	16	nW
08/04/2023	22:33:00	0	0	16	nW
08/04/2023	22:34:00	0	0	16	nW
08/04/2023	22:35:00	0	0	16	nW
08/04/2023	22:36:00	0	0	16	nW
08/04/2023	22:37:00	0	0	16	nW
08/04/2023	22:38:00	0	0	16	nW
08/04/2023	22:39:00	0	0	16	nW

Date	Time	Wind speed average	Wind Speed maximum	Temperature	Wind Direction
08/04/2023	22:40:00	0	0	16	nW
08/04/2023	22:41:00	0	0	16	nW
08/04/2023	22:42:00	0	0	16	nW
08/04/2023	22:43:00	0	0	16	nW
08/04/2023	22:44:00	0	0	16	nW
08/04/2023	22:45:00	0	0	16	nW
08/04/2023	22:46:00	0	0	16	nW
08/04/2023	22:47:00	0	0	15	nW
08/04/2023	22:48:00	0	0	15	nW
08/04/2023	22:49:00	0	0	15	nW
08/04/2023	22:50:00	0	0	15	nW
08/04/2023	22:51:00	0	0	15	nW
08/04/2023	22:52:00	0	0	15	nW
08/04/2023	22:53:00	0.1	0.7	15	356
08/04/2023	22:54:00	0	0	14	nW
08/04/2023	22:55:00	0	0	14	nW
08/04/2023	22:56:00	0	0	14	nW
08/04/2023	22:57:00	0	0	14	nW
08/04/2023	22:58:00	0.3	0.8	14	356
08/04/2023	22:59:00	0.5	0.7	14	356
08/04/2023	23:00:00	0.7	0.9	14	356
08/04/2023	23:01:00	0.2	0.7	14	356
08/04/2023	23:02:00	0.5	0.9	14	356
08/04/2023	23:03:00	0.7	1	14	356
08/04/2023	23:04:00	0.7	1	14	357
08/04/2023	23:05:00	0.3	0.8	14	356
08/04/2023	23:06:00	0.8	1.2	14	354
08/04/2023	23:07:00	0.9	1.3	14	349
08/04/2023	23:08:00	0.9	1.4	14	359
08/04/2023	23:09:00	1.1	1.6	14	355
08/04/2023	23:10:00	1.2	1.9	14	16
08/04/2023	23:11:00	1	1.5	14	23
08/04/2023	23:12:00	1.1	1.7	15	20
08/04/2023	23:13:00	1	1.8	15	31
08/04/2023	23:14:00	1.2	2	15	33
08/04/2023	23:15:00	1	1.5	15	29
08/04/2023	23:16:00	0.8	1.2	16	34
08/04/2023	23:17:00	0.9	1.3	16	30
08/04/2023	23:18:00	1.1	1.5	16	31
08/04/2023	23:19:00	0.9	1.4	16	33
08/04/2023	23:20:00	1	1.5	16	33
08/04/2023	23:21:00	0.9	1.5	16	35
08/04/2023	23:22:00	0.8	1.2	16	34
08/04/2023	23:23:00	0.7	1.1	16	34
08/04/2023	23:24:00	0.8	1.4	16	36
08/04/2023	23:25:00	0.9	1.5	17	36
08/04/2023	23:26:00	0.9	1.5	17	37
08/04/2023	23:27:00	1	1.7	17	38
08/04/2023	23:28:00	1.1	1.7	17	38
08/04/2023	23:29:00	1	1.6	17	37
08/04/2023	23:30:00	1.5	2.2	17	39
08/04/2023	23:31:00	1.5	2.5	17	51
08/04/2023	23:32:00	1.3	1.8	17	35
08/04/2023	23:33:00	1.1	1.9	17	38
08/04/2023	23:34:00	1	1.6	17	40
08/04/2023	23:35:00	1.1	1.5	17	41
08/04/2023	23:36:00	1.2	1.6	17	41
08/04/2023	23:37:00	1.3	2.2	17	44
08/04/2023	23:38:00	1.5	1.9	17	43
08/04/2023	23:39:00	1.4	2.1	17	42
08/04/2023	23:40:00	1.3	2	17	42
08/04/2023	23:41:00	1.4	2.1	17	41

Date	Time	Wind speed average	Wind Speed maximum	Temperature	Wind Direction
08/04/2023	23:42:00	1.3	2	17	44
08/04/2023	23:43:00	1.3	1.9	17	46
08/04/2023	23:44:00	1.3	1.5	17	47
08/04/2023	23:45:00	1.2	2.1	17	47
08/04/2023	23:46:00	1.1	1.7	17	47
08/04/2023	23:47:00	1.1	1.6	17	44
08/04/2023	23:48:00	1.1	1.6	17	44
08/04/2023	23:49:00	1.1	1.6	17	48
08/04/2023	23:50:00	1	1.5	17	46
08/04/2023	23:51:00	1.2	1.7	17	47
08/04/2023	23:52:00	1	1.6	17	49
08/04/2023	23:53:00	1.1	1.7	17	47
08/04/2023	23:54:00	1.2	1.7	17	50
08/04/2023	23:55:00	0.8	1.4	17	44
08/04/2023	23:56:00	0.8	1.4	17	46
08/04/2023	23:57:00	0.8	1.2	17	42
08/04/2023	23:58:00	0.7	1.5	17	46
08/04/2023	23:59:00	1	1.6	17	42
09/04/2023	00:00:00	1.1	1.6	17	42
09/04/2023	00:01:00	1.1	1.7	17	42
09/04/2023	00:02:00	1.1	1.6	17	41
09/04/2023	00:03:00	1.1	1.7	17	44
09/04/2023	00:04:00	1	1.7	17	42
09/04/2023	00:05:00	0.9	1.3	17	41
09/04/2023	00:06:00	0.7	1	17	41
09/04/2023	00:07:00	0.1	0.9	16	42
09/04/2023	00:08:00	0.1	0.7	16	42
09/04/2023	00:09:00	0.5	0.8	16	42
09/04/2023	00:10:00	0.2	0.7	16	42
09/04/2023	00:11:00	0.2	0.7	16	42
09/04/2023	00:12:00	0.3	0.8	16	42
09/04/2023	00:13:00	0.2	0.7	16	42
09/04/2023	00:14:00	0.3	0.8	16	42
09/04/2023	00:15:00	0.3	0.9	16	42
09/04/2023	00:16:00	0.2	0.8	16	42
09/04/2023	00:17:00	0	0	16	nW
09/04/2023	00:18:00	0	0	16	nW
09/04/2023	00:19:00	0	0	16	nW
09/04/2023	00:20:00	0.1	1.6	16	42
09/04/2023	00:21:00	0.8	1.5	16	43
09/04/2023	00:22:00	0.9	1.2	15	44
09/04/2023	00:23:00	1	1.3	15	46
09/04/2023	00:24:00	1.1	1.5	15	45
09/04/2023	00:25:00	1.3	1.8	15	44
09/04/2023	00:26:00	1.3	1.9	15	44
09/04/2023	00:27:00	1.3	1.7	15	45
09/04/2023	00:28:00	1.2	1.5	15	47
09/04/2023	00:29:00	1.2	1.6	15	47
09/04/2023	00:30:00	1.3	1.9	15	47
09/04/2023	00:31:00	1.1	1.8	15	46
09/04/2023	00:32:00	1.2	2.1	15	46
09/04/2023	00:33:00	1.2	1.9	15	47
09/04/2023	00:34:00	1	1.6	15	43
09/04/2023	00:35:00	0.9	1.5	15	46
09/04/2023	00:36:00	1.2	1.7	15	42
09/04/2023	00:37:00	1.4	1.9	16	45
09/04/2023	00:38:00	1.1	1.8	16	44
09/04/2023	00:39:00	1.3	2.2	16	41
09/04/2023	00:40:00	0.9	1.4	16	42
09/04/2023	00:41:00	1.1	1.7	16	41
09/04/2023	00:42:00	1.1	2	16	43
09/04/2023	00:43:00	0.8	1.3	16	46

Date	Time	Wind speed average	Wind Speed maximum	Temperature	Wind Direction
09/04/2023	00:44:00	0.8	1.1	16	44
09/04/2023	00:45:00	0.5	1.1	16	43
09/04/2023	00:46:00	0.5	1	16	45
09/04/2023	00:47:00	0.5	1.2	16	52
09/04/2023	00:48:00	0.3	0.8	16	54
09/04/2023	00:49:00	0.3	0.8	16	51
09/04/2023	00:50:00	0.6	1.2	16	46
09/04/2023	00:51:00	1	1.7	16	45
09/04/2023	00:52:00	1.1	1.5	16	43
09/04/2023	00:53:00	1.1	1.6	16	43
09/04/2023	00:54:00	1.2	1.7	16	41
09/04/2023	00:55:00	1.2	1.7	16	41
09/04/2023	00:56:00	1.3	1.7	16	39
09/04/2023	00:57:00	1.2	2	16	43
09/04/2023	00:58:00	1.1	1.6	16	45
09/04/2023	00:59:00	1.5	2.4	16	42
09/04/2023	01:00:00	1.2	1.8	16	43
09/04/2023	01:01:00	1.2	1.7	16	45
09/04/2023	01:02:00	1.4	1.9	16	42
09/04/2023	01:03:00	1.5	2.2	16	46
09/04/2023	01:04:00	1.6	2.2	16	50
09/04/2023	01:05:00	1.2	2	16	50
09/04/2023	01:06:00	1.4	2	16	51
09/04/2023	01:07:00	1.4	2.3	16	49
09/04/2023	01:08:00	1.3	2.1	16	45
09/04/2023	01:09:00	1.1	1.6	16	46
09/04/2023	01:10:00	1.4	2.3	16	44
09/04/2023	01:11:00	1.4	2	16	47
09/04/2023	01:12:00	1.5	2.2	16	45
09/04/2023	01:13:00	1.5	2.4	16	48
09/04/2023	01:14:00	1.4	2.1	16	45
09/04/2023	01:15:00	1.5	2.6	16	45
09/04/2023	01:16:00	1.1	1.5	16	47
09/04/2023	01:17:00	1.3	2.2	16	46
09/04/2023	01:18:00	1	1.9	16	45
09/04/2023	01:19:00	1.1	1.5	16	46
09/04/2023	01:20:00	1	1.4	16	50
09/04/2023	01:21:00	1.1	2.1	17	49
09/04/2023	01:22:00	0.7	1.1	16	48
09/04/2023	01:23:00	0.8	1.2	16	49
09/04/2023	01:24:00	0.9	1.1	16	49
09/04/2023	01:25:00	0.9	1.4	16	48
09/04/2023	01:26:00	0.9	1.5	16	50
09/04/2023	01:27:00	0.8	1.2	16	54
09/04/2023	01:28:00	0.8	1.4	16	49
09/04/2023	01:29:00	0.7	1.4	16	56
09/04/2023	01:30:00	0.8	1.8	16	49
09/04/2023	01:31:00	1	1.9	16	50
09/04/2023	01:32:00	1.1	1.6	16	49
09/04/2023	01:33:00	0.8	1.2	16	52
09/04/2023	01:34:00	1	1.4	16	50
09/04/2023	01:35:00	1	1.5	16	49
09/04/2023	01:36:00	1	1.5	16	50
09/04/2023	01:37:00	0.5	1	16	49
09/04/2023	01:38:00	0.4	1.1	16	49
09/04/2023	01:39:00	0.1	0.6	16	48
09/04/2023	01:40:00	0.5	0.8	16	48
09/04/2023	01:41:00	0.2	0.7	16	48
09/04/2023	01:42:00	0.3	0.8	16	48
09/04/2023	01:43:00	0.7	1.1	16	48
09/04/2023	01:44:00	0.5	0.9	16	48
09/04/2023	01:45:00	0.6	1	16	49

Date	Time	Wind speed average	Wind Speed maximum	Temperature	Wind Direction
09/04/2023	01:46:00	0.8	1	16	49
09/04/2023	01:47:00	0.8	1.1	16	49
09/04/2023	01:48:00	0.9	1.1	16	49
09/04/2023	01:49:00	1	1.2	16	51
09/04/2023	01:50:00	0.9	1.2	16	52
09/04/2023	01:51:00	1	1.2	16	52
09/04/2023	01:52:00	0.9	1.2	16	52
09/04/2023	01:53:00	0.8	1	16	52
09/04/2023	01:54:00	0.7	1	16	52
09/04/2023	01:55:00	0.8	1.1	16	52
09/04/2023	01:56:00	0.9	1.2	16	52
09/04/2023	01:57:00	0.9	1.3	16	57
09/04/2023	01:58:00	1	1.3	16	58
09/04/2023	01:59:00	1	1.2	16	58
09/04/2023	02:00:00	0.8	1	16	58
09/04/2023	02:01:00	0.9	1.1	16	59
09/04/2023	02:02:00	0.8	1	15	58
09/04/2023	02:03:00	0.8	1	15	58
09/04/2023	02:04:00	0.8	1	15	58
09/04/2023	02:05:00	0.7	1	15	58
09/04/2023	02:06:00	0.5	0.8	15	58
09/04/2023	02:07:00	0.5	0.8	15	59
09/04/2023	02:08:00	0.8	1.2	15	58
09/04/2023	02:09:00	1	1.4	15	59
09/04/2023	02:10:00	1	1.3	15	61
09/04/2023	02:11:00	1	1.3	15	61
09/04/2023	02:12:00	0.9	1.1	15	61
09/04/2023	02:13:00	0.9	1.3	15	61
09/04/2023	02:14:00	0.8	1.1	15	61
09/04/2023	02:15:00	0.7	1	15	61
09/04/2023	02:16:00	0.6	0.9	15	61
09/04/2023	02:17:00	0.6	0.9	15	61
09/04/2023	02:18:00	0.7	0.9	15	61
09/04/2023	02:19:00	0.7	0.8	15	61
09/04/2023	02:20:00	0.7	0.9	15	61
09/04/2023	02:21:00	0.7	0.9	15	61
09/04/2023	02:22:00	0.6	0.9	15	61
09/04/2023	02:23:00	0.4	0.8	15	61
09/04/2023	02:24:00	0.6	0.9	15	60
09/04/2023	02:25:00	0.8	1.2	15	61
09/04/2023	02:26:00	0.8	1.1	15	61
09/04/2023	02:27:00	0.9	1.2	15	61
09/04/2023	02:28:00	0.9	1.3	15	61
09/04/2023	02:29:00	0.7	1.1	15	61
09/04/2023	02:30:00	1	1.4	16	61
09/04/2023	02:31:00	1.1	1.4	16	62
09/04/2023	02:32:00	1	1.3	16	62
09/04/2023	02:33:00	0.9	1.3	16	62
09/04/2023	02:34:00	0.7	1	16	62
09/04/2023	02:35:00	0.3	0.9	16	62
09/04/2023	02:36:00	0.4	1	16	56
09/04/2023	02:37:00	0.1	0.9	16	48
09/04/2023	02:38:00	0.4	1.5	16	50
09/04/2023	02:39:00	0.3	1	16	50
09/04/2023	02:40:00	0.6	1	16	52
09/04/2023	02:41:00	0.8	1.1	16	56
09/04/2023	02:42:00	0.7	1	16	60
09/04/2023	02:43:00	0.5	1.1	16	61
09/04/2023	02:44:00	0.4	1.1	16	61
09/04/2023	02:45:00	0.2	0.7	16	61
09/04/2023	02:46:00	0.7	1.4	16	54
09/04/2023	02:47:00	1.4	1.7	16	44

Date	Time	Wind speed average	Wind Speed maximum	Temperature	Wind Direction
09/04/2023	02:48:00	1.6	2.1	16	35
09/04/2023	02:49:00	1.7	2.5	16	38
09/04/2023	02:50:00	2.1	3.3	16	40
09/04/2023	02:51:00	1.6	2.6	16	46
09/04/2023	02:52:00	1.3	2.2	16	51
09/04/2023	02:53:00	1.5	3.1	16	57
09/04/2023	02:54:00	1.4	2.5	16	57
09/04/2023	02:55:00	1.4	2.5	16	52
09/04/2023	02:56:00	1.7	2.7	16	50
09/04/2023	02:57:00	1.2	2.2	16	53
09/04/2023	02:58:00	1.5	2.2	16	46
09/04/2023	02:59:00	1.3	2.2	16	50
09/04/2023	03:00:00	1.4	2.5	17	53
09/04/2023	03:01:00	1.3	2.2	17	45
09/04/2023	03:02:00	1.1	1.7	17	40
09/04/2023	03:03:00	1.6	2	17	47
09/04/2023	03:04:00	1.6	2.3	17	52
09/04/2023	03:05:00	0.5	1.1	17	62
09/04/2023	03:06:00	1.2	1.9	17	96
09/04/2023	03:07:00	1.6	1.9	17	152
09/04/2023	03:08:00	1.8	2.5	17	150
09/04/2023	03:09:00	1.1	2	17	131
09/04/2023	03:10:00	1.2	1.9	17	80
09/04/2023	03:11:00	1.2	2	17	76
09/04/2023	03:12:00	1.4	3	17	53
09/04/2023	03:13:00	1.9	2.8	17	49
09/04/2023	03:14:00	2.6	4.2	17	39
09/04/2023	03:15:00	3	3.9	17	35
09/04/2023	03:16:00	2.8	4.1	17	33
09/04/2023	03:17:00	2.5	3.6	17	33
09/04/2023	03:18:00	2.7	4.5	17	15
09/04/2023	03:19:00	3	5.4	18	24
09/04/2023	03:20:00	3.1	4.9	18	16
09/04/2023	03:21:00	3.3	4.7	18	22
09/04/2023	03:22:00	2.8	4	18	37
09/04/2023	03:23:00	2.6	4.5	18	35
09/04/2023	03:24:00	2.6	4.3	18	22
09/04/2023	03:25:00	2.5	3.7	18	54
09/04/2023	03:26:00	1.6	2.4	18	64
09/04/2023	03:27:00	1.5	3.1	18	81
09/04/2023	03:28:00	1.2	2.5	18	68
09/04/2023	03:29:00	1.6	2.7	18	77
09/04/2023	03:30:00	1.7	3.2	19	64
09/04/2023	03:31:00	1.4	2.9	19	64
09/04/2023	03:32:00	1.1	1.5	19	71
09/04/2023	03:33:00	1	1.4	19	62
09/04/2023	03:34:00	1.2	2.4	19	35
09/04/2023	03:35:00	1.2	2.6	19	30
09/04/2023	03:36:00	1.6	2.9	19	32
09/04/2023	03:37:00	1.5	2.9	19	41
09/04/2023	03:38:00	1.3	2.2	19	45
09/04/2023	03:39:00	1.7	2.7	19	36
09/04/2023	03:40:00	1.8	2.5	19	39
09/04/2023	03:41:00	0.6	1.8	19	52
09/04/2023	03:42:00	0.9	1.2	19	65
09/04/2023	03:43:00	0.4	1	19	65
09/04/2023	03:44:00	0	0	19	nW
09/04/2023	03:45:00	0	0	19	nW
09/04/2023	03:46:00	0.5	0.9	19	63
09/04/2023	03:47:00	0.9	1.5	19	57
09/04/2023	03:48:00	1.7	3.1	19	47
09/04/2023	03:49:00	1.4	2.2	19	46

Date	Time	Wind speed average	Wind Speed maximum	Temperature	Wind Direction
09/04/2023	03:50:00	1.3	2.3	19	42
09/04/2023	03:51:00	0.9	1.5	19	42
09/04/2023	03:52:00	1.3	2.7	19	59
09/04/2023	03:53:00	0.8	1.2	19	71
09/04/2023	03:54:00	0.4	0.9	19	77
09/04/2023	03:55:00	0	0.7	19	nW
09/04/2023	03:56:00	0	0.6	19	nW
09/04/2023	03:57:00	0.1	0.8	19	72
09/04/2023	03:58:00	0.7	1.2	19	73
09/04/2023	03:59:00	0.6	1	19	75
09/04/2023	04:00:00	0.1	0.8	19	71
09/04/2023	04:01:00	0.9	1.4	19	50
09/04/2023	04:02:00	1.4	1.7	19	17
09/04/2023	04:03:00	1.6	2	19	344
09/04/2023	04:04:00	1.2	2	19	319
09/04/2023	04:05:00	1.7	2.1	19	177
09/04/2023	04:06:00	0.8	1.9	19	162
09/04/2023	04:07:00	1.5	2.8	19	160
09/04/2023	04:08:00	1.4	2.6	19	158
09/04/2023	04:09:00	1.4	2.6	19	138
09/04/2023	04:10:00	1.2	2	19	144
09/04/2023	04:11:00	1.3	2	19	169
09/04/2023	04:12:00	1.2	2.1	19	278
09/04/2023	04:13:00	1.2	2.3	19	287
09/04/2023	04:14:00	0.3	0.9	19	297
09/04/2023	04:15:00	0	0	19	nW
09/04/2023	04:16:00	0	0	19	nW
09/04/2023	04:17:00	0	0	19	nW
09/04/2023	04:18:00	0.2	0.9	19	281
09/04/2023	04:19:00	0.1	0.7	19	271
09/04/2023	04:20:00	0.3	0.8	19	272
09/04/2023	04:21:00	0.2	0.8	19	272
09/04/2023	04:22:00	0.4	1	19	279
09/04/2023	04:23:00	1.1	1.8	19	26
09/04/2023	04:24:00	0.7	1.6	19	51
09/04/2023	04:25:00	1	1.5	19	55
09/04/2023	04:26:00	0.9	1.5	19	55
09/04/2023	04:27:00	0.7	1.3	19	55
09/04/2023	04:28:00	1.2	2	19	54
09/04/2023	04:29:00	1.4	2.3	19	53
09/04/2023	04:30:00	0.7	1.3	19	58
09/04/2023	04:31:00	1.2	1.5	19	47
09/04/2023	04:32:00	1.3	1.8	19	42
09/04/2023	04:33:00	1.4	2.4	19	39
09/04/2023	04:34:00	1.1	1.6	19	37
09/04/2023	04:35:00	1.2	1.7	19	37
09/04/2023	04:36:00	0.7	1.8	19	39
09/04/2023	04:37:00	0.9	1.6	19	44
09/04/2023	04:38:00	0.3	0.9	18	39
09/04/2023	04:39:00	0.4	0.9	18	41
09/04/2023	04:40:00	0.9	1.9	18	45
09/04/2023	04:41:00	0.9	1.5	18	51
09/04/2023	04:42:00	0.9	1.3	18	41
09/04/2023	04:43:00	0.7	1.4	18	49
09/04/2023	04:44:00	1	1.5	18	54
09/04/2023	04:45:00	1.1	1.5	18	45
09/04/2023	04:46:00	1.3	2.6	18	52
09/04/2023	04:47:00	1	1.7	18	52
09/04/2023	04:48:00	1.5	2.8	18	47
09/04/2023	04:49:00	1.6	3.2	18	54
09/04/2023	04:50:00	1	2	18	61
09/04/2023	04:51:00	1	1.8	18	63

Date	Time	Wind speed average	Wind Speed maximum	Temperature	Wind Direction
09/04/2023	04:52:00	1.8	2.4	18	51
09/04/2023	04:53:00	1.4	2	18	44
09/04/2023	04:54:00	1.1	1.8	18	59
09/04/2023	04:55:00	0.9	2.4	18	61
09/04/2023	04:56:00	0.8	1.2	18	57
09/04/2023	04:57:00	1	1.4	18	52
09/04/2023	04:58:00	0.8	2.1	18	52
09/04/2023	04:59:00	0.9	1.4	18	52
09/04/2023	05:00:00	0.7	1	18	50
09/04/2023	05:01:00	0.7	1.9	18	55
09/04/2023	05:02:00	1	1.7	18	59
09/04/2023	05:03:00	0.8	1.6	18	60
09/04/2023	05:04:00	1	1.5	18	60
09/04/2023	05:05:00	1.3	1.9	18	58
09/04/2023	05:06:00	1.3	1.7	18	51
09/04/2023	05:07:00	1.1	1.3	18	57
09/04/2023	05:08:00	0.9	1.6	18	57
09/04/2023	05:09:00	1.5	1.9	18	56
09/04/2023	05:10:00	1.5	2.2	18	55
09/04/2023	05:11:00	1.4	2.1	18	53
09/04/2023	05:12:00	1.1	1.8	19	56
09/04/2023	05:13:00	1.1	1.7	19	57
09/04/2023	05:14:00	1	1.7	19	58
09/04/2023	05:15:00	1.2	1.9	19	59
09/04/2023	05:16:00	1.1	1.6	19	56
09/04/2023	05:17:00	1.3	2.3	19	51
09/04/2023	05:18:00	1.6	2.2	19	38
09/04/2023	05:19:00	1.6	2.5	19	38
09/04/2023	05:20:00	1.1	2	19	38
09/04/2023	05:21:00	1.9	3.1	19	27
09/04/2023	05:22:00	1.3	1.9	19	33
09/04/2023	05:23:00	0.9	1.2	19	30
09/04/2023	05:24:00	0.9	1.4	19	20
09/04/2023	05:25:00	1.1	1.7	19	359
09/04/2023	05:26:00	1.3	1.7	19	335
09/04/2023	05:27:00	1.2	1.6	19	333
09/04/2023	05:28:00	1.2	2	19	333
09/04/2023	05:29:00	1.4	2.3	18	328
09/04/2023	05:30:00	1.8	2.3	18	322
09/04/2023	05:31:00	1.7	2.4	18	321
09/04/2023	05:32:00	1.7	2.3	18	323
09/04/2023	05:33:00	1.4	2.5	18	325
09/04/2023	05:34:00	1.3	2.1	18	328
09/04/2023	05:35:00	1.3	1.9	18	326
09/04/2023	05:36:00	1.6	2.1	18	325
09/04/2023	05:37:00	1.2	1.6	18	324
09/04/2023	05:38:00	1.1	1.7	18	323
09/04/2023	05:39:00	1.3	1.9	18	323
09/04/2023	05:40:00	1	1.6	18	326
09/04/2023	05:41:00	0.9	1.3	18	321
09/04/2023	05:42:00	1.1	1.5	18	320
09/04/2023	05:43:00	1.3	2.3	18	315
09/04/2023	05:44:00	1.4	2.1	18	286
09/04/2023	05:45:00	1.3	1.9	18	287
09/04/2023	05:46:00	0.9	1.4	18	285
09/04/2023	05:47:00	1.2	1.7	18	277
09/04/2023	05:48:00	1.4	2.3	18	304
09/04/2023	05:49:00	2.3	3.8	18	300
09/04/2023	05:50:00	1.8	3.5	18	291
09/04/2023	05:51:00	1.5	2.5	18	289
09/04/2023	05:52:00	2.6	5.7	18	293
09/04/2023	05:53:00	1.9	3.4	18	297

Date	Time	Wind speed average	Wind Speed maximum	Temperature	Wind Direction
09/04/2023	05:54:00	2.2	4.3	18	302
09/04/2023	05:55:00	2.2	3.8	18	315
09/04/2023	05:56:00	1.7	2.5	18	313
09/04/2023	05:57:00	1.1	1.5	18	304
09/04/2023	05:58:00	0.8	1.2	18	311
09/04/2023	05:59:00	0.6	1.1	18	308
09/04/2023	06:00:00	0.5	1	18	304
09/04/2023	06:01:00	0.7	1.3	18	305
09/04/2023	06:02:00	0.6	1.4	18	306
09/04/2023	06:03:00	0.6	0.9	18	305
09/04/2023	06:04:00	0.6	0.9	18	306
09/04/2023	06:05:00	0	0.6	18	nW
09/04/2023	06:06:00	0.5	0.9	18	308
09/04/2023	06:07:00	0.9	1.4	18	332
09/04/2023	06:08:00	1.3	1.9	18	45
09/04/2023	06:09:00	1.4	2.6	18	79
09/04/2023	06:10:00	1.1	1.7	18	77
09/04/2023	06:11:00	1.4	2	18	66
09/04/2023	06:12:00	1.4	2	18	64
09/04/2023	06:13:00	1.1	1.7	18	75
09/04/2023	06:14:00	1.3	2.7	18	63
09/04/2023	06:15:00	0.7	1	18	70
09/04/2023	06:16:00	0.6	1.3	18	99
09/04/2023	06:17:00	0.8	1.2	18	108
09/04/2023	06:18:00	1.3	2	18	44
09/04/2023	06:19:00	1.3	2.1	18	29
09/04/2023	06:20:00	1.4	2.1	18	32
09/04/2023	06:21:00	0.9	1.6	18	34
09/04/2023	06:22:00	0.5	0.8	18	36
09/04/2023	06:23:00	0.2	0.8	18	36
09/04/2023	06:24:00	0.1	0.8	18	36
09/04/2023	06:25:00	0	0	18	nW
09/04/2023	06:26:00	0	0.8	18	nW
09/04/2023	06:27:00	1	1.3	18	36
09/04/2023	06:28:00	1.1	1.3	18	33
09/04/2023	06:29:00	1	1.5	18	15
09/04/2023	06:30:00	1	1.5	18	7
09/04/2023	06:31:00	1.1	1.5	18	115
09/04/2023	06:32:00	0.4	1	18	126
09/04/2023	06:33:00	0.2	0.8	18	120
09/04/2023	06:34:00	0.4	0.8	18	118
09/04/2023	06:35:00	0.8	1.2	18	118
09/04/2023	06:36:00	0.8	1.1	18	116
09/04/2023	06:37:00	1	1.7	18	123
09/04/2023	06:38:00	0.3	0.9	18	126
09/04/2023	06:39:00	0.4	0.9	18	117
09/04/2023	06:40:00	0.4	1.1	18	120
09/04/2023	06:41:00	1.1	3.1	18	128
09/04/2023	06:42:00	1.9	3.2	18	163
09/04/2023	06:43:00	1.4	2.1	18	162
09/04/2023	06:44:00	1.9	2.9	18	160
09/04/2023	06:45:00	1.1	2.2	18	166
09/04/2023	06:46:00	0.8	1.4	18	164
09/04/2023	06:47:00	0.9	1.5	18	162
09/04/2023	06:48:00	0.5	0.9	18	163
09/04/2023	06:49:00	0.6	0.7	18	163
09/04/2023	06:50:00	1.1	1.9	18	224
09/04/2023	06:51:00	0.7	1.2	18	251
09/04/2023	06:52:00	0.8	1.1	18	251
09/04/2023	06:53:00	1	1.2	18	242
09/04/2023	06:54:00	0.5	1.6	18	253
09/04/2023	06:55:00	1.4	1.8	18	300

Date	Time	Wind speed average	Wind Speed maximum	Temperature	Wind Direction
09/04/2023	06:56:00	1.5	2.3	18	311
09/04/2023	06:57:00	1.6	3.1	18	292
09/04/2023	06:58:00	1.5	2.1	18	292
09/04/2023	06:59:00	1.2	1.8	18	288
09/04/2023	07:00:00	1	1.4	18	302
09/04/2023	07:01:00	0.9	1.2	18	301
09/04/2023	07:02:00	0.5	1	18	304
09/04/2023	07:03:00	0.9	1.4	18	303
09/04/2023	07:04:00	1	1.9	18	323
09/04/2023	07:05:00	1.1	1.5	18	327
09/04/2023	07:06:00	1	1.4	18	319
09/04/2023	07:07:00	0.6	1.2	17	331
09/04/2023	07:08:00	1	1.3	17	90
09/04/2023	07:09:00	0.9	1.2	17	95
09/04/2023	07:10:00	1.1	1.5	17	114
09/04/2023	07:11:00	1.3	2.1	17	287
09/04/2023	07:12:00	1.3	1.9	17	317
09/04/2023	07:13:00	0.9	1.6	17	4
09/04/2023	07:14:00	1.1	1.7	17	34
09/04/2023	07:15:00	1.4	2.9	17	40
09/04/2023	07:16:00	1.5	2	17	44
09/04/2023	07:17:00	0.8	1.9	17	40
09/04/2023	07:18:00	0.7	1.1	17	49
09/04/2023	07:19:00	1.1	1.9	17	81
09/04/2023	07:20:00	1.7	2.1	17	153
09/04/2023	07:21:00	1.3	1.7	16	149
09/04/2023	07:22:00	1.1	1.6	16	136
09/04/2023	07:23:00	1.4	1.9	16	62
09/04/2023	07:24:00	1.4	2.2	16	61
09/04/2023	07:25:00	1.5	1.9	16	99
09/04/2023	07:26:00	1.6	2	16	119
09/04/2023	07:27:00	1.4	2.1	16	111
09/04/2023	07:28:00	1.3	1.8	16	90
09/04/2023	07:29:00	1.5	2.1	16	63
09/04/2023	07:30:00	1.5	3.1	16	54
09/04/2023	07:31:00	1.1	1.7	16	47
09/04/2023	07:32:00	1.1	2.4	16	36
09/04/2023	07:33:00	1.5	2.1	16	45
09/04/2023	07:34:00	0.5	1.3	16	56
09/04/2023	07:35:00	0.6	1.3	16	35
09/04/2023	07:36:00	0.4	1	16	32
09/04/2023	07:37:00	0.9	1.7	16	37
09/04/2023	07:38:00	0.7	0.9	16	31
09/04/2023	07:39:00	0.3	1.1	16	31
09/04/2023	07:40:00	0.7	1.5	16	38
09/04/2023	07:41:00	0.3	0.8	16	36
09/04/2023	07:42:00	0.4	0.9	16	37
09/04/2023	07:43:00	0.8	1	16	47
09/04/2023	07:44:00	0.9	1	16	49
09/04/2023	07:45:00	1	1.2	16	54
09/04/2023	07:46:00	1	1.2	16	55
09/04/2023	07:47:00	0.9	1.2	16	56
09/04/2023	07:48:00	0.9	1.2	16	85
09/04/2023	07:49:00	1	1.8	16	117
09/04/2023	07:50:00	1	2.2	16	125
09/04/2023	07:51:00	1.2	2	16	152
09/04/2023	07:52:00	1.3	2.4	16	142
09/04/2023	07:53:00	1.2	1.6	16	138
09/04/2023	07:54:00	1	1.6	16	137
09/04/2023	07:55:00	1.5	2.7	16	145
09/04/2023	07:56:00	1.3	2.3	16	139
09/04/2023	07:57:00	1.2	1.7	17	134

Date	Time	Wind speed average	Wind Speed maximum	Temperature	Wind Direction
09/04/2023	07:58:00	0.9	1.4	17	132
09/04/2023	07:59:00	0.9	1.3	17	133
09/04/2023	08:00:00	1.3	1.8	17	140
09/04/2023	08:01:00	1.2	1.5	17	132
09/04/2023	08:02:00	1.1	1.4	17	132
09/04/2023	08:03:00	0.9	1.3	17	129
09/04/2023	08:04:00	0.7	1.3	17	103
09/04/2023	08:05:00	1.3	1.8	17	51
09/04/2023	08:06:00	1.5	2.9	17	46
09/04/2023	08:07:00	1.1	2.6	17	65
09/04/2023	08:08:00	1.4	2.2	17	61
09/04/2023	08:09:00	1.2	2.1	17	79
09/04/2023	08:10:00	1.4	2.6	17	53
09/04/2023	08:11:00	1.5	2.8	17	50
09/04/2023	08:12:00	1.1	1.7	17	77
09/04/2023	08:13:00	0.8	1.1	17	84
09/04/2023	08:14:00	0.7	1	17	83
09/04/2023	08:15:00	1.2	2.5	17	42
09/04/2023	08:16:00	1.1	1.4	17	70
09/04/2023	08:17:00	1.2	2	17	60
09/04/2023	08:18:00	1.2	2.4	17	73
09/04/2023	08:19:00	1	1.4	17	73
09/04/2023	08:20:00	0.9	1.5	17	64
09/04/2023	08:21:00	1.2	2	17	67
09/04/2023	08:22:00	0.9	1.7	17	76
09/04/2023	08:23:00	1	1.6	17	55
09/04/2023	08:24:00	1.1	1.9	17	58
09/04/2023	08:25:00	1	2	17	57
09/04/2023	08:26:00	1.5	2.4	17	58
09/04/2023	08:27:00	1.5	2.8	17	56
09/04/2023	08:28:00	1.3	2	17	54
09/04/2023	08:29:00	1.4	2.6	17	55
09/04/2023	08:30:00	1.3	1.7	17	53
09/04/2023	08:31:00	1.1	2.3	17	72
09/04/2023	08:32:00	1.4	2.3	17	64
09/04/2023	08:33:00	1.1	1.6	17	55
09/04/2023	08:34:00	1.5	2.2	17	55
09/04/2023	08:35:00	1.3	2.2	17	65
09/04/2023	08:36:00	1	1.6	17	61
09/04/2023	08:37:00	0.9	1.4	17	65
09/04/2023	08:38:00	0.8	1.4	17	62
09/04/2023	08:39:00	1	1.5	17	64
09/04/2023	08:40:00	1.1	1.6	17	69
09/04/2023	08:41:00	1.1	2.3	17	64
09/04/2023	08:42:00	0.9	1.4	17	56
09/04/2023	08:43:00	1.1	1.6	17	81
09/04/2023	08:44:00	1.2	2.6	17	58
09/04/2023	08:45:00	1.3	1.9	17	66
09/04/2023	08:46:00	1.2	2.1	17	66
09/04/2023	08:47:00	1.1	1.6	17	57
09/04/2023	08:48:00	1.1	2.2	17	58
09/04/2023	08:49:00	1.1	1.8	17	55
09/04/2023	08:50:00	1.1	2	17	50
09/04/2023	08:51:00	1.3	1.8	17	77
09/04/2023	08:52:00	1.5	2.9	17	68
09/04/2023	08:53:00	1.8	2.8	17	56
09/04/2023	08:54:00	1.3	1.9	17	60
09/04/2023	08:55:00	1	1.7	17	62
09/04/2023	08:56:00	1.6	2.7	17	72
09/04/2023	08:57:00	1.1	1.7	17	71
09/04/2023	08:58:00	1.1	1.6	17	69
09/04/2023	08:59:00	1.1	1.5	18	67

Date	Time	Wind speed average	Wind Speed maximum	Temperature	Wind Direction
09/04/2023	09:00:00	1.7	2.9	18	54
09/04/2023	09:01:00	1.1	1.8	18	57
09/04/2023	09:02:00	1.2	2.2	18	75
09/04/2023	09:03:00	1.3	2.6	18	76
09/04/2023	09:04:00	1.2	2.1	18	79
09/04/2023	09:05:00	1.3	2.2	18	55
09/04/2023	09:06:00	1.5	2.6	18	58
09/04/2023	09:07:00	1.7	3	18	58
09/04/2023	09:08:00	1	1.8	18	61
09/04/2023	09:09:00	1.5	2.5	18	57
09/04/2023	09:10:00	1.6	3.4	18	64
09/04/2023	09:11:00	1.6	3.2	19	72
09/04/2023	09:12:00	1.7	3.4	19	51
09/04/2023	09:13:00	1.5	2.5	19	57
09/04/2023	09:14:00	1.4	2.8	19	49
09/04/2023	09:15:00	1.2	1.8	19	60
09/04/2023	09:16:00	1.1	1.9	19	63
09/04/2023	09:17:00	1.5	3.2	19	63
09/04/2023	09:18:00	1.4	2.2	19	53
09/04/2023	09:19:00	1	1.9	19	58
09/04/2023	09:20:00	0.9	1.8	19	57
09/04/2023	09:21:00	1.5	3.7	19	67
09/04/2023	09:22:00	1.4	2.7	19	64
09/04/2023	09:23:00	1.5	2.3	19	45
09/04/2023	09:24:00	1.6	2.3	19	51
09/04/2023	09:25:00	2.1	3.2	19	44
09/04/2023	09:26:00	1.3	1.8	19	55
09/04/2023	09:27:00	1.5	2.4	19	53
09/04/2023	09:28:00	0.9	1.7	19	56
09/04/2023	09:29:00	1.1	2.2	19	62
09/04/2023	09:30:00	1	1.5	19	59
09/04/2023	09:31:00	1.7	4	19	54
09/04/2023	09:32:00	2	3.6	19	62
09/04/2023	09:33:00	1.6	2.7	20	64
09/04/2023	09:34:00	1.4	2.1	20	61
09/04/2023	09:35:00	1.6	2.8	20	39
09/04/2023	09:36:00	1.9	3.4	20	56
09/04/2023	09:37:00	1.6	2.9	20	58
09/04/2023	09:38:00	1.4	2.2	20	57
09/04/2023	09:39:00	1.5	2.9	20	55
09/04/2023	09:40:00	1.3	2.8	20	52
09/04/2023	09:41:00	1	1.6	20	75
09/04/2023	09:42:00	1.2	1.7	20	65
09/04/2023	09:43:00	1.3	2	20	59
09/04/2023	09:44:00	1.2	2.9	20	78
09/04/2023	09:45:00	1.2	1.9	20	76
09/04/2023	09:46:00	2.1	3.6	20	52
09/04/2023	09:47:00	1.5	2.1	21	61
09/04/2023	09:48:00	1.2	2.2	21	51
09/04/2023	09:49:00	1.2	2.4	21	79
09/04/2023	09:50:00	1.5	3.1	21	55
09/04/2023	09:51:00	1.2	1.7	21	53
09/04/2023	09:52:00	1.7	2.9	21	55
09/04/2023	09:53:00	1.5	2.5	21	70
09/04/2023	09:54:00	1.5	2.5	21	54
09/04/2023	09:55:00	1.4	2.1	21	64
09/04/2023	09:56:00	1.5	2.5	21	67
09/04/2023	09:57:00	1.4	2.9	21	56
09/04/2023	09:58:00	1.4	2.3	21	40
09/04/2023	09:59:00	1.8	2.8	21	53
09/04/2023	10:00:00	1.2	2.2	21	64
09/04/2023	10:01:00	1.2	2	21	104

Date	Time	Wind speed average	Wind Speed maximum	Temperature	Wind Direction
09/04/2023	10:02:00	1.2	1.9	21	73
09/04/2023	10:03:00	1.3	2.9	21	47
09/04/2023	10:04:00	1.3	2.3	21	72
09/04/2023	10:05:00	1.9	3.1	21	55
09/04/2023	10:06:00	1.8	3.2	21	58
09/04/2023	10:07:00	1.8	3	22	66
09/04/2023	10:08:00	1.4	2.4	22	64
09/04/2023	10:09:00	1.5	3.1	22	59
09/04/2023	10:10:00	1.7	3.5	22	75
09/04/2023	10:11:00	1.6	2.6	22	61
09/04/2023	10:12:00	1.6	3.3	22	61
09/04/2023	10:13:00	1.5	2.5	22	75
09/04/2023	10:14:00	1.3	1.8	22	107
09/04/2023	10:15:00	1.1	1.7	22	104
09/04/2023	10:16:00	1.3	1.8	22	107
09/04/2023	10:17:00	1.1	2.1	22	103
09/04/2023	10:18:00	1.2	1.7	23	108
09/04/2023	10:19:00	1	1.4	23	119
09/04/2023	10:20:00	1.2	2	23	88
09/04/2023	10:21:00	1.2	1.8	23	79
09/04/2023	10:22:00	1.1	1.8	23	88
09/04/2023	10:23:00	1.3	2	23	77
09/04/2023	10:24:00	1.3	1.9	23	94
09/04/2023	10:25:00	1.3	2.6	23	79
09/04/2023	10:26:00	1.1	1.7	23	94
09/04/2023	10:27:00	1.2	1.6	23	111
09/04/2023	10:28:00	1.1	1.5	24	115
09/04/2023	10:29:00	1	1.5	24	121
09/04/2023	10:30:00	1.1	2	24	113
09/04/2023	10:31:00	1.1	1.9	24	113
09/04/2023	10:32:00	1.4	2	24	133
09/04/2023	10:33:00	1.8	3.5	24	69
09/04/2023	10:34:00	1.2	1.6	24	97
09/04/2023	10:35:00	1.3	2	24	106
09/04/2023	10:36:00	1.2	1.9	24	106
09/04/2023	10:37:00	1.1	2.3	24	96
09/04/2023	10:38:00	1.3	1.9	24	88
09/04/2023	10:39:00	1.3	1.9	24	145
09/04/2023	10:40:00	1.4	2.2	24	98
09/04/2023	10:41:00	1.2	2	24	101
09/04/2023	10:42:00	1.1	1.6	24	101
09/04/2023	10:43:00	1.5	2.7	24	78
09/04/2023	10:44:00	1.3	1.9	24	115
09/04/2023	10:45:00	1.3	1.8	25	124
09/04/2023	10:46:00	1.2	1.6	25	98
09/04/2023	10:47:00	1.4	2.3	25	108
09/04/2023	10:48:00	1.6	2.2	25	119
09/04/2023	10:49:00	1.4	2.1	25	114
09/04/2023	10:50:00	1.3	2	25	111
09/04/2023	10:51:00	1.3	1.9	25	114
09/04/2023	10:52:00	1.4	2.5	25	120
09/04/2023	10:53:00	1.4	1.9	25	111
09/04/2023	10:54:00	1.4	2	25	105
09/04/2023	10:55:00	1.5	2.7	25	117
09/04/2023	10:56:00	1.2	2.3	25	116
09/04/2023	10:57:00	1.4	2.1	25	132
09/04/2023	10:58:00	1.7	2.5	25	116
09/04/2023	10:59:00	1.7	2.2	25	115
09/04/2023	11:00:00	1.5	2.5	25	112
09/04/2023	11:01:00	1.3	1.9	25	120
09/04/2023	11:02:00	1.5	1.9	25	109
09/04/2023	11:03:00	1.5	2.2	25	114

Date	Time	Wind speed average	Wind Speed maximum	Temperature	Wind Direction
09/04/2023	11:04:00	1.5	2.3	26	110
09/04/2023	11:05:00	1.7	2.5	26	117
09/04/2023	11:06:00	1.6	2.7	26	132
09/04/2023	11:07:00	1.4	2.2	26	133
09/04/2023	11:08:00	1.6	3.5	26	112
09/04/2023	11:09:00	1.6	2.3	26	120
09/04/2023	11:10:00	1.5	2.2	26	120
09/04/2023	11:11:00	1.6	2.5	26	125
09/04/2023	11:12:00	1.6	2.5	26	120
09/04/2023	11:13:00	1.4	2.2	26	104
09/04/2023	11:14:00	1.8	2.5	26	126
09/04/2023	11:15:00	1.5	2.2	26	129
09/04/2023	11:16:00	1.4	2.2	26	121
09/04/2023	11:17:00	1.8	3.9	26	80
09/04/2023	11:18:00	1.4	2.1	26	138
09/04/2023	11:19:00	1.5	2.2	26	119
09/04/2023	11:20:00	1.8	2.4	26	132
09/04/2023	11:21:00	1.4	2.2	26	126
09/04/2023	11:22:00	1.5	2.9	26	95
09/04/2023	11:23:00	1.6	2.6	26	125
09/04/2023	11:24:00	1.4	2.2	26	137
09/04/2023	11:25:00	1.6	3.1	26	112
09/04/2023	11:26:00	1.5	3.1	26	92
09/04/2023	11:27:00	1.4	1.9	26	128
09/04/2023	11:28:00	1.4	2.6	26	92
09/04/2023	11:29:00	1.6	2.8	26	101
09/04/2023	11:30:00	1.4	1.9	26	119
09/04/2023	11:31:00	1.6	3.4	26	97
09/04/2023	11:32:00	1.6	3.3	26	99
09/04/2023	11:33:00	1.6	2.4	26	109
09/04/2023	11:34:00	1.7	2.4	26	123
09/04/2023	11:35:00	2	2.9	26	117
09/04/2023	11:36:00	1.7	2.7	26	120
09/04/2023	11:37:00	1.6	2.5	26	110
09/04/2023	11:38:00	1.5	2.2	26	116
09/04/2023	11:39:00	1.5	2.3	26	107
09/04/2023	11:40:00	1.5	2.6	26	80
09/04/2023	11:41:00	1.6	3.1	26	123
09/04/2023	11:42:00	1.3	2.2	26	117
09/04/2023	11:43:00	1.8	3.2	26	122
09/04/2023	11:44:00	1.7	2.7	27	119
09/04/2023	11:45:00	1.7	2.6	27	116
09/04/2023	11:46:00	1.6	2.4	27	109
09/04/2023	11:47:00	1.8	3.3	27	113
09/04/2023	11:48:00	1.4	1.9	27	95
09/04/2023	11:49:00	1.7	2.5	27	118
09/04/2023	11:50:00	1.6	2.6	27	119
09/04/2023	11:51:00	1.7	2.8	27	88
09/04/2023	11:52:00	1.5	2.2	27	116
09/04/2023	11:53:00	1.5	2.2	27	114
09/04/2023	11:54:00	1.8	2.7	27	111
09/04/2023	11:55:00	1.7	2.6	27	127
09/04/2023	11:56:00	1.5	2.1	27	141
09/04/2023	11:57:00	1.4	2.5	27	114
09/04/2023	11:58:00	1.8	2.4	27	117
09/04/2023	11:59:00	1.7	2.5	27	132
09/04/2023	12:00:00	1.8	2.2	27	138
09/04/2023	12:01:00	1.6	2.4	27	96
09/04/2023	12:02:00	1.8	2.7	27	104
09/04/2023	12:03:00	1.6	2.5	27	108
09/04/2023	12:04:00	1.7	2.9	27	105
09/04/2023	12:05:00	1.4	2.4	27	97

Date	Time	Wind speed average	Wind Speed maximum	Temperature	Wind Direction
09/04/2023	12:06:00	1.7	2.5	27	124
09/04/2023	12:07:00	2.3	4.2	27	80
09/04/2023	12:08:00	1.8	3.4	27	98
09/04/2023	12:09:00	1.7	2.3	27	105
09/04/2023	12:10:00	1.8	2.6	27	111
09/04/2023	12:11:00	1.7	3.8	27	88
09/04/2023	12:12:00	1.9	4.1	27	104
09/04/2023	12:13:00	1.7	3.5	27	89
09/04/2023	12:14:00	1.6	2.2	27	102
09/04/2023	12:15:00	1.8	3	27	113
09/04/2023	12:16:00	1.8	3.4	27	125
09/04/2023	12:17:00	1.5	2.7	27	112
09/04/2023	12:18:00	1.8	4.2	27	113
09/04/2023	12:19:00	1.7	2.2	27	122
09/04/2023	12:20:00	1.8	2.6	27	121
09/04/2023	12:21:00	1.9	4.1	27	107
09/04/2023	12:22:00	1.6	2.1	27	131
09/04/2023	12:23:00	1.4	2.5	27	111
09/04/2023	12:24:00	1.8	2.9	27	114
09/04/2023	12:25:00	1.7	2.8	27	103
09/04/2023	12:26:00	1.8	2.5	27	120
09/04/2023	12:27:00	1.7	3.2	27	118
09/04/2023	12:28:00	1.6	2.3	27	110
09/04/2023	12:29:00	1.5	2.2	27	116
09/04/2023	12:30:00	1.4	1.8	27	112
09/04/2023	12:31:00	1.3	1.9	27	120
09/04/2023	12:32:00	1.9	3	27	97
09/04/2023	12:33:00	1.6	2.4	27	109
09/04/2023	12:34:00	1.7	2.4	27	112
09/04/2023	12:35:00	1.6	3.3	27	119
09/04/2023	12:36:00	1.9	3.6	27	126
09/04/2023	12:37:00	1.4	2.4	27	109
09/04/2023	12:38:00	1.9	3.3	27	95
09/04/2023	12:39:00	1.4	2.5	27	98
09/04/2023	12:40:00	1.7	2.6	27	118
09/04/2023	12:41:00	1.6	2.8	27	105
09/04/2023	12:42:00	1.8	2.8	27	131
09/04/2023	12:43:00	1.8	3.4	27	102
09/04/2023	12:44:00	1.9	2.8	27	113
09/04/2023	12:45:00	1.6	3	27	114
09/04/2023	12:46:00	1.5	2	27	122
09/04/2023	12:47:00	1.8	2.9	27	129
09/04/2023	12:48:00	1.7	2.5	27	126
09/04/2023	12:49:00	1.4	2.1	27	116
09/04/2023	12:50:00	1.7	2.2	27	129
09/04/2023	12:51:00	1.9	3	27	139
09/04/2023	12:52:00	1.8	4	27	93
09/04/2023	12:53:00	2.2	3.8	27	89
09/04/2023	12:54:00	1.8	3	27	87
09/04/2023	12:55:00	1.9	3.7	27	83
09/04/2023	12:56:00	1.7	2.7	27	120
09/04/2023	12:57:00	1.5	2.2	27	131
09/04/2023	12:58:00	1.8	2.3	27	127
09/04/2023	12:59:00	1.4	2.4	27	123
09/04/2023	13:00:00	1.7	3.2	27	109
09/04/2023	13:01:00	2.3	3.2	27	120
09/04/2023	13:02:00	1.8	2.6	27	121
09/04/2023	13:03:00	1.6	2.5	27	124
09/04/2023	13:04:00	1.4	2.1	27	119
09/04/2023	13:05:00	1.7	2.4	27	119
09/04/2023	13:06:00	2.1	3.3	27	131
09/04/2023	13:07:00	2.1	2.8	27	123

Date	Time	Wind speed average	Wind Speed maximum	Temperature	Wind Direction
09/04/2023	13:08:00	1.7	2.4	28	115
09/04/2023	13:09:00	1.5	2.1	28	132
09/04/2023	13:10:00	1.6	2.3	28	120
09/04/2023	13:11:00	1.7	2.9	28	118
09/04/2023	13:12:00	1.6	2.3	28	121
09/04/2023	13:13:00	1.8	2.5	28	135
09/04/2023	13:14:00	2.1	3	28	114
09/04/2023	13:15:00	1.7	2.3	28	115
09/04/2023	13:16:00	1.6	3.1	28	119
09/04/2023	13:17:00	1.6	2.5	28	109
09/04/2023	13:18:00	1.9	2.6	28	127
09/04/2023	13:19:00	1.6	2.3	28	119
09/04/2023	13:20:00	2	3	28	133
09/04/2023	13:21:00	1.8	2.5	28	121
09/04/2023	13:22:00	1.7	3	28	121
09/04/2023	13:23:00	1.4	2.6	28	112
09/04/2023	13:24:00	2	2.8	28	115
09/04/2023	13:25:00	1.8	3.1	28	131
09/04/2023	13:26:00	1.5	3	28	129
09/04/2023	13:27:00	1.9	3.2	28	106
09/04/2023	13:28:00	1.8	2.6	28	116
09/04/2023	13:29:00	1.8	2.6	28	126
09/04/2023	13:30:00	1.9	2.8	28	117
09/04/2023	13:31:00	1.8	2.5	28	115
09/04/2023	13:32:00	1.8	2.4	28	117
09/04/2023	13:33:00	1.7	2.6	28	143
09/04/2023	13:34:00	1.7	2.3	28	93
09/04/2023	13:35:00	1.8	3	28	122
09/04/2023	13:36:00	1.6	2.9	28	129
09/04/2023	13:37:00	2.1	2.9	28	121
09/04/2023	13:38:00	1.9	3.3	28	127
09/04/2023	13:39:00	1.7	2.5	28	115
09/04/2023	13:40:00	1.7	2.7	28	110
09/04/2023	13:41:00	1.8	2.8	28	117
09/04/2023	13:42:00	1.9	3.5	28	107
09/04/2023	13:43:00	2.1	4.2	28	118
09/04/2023	13:44:00	2.1	4.6	28	94
09/04/2023	13:45:00	2.6	5.5	28	85
09/04/2023	13:46:00	2	3.1	28	119
09/04/2023	13:47:00	1.8	2.4	28	133
09/04/2023	13:48:00	2.1	3	28	117
09/04/2023	13:49:00	1.6	2.6	28	116
09/04/2023	13:50:00	1.6	2.8	28	112
09/04/2023	13:51:00	1.8	2.6	28	121
09/04/2023	13:52:00	1.7	3.5	28	111
09/04/2023	13:53:00	2.2	3.2	28	82
09/04/2023	13:54:00	1.6	2.4	28	121
09/04/2023	13:55:00	1.7	2.3	28	127
09/04/2023	13:56:00	1.6	2.3	28	127
09/04/2023	13:57:00	1.6	2.2	28	131
09/04/2023	13:58:00	2	2.7	28	116
09/04/2023	13:59:00	1.9	2.9	28	129
09/04/2023	14:00:00	1.8	2.8	28	125
09/04/2023	14:01:00	1.7	2.8	28	123
09/04/2023	14:02:00	1.9	3	28	141
09/04/2023	14:03:00	1.8	2.5	28	116
09/04/2023	14:04:00	1.9	2.8	28	125
09/04/2023	14:05:00	2	2.9	28	127
09/04/2023	14:06:00	1.9	2.9	28	124
09/04/2023	14:07:00	2.1	3	28	124
09/04/2023	14:08:00	1.8	2.3	28	116
09/04/2023	14:09:00	1.5	2.4	28	110

Date	Time	Wind speed average	Wind Speed maximum	Temperature	Wind Direction
09/04/2023	14:10:00	1.5	3.6	28	130
09/04/2023	14:11:00	1.7	3	28	138
09/04/2023	14:12:00	2	3.1	28	84
09/04/2023	14:13:00	2.4	3.4	28	95
09/04/2023	14:14:00	1.9	3.4	28	91
09/04/2023	14:15:00	1.6	2.7	28	107
09/04/2023	14:16:00	1.4	2.1	28	95
09/04/2023	14:17:00	2.2	5.5	28	95
09/04/2023	14:18:00	1.9	3.2	28	97
09/04/2023	14:19:00	1.8	2.6	28	125
09/04/2023	14:20:00	1.2	1.9	28	101
09/04/2023	14:21:00	1.6	2.4	28	112
09/04/2023	14:22:00	2.3	3	28	122
09/04/2023	14:23:00	2.1	2.8	28	121
09/04/2023	14:24:00	1.9	2.4	28	123
09/04/2023	14:25:00	1.6	2.8	28	125
09/04/2023	14:26:00	1.5	2.3	28	158
09/04/2023	14:27:00	1.5	2.9	28	116
09/04/2023	14:28:00	1.4	2.6	28	86
09/04/2023	14:29:00	1.6	2.4	28	96
09/04/2023	14:30:00	1.3	2.2	28	102
09/04/2023	14:31:00	1.7	3.6	28	110
09/04/2023	14:32:00	1.9	3.2	28	108
09/04/2023	14:33:00	1.7	2.4	28	107
09/04/2023	14:34:00	1.3	2	28	116
09/04/2023	14:35:00	1.2	2.2	28	119
09/04/2023	14:36:00	1.7	2.3	28	117
09/04/2023	14:37:00	1.5	2.8	28	120
09/04/2023	14:38:00	1.9	4	28	93
09/04/2023	14:39:00	1.6	2.8	28	94
09/04/2023	14:40:00	1.3	1.9	28	107
09/04/2023	14:41:00	1.6	5	28	89
09/04/2023	14:42:00	1.7	2.7	28	154
09/04/2023	14:43:00	1.5	2.2	28	139
09/04/2023	14:44:00	1.4	2.2	28	120
09/04/2023	14:45:00	1.3	1.9	28	113
09/04/2023	14:46:00	1.5	3.7	28	108
09/04/2023	14:47:00	1.8	3.8	28	98
09/04/2023	14:48:00	1.6	2.6	28	114
09/04/2023	14:49:00	1.8	2.2	28	124
09/04/2023	14:50:00	1.7	4.8	28	120
09/04/2023	14:51:00	1.4	1.9	28	115
09/04/2023	14:52:00	1.5	2.2	28	133
09/04/2023	14:53:00	1.9	3.3	28	117
09/04/2023	14:54:00	1.6	2.2	28	115
09/04/2023	14:55:00	1.6	2.6	28	124
09/04/2023	14:56:00	1.7	2.5	28	115
09/04/2023	14:57:00	1.5	2.1	28	120
09/04/2023	14:58:00	1.4	2.3	28	117
09/04/2023	14:59:00	1.3	2	28	108
09/04/2023	15:00:00	1.5	3.1	28	100
09/04/2023	15:01:00	1.4	2.2	28	117
09/04/2023	15:02:00	1.6	2.4	28	88
09/04/2023	15:03:00	1.6	2.2	28	108
09/04/2023	15:04:00	1.3	2.4	28	123
09/04/2023	15:05:00	1.4	3.4	27	108
09/04/2023	15:06:00	1.3	2.4	27	123
09/04/2023	15:07:00	1.4	2.8	27	128
09/04/2023	15:08:00	1.4	1.9	27	134
09/04/2023	15:09:00	1.4	2.4	27	109
09/04/2023	15:10:00	1.2	1.7	27	113
09/04/2023	15:11:00	1.3	3.5	27	56

Date	Time	Wind speed average	Wind Speed maximum	Temperature	Wind Direction
09/04/2023	15:12:00	2	5.1	27	83
09/04/2023	15:13:00	1.5	3.5	27	94
09/04/2023	15:14:00	1.6	3.4	27	116
09/04/2023	15:15:00	1.4	2	27	131
09/04/2023	15:16:00	1.4	2	27	116
09/04/2023	15:17:00	1.1	1.7	27	120
09/04/2023	15:18:00	1.1	1.8	27	112
09/04/2023	15:19:00	1.2	1.6	27	120
09/04/2023	15:20:00	1.5	2	27	114
09/04/2023	15:21:00	1.3	1.9	27	115
09/04/2023	15:22:00	1.2	1.8	27	115
09/04/2023	15:23:00	1.3	2.6	27	80
09/04/2023	15:24:00	1.6	2.7	27	65
09/04/2023	15:25:00	1	1.7	27	95
09/04/2023	15:26:00	1.5	3.9	27	13
09/04/2023	15:27:00	1.7	3.5	27	69
09/04/2023	15:28:00	2	2.8	27	51
09/04/2023	15:29:00	1.9	3.5	27	74
09/04/2023	15:30:00	1.1	1.9	27	116
09/04/2023	15:31:00	1.3	2.5	27	95
09/04/2023	15:32:00	0.9	1.7	27	98
09/04/2023	15:33:00	0.8	1.4	27	79
09/04/2023	15:34:00	1.4	2.5	27	33
09/04/2023	15:35:00	1.4	2.7	28	60
09/04/2023	15:36:00	1.9	2.8	28	52
09/04/2023	15:37:00	1.5	3.5	28	86

Table 7: AN 2 location weather data for noise monitoring

Date	Time	Wind speed average	Wind Speed maximum	Temperature	Wind Direction
07/04/2023	13:33:00	1.6	2.5	26	359
07/04/2023	13:34:00	1	1.4	26	36
07/04/2023	13:35:00	1.4	2	26	58
07/04/2023	13:36:00	1.3	1.8	26	61
07/04/2023	13:37:00	1.1	1.7	26	41
07/04/2023	13:38:00	0.8	1.2	26	32
07/04/2023	13:39:00	1.2	1.6	27	294
07/04/2023	13:40:00	1.7	2.9	27	262
07/04/2023	13:41:00	1.8	2.8	27	237
07/04/2023	13:42:00	1.6	2.6	27	254
07/04/2023	13:43:00	1.8	2.4	27	324
07/04/2023	13:44:00	1.4	2.3	27	336
07/04/2023	13:45:00	2.3	3.3	27	323
07/04/2023	13:46:00	2.3	2.9	27	321
07/04/2023	13:47:00	2.4	3.2	27	333
07/04/2023	13:48:00	1.7	2.2	27	341
07/04/2023	13:49:00	1.3	1.8	27	349
07/04/2023	13:50:00	1.1	1.6	27	59
07/04/2023	13:51:00	1.2	1.5	27	70
07/04/2023	13:52:00	0.9	1.4	27	85
07/04/2023	13:53:00	1.4	3.2	27	66
07/04/2023	13:54:00	2.7	3.4	27	325
07/04/2023	13:55:00	1.9	2.8	27	324
07/04/2023	13:56:00	2.2	3	27	351
07/04/2023	13:57:00	1.9	2.8	28	17
07/04/2023	13:58:00	2.8	4	28	10
07/04/2023	13:59:00	1.2	1.9	28	356
07/04/2023	14:00:00	1.3	1.8	28	345
07/04/2023	14:01:00	1.5	2.2	28	30
07/04/2023	14:02:00	2	2.7	28	61

Date	Time	Wind speed average	Wind Speed maximum	Temperature	Wind Direction
07/04/2023	14:03:00	1.7	2.5	28	40
07/04/2023	14:04:00	2.7	3.6	28	51
07/04/2023	14:05:00	2.3	2.8	28	58
07/04/2023	14:06:00	2	2.5	28	85
07/04/2023	14:07:00	1.5	2.1	28	83
07/04/2023	14:08:00	1.2	1.9	28	85
07/04/2023	14:09:00	2	2.9	28	86
07/04/2023	14:10:00	1.4	2.1	28	89
07/04/2023	14:11:00	1.1	2	28	85
07/04/2023	14:12:00	1	1.8	28	117
07/04/2023	14:13:00	1.3	1.9	28	272
07/04/2023	14:14:00	0.8	1.2	28	288
07/04/2023	14:15:00	1.8	2.5	28	315
07/04/2023	14:16:00	1.9	2.3	28	328
07/04/2023	14:17:00	2	3.6	28	327
07/04/2023	14:18:00	2.5	3.6	28	330
07/04/2023	14:19:00	2	2.6	28	344
07/04/2023	14:20:00	2.2	3.2	28	317
07/04/2023	14:21:00	2.9	3.6	28	341
07/04/2023	14:22:00	3.2	4.6	28	328
07/04/2023	14:23:00	3.7	4.7	28	349
07/04/2023	14:24:00	2.6	3.4	28	357
07/04/2023	14:25:00	2.1	3	28	345
07/04/2023	14:26:00	2.1	2.8	28	306
07/04/2023	14:27:00	2.5	3.5	28	311
07/04/2023	14:28:00	2.9	3.9	28	324
07/04/2023	14:29:00	2.4	3.4	28	333
07/04/2023	14:30:00	2	2.9	28	339
07/04/2023	14:31:00	2	3.3	28	334
07/04/2023	14:32:00	2.8	3.7	28	324
07/04/2023	14:33:00	2.6	4.7	28	342
07/04/2023	14:34:00	4.2	5.2	28	354
07/04/2023	14:35:00	3.4	4.5	28	340
07/04/2023	14:36:00	2.5	3.1	28	341
07/04/2023	14:37:00	2.7	3.2	28	358
07/04/2023	14:38:00	2.6	3.5	28	351
07/04/2023	14:39:00	1.5	2.2	28	343
07/04/2023	14:40:00	1	1.6	28	340
07/04/2023	14:41:00	1.9	2.3	28	7
07/04/2023	14:42:00	3.3	4.1	28	339
07/04/2023	14:43:00	4	5.3	28	12
07/04/2023	14:44:00	4	5.5	28	12
07/04/2023	14:45:00	3.4	4.3	28	19
07/04/2023	14:46:00	3.4	4.4	28	11
07/04/2023	14:47:00	3.2	4.6	28	6
07/04/2023	14:48:00	3.6	4.7	28	5
07/04/2023	14:49:00	4.4	6.3	27	1
07/04/2023	14:50:00	3.2	4.1	27	348
07/04/2023	14:51:00	3.5	4.5	27	337
07/04/2023	14:52:00	2.8	3.6	27	353
07/04/2023	14:53:00	3.5	4.8	27	350
07/04/2023	14:54:00	3.8	4.6	27	336
07/04/2023	14:55:00	3.7	5	27	332
07/04/2023	14:56:00	3	3.8	27	329
07/04/2023	14:57:00	3.3	4.2	27	342
07/04/2023	14:58:00	3.4	4.4	27	351
07/04/2023	14:59:00	3.2	4.1	27	336
07/04/2023	15:00:00	2.8	3.4	27	341
07/04/2023	15:01:00	3.6	4.7	27	345
07/04/2023	15:02:00	3.6	4.4	27	329
07/04/2023	15:03:00	2.8	3.9	27	334
07/04/2023	15:04:00	2.9	4.1	27	336

Date	Time	Wind speed average	Wind Speed maximum	Temperature	Wind Direction
07/04/2023	15:05:00	3.8	4.8	27	354
07/04/2023	15:06:00	4.1	5	27	4
07/04/2023	15:07:00	4	4.9	27	347
07/04/2023	15:08:00	3.8	4.6	27	346
07/04/2023	15:09:00	3.5	4.4	27	341
07/04/2023	15:10:00	3.5	4.5	27	345
07/04/2023	15:11:00	3.2	4.3	27	349
07/04/2023	15:12:00	3.4	4.1	27	359
07/04/2023	15:13:00	3.2	4.1	26	355
07/04/2023	15:14:00	3.3	4.4	26	351
07/04/2023	15:15:00	3.4	4.5	26	11
07/04/2023	15:16:00	3.3	4.5	26	6
07/04/2023	15:17:00	3.7	4.3	26	356
07/04/2023	15:18:00	2.8	3.5	26	352
07/04/2023	15:19:00	2.6	3.4	26	4
07/04/2023	15:20:00	3.3	4.7	26	352
07/04/2023	15:21:00	3.3	3.9	26	2
07/04/2023	15:22:00	2.9	3.6	26	19
07/04/2023	15:23:00	3.6	4.5	26	6
07/04/2023	15:24:00	3.1	4	26	2
07/04/2023	15:25:00	3.3	4	26	4
07/04/2023	15:26:00	3.2	5.1	26	10
07/04/2023	15:27:00	3.4	4.9	26	10
07/04/2023	15:28:00	3.2	4	26	30
07/04/2023	15:29:00	3.1	4	26	26
07/04/2023	15:30:00	2.7	3.5	26	19
07/04/2023	15:31:00	3.4	4	26	16
07/04/2023	15:32:00	3.4	4.4	26	12
07/04/2023	15:33:00	3.3	4.8	26	18
07/04/2023	15:34:00	3	3.9	26	26
07/04/2023	15:35:00	3.1	4.4	26	35
07/04/2023	15:36:00	3.2	4.3	26	29
07/04/2023	15:37:00	2.5	3.2	26	30
07/04/2023	15:38:00	2.6	3.4	26	33
07/04/2023	15:39:00	2.8	3.7	26	38
07/04/2023	15:40:00	2.9	3.6	26	29
07/04/2023	15:41:00	2.8	4.5	26	40
07/04/2023	15:42:00	3.4	4.4	26	35
07/04/2023	15:43:00	2.9	3.6	26	45
07/04/2023	15:44:00	3.3	4.1	26	45
07/04/2023	15:45:00	3.4	4.4	26	47
07/04/2023	15:46:00	3.6	4.4	26	42
07/04/2023	15:47:00	3.3	4.2	26	41
07/04/2023	15:48:00	3.2	3.9	26	45
07/04/2023	15:49:00	3.2	4	26	36
07/04/2023	15:50:00	2.9	3.5	26	47
07/04/2023	15:51:00	2.3	3.1	26	49
07/04/2023	15:52:00	2.7	3.4	26	47
07/04/2023	15:53:00	3.6	4.3	26	61
07/04/2023	15:54:00	3.2	4.1	26	57
07/04/2023	15:55:00	2.6	3.1	26	56
07/04/2023	15:56:00	3.1	4.3	26	53
07/04/2023	15:57:00	2.8	3.4	26	51
07/04/2023	15:58:00	2.5	3.6	26	55
07/04/2023	15:59:00	3.5	5	26	67
07/04/2023	16:00:00	3.4	4.1	26	67
07/04/2023	16:01:00	3	3.9	26	56
07/04/2023	16:02:00	2.7	3.6	26	67
07/04/2023	16:03:00	3.1	3.9	26	84
07/04/2023	16:04:00	2.5	3.2	26	86
07/04/2023	16:05:00	2.6	3.3	26	76
07/04/2023	16:06:00	2	2.7	26	80

Date	Time	Wind speed average	Wind Speed maximum	Temperature	Wind Direction
07/04/2023	16:07:00	2.2	3.1	26	74
07/04/2023	16:08:00	2.7	3.3	26	73
07/04/2023	16:09:00	2.1	2.8	26	88
07/04/2023	16:10:00	2.3	2.9	26	109
07/04/2023	16:11:00	2.3	3.3	26	81
07/04/2023	16:12:00	2.5	3.4	26	72
07/04/2023	16:13:00	2.6	3.2	26	68
07/04/2023	16:14:00	2.3	3.5	26	69
07/04/2023	16:15:00	2.2	2.9	26	71
07/04/2023	16:16:00	2.2	3.4	26	66
07/04/2023	16:17:00	1.9	3	26	68
07/04/2023	16:18:00	2.1	2.9	26	68
07/04/2023	16:19:00	1.8	2.3	26	81
07/04/2023	16:20:00	2.5	3.2	26	76
07/04/2023	16:21:00	2.5	3.1	26	74
07/04/2023	16:22:00	2.2	3.1	26	80
07/04/2023	16:23:00	2.3	3	26	79
07/04/2023	16:24:00	2.4	3.4	26	79
07/04/2023	16:25:00	2.8	3.9	26	89
07/04/2023	16:26:00	2.2	2.8	26	84
07/04/2023	16:27:00	2.1	2.8	26	93
07/04/2023	16:28:00	2	2.7	26	97
07/04/2023	16:29:00	1.9	2.3	26	101
07/04/2023	16:30:00	2.1	2.8	26	96
07/04/2023	16:31:00	2	2.7	26	100
07/04/2023	16:32:00	2.1	2.8	26	96
07/04/2023	16:33:00	2	2.5	26	93
07/04/2023	16:34:00	1.6	2.2	26	95
07/04/2023	16:35:00	2.1	2.5	26	96
07/04/2023	16:36:00	2.1	2.6	26	97
07/04/2023	16:37:00	2.3	3.3	26	79
07/04/2023	16:38:00	2.6	3.3	26	77
07/04/2023	16:39:00	2.9	3.9	26	77
07/04/2023	16:40:00	2.9	3.6	26	72
07/04/2023	16:41:00	2.8	3.7	26	77
07/04/2023	16:42:00	3.1	3.6	26	84
07/04/2023	16:43:00	2.6	3.2	26	90
07/04/2023	16:44:00	2.7	3.8	26	89
07/04/2023	16:45:00	2.6	3.8	26	82
07/04/2023	16:46:00	2.5	3.6	26	90
07/04/2023	16:47:00	2.5	3.6	26	90
07/04/2023	16:48:00	2.1	2.6	26	98
07/04/2023	16:49:00	2.2	3.1	26	104
07/04/2023	16:50:00	2.5	3.4	26	112
07/04/2023	16:51:00	2.7	3.4	26	103
07/04/2023	16:52:00	2.7	3.5	26	97
07/04/2023	16:53:00	3.1	4.5	26	91
07/04/2023	16:54:00	3.7	4.6	26	94
07/04/2023	16:55:00	3.2	4.2	26	96
07/04/2023	16:56:00	2.9	3.7	26	98
07/04/2023	16:57:00	3.6	4.7	26	102
07/04/2023	16:58:00	2.6	3.7	26	90
07/04/2023	16:59:00	4	5.2	26	81
07/04/2023	17:00:00	4.7	6.5	26	84
07/04/2023	17:01:00	4.2	5.5	26	88
07/04/2023	17:02:00	4.2	5.4	26	95
07/04/2023	17:03:00	4	5	26	96
07/04/2023	17:04:00	4.5	5.5	26	93
07/04/2023	17:05:00	3.2	4.4	26	86
07/04/2023	17:06:00	3.4	4.5	26	93
07/04/2023	17:07:00	3.4	5.2	26	91
07/04/2023	17:08:00	3.5	4.8	26	93

Date	Time	Wind speed average	Wind Speed maximum	Temperature	Wind Direction
07/04/2023	17:09:00	4	5.6	26	90
07/04/2023	17:10:00	3.5	4.7	26	92
07/04/2023	17:11:00	3.9	5.8	26	97
07/04/2023	17:12:00	4.1	5.4	26	97
07/04/2023	17:13:00	3.3	4.8	26	91
07/04/2023	17:14:00	2.4	3.8	25	92
07/04/2023	17:15:00	2.3	3	25	93
07/04/2023	17:16:00	3	4.8	25	92
07/04/2023	17:17:00	3.2	4.3	25	95
07/04/2023	17:18:00	2.4	3.5	25	108
07/04/2023	17:19:00	2.7	3.7	25	113
07/04/2023	17:20:00	3.1	4	25	115
07/04/2023	17:21:00	3.3	5.2	25	110
07/04/2023	17:22:00	3.6	5	25	105
07/04/2023	17:23:00	3.3	4.3	25	96
07/04/2023	17:24:00	4	5.4	25	104
07/04/2023	17:25:00	3.5	4.7	25	99
07/04/2023	17:26:00	4.2	5.8	25	98
07/04/2023	17:27:00	4	5.4	25	97
07/04/2023	17:28:00	3.9	5	25	109
07/04/2023	17:29:00	3.4	5.4	25	101
07/04/2023	17:30:00	2.3	3.3	25	95
07/04/2023	17:31:00	3.6	5.1	25	88
07/04/2023	17:32:00	3.5	6.2	25	86
07/04/2023	17:33:00	4.2	5.6	25	82
07/04/2023	17:34:00	4.1	5.2	25	73
07/04/2023	17:35:00	4.6	6	25	65
07/04/2023	17:36:00	4.2	5.5	25	68
07/04/2023	17:37:00	4.3	6.2	25	65
07/04/2023	17:38:00	4.6	5.3	25	62
07/04/2023	17:39:00	4.1	6.2	25	67
07/04/2023	17:40:00	4.6	5.6	25	65
07/04/2023	17:41:00	4.4	5.9	25	67
07/04/2023	17:42:00	3.1	4.5	25	65
07/04/2023	17:43:00	4.1	5.4	25	68
07/04/2023	17:44:00	4.6	5.8	25	70
07/04/2023	17:45:00	4	5.5	25	82
07/04/2023	17:46:00	4.3	5.6	25	92
07/04/2023	17:47:00	3.6	5.3	25	73
07/04/2023	17:48:00	5.2	6.9	25	71
07/04/2023	17:49:00	4.6	6	26	80
07/04/2023	17:50:00	4.8	6	26	78
07/04/2023	17:51:00	4.1	5.1	26	83
07/04/2023	17:52:00	4	5.3	26	84
07/04/2023	17:53:00	3.7	5	26	85
07/04/2023	17:54:00	3	4.1	26	88
07/04/2023	17:55:00	4.2	5.4	26	96
07/04/2023	17:56:00	4.1	5.5	26	89
07/04/2023	17:57:00	5.1	7	26	83
07/04/2023	17:58:00	4.5	6.1	26	82
07/04/2023	17:59:00	4.3	6.2	25	87
07/04/2023	18:00:00	3.2	4	25	92
07/04/2023	18:01:00	4.1	6.5	25	94
07/04/2023	18:02:00	4.4	6.1	25	91
07/04/2023	18:03:00	3.9	5.4	25	82
07/04/2023	18:04:00	4.4	5.9	25	84
07/04/2023	18:05:00	4	5.3	25	92
07/04/2023	18:06:00	4.7	6.6	25	89
07/04/2023	18:07:00	4.3	6.4	25	84
07/04/2023	18:08:00	4.6	6.1	25	85
07/04/2023	18:09:00	4.2	5.8	24	82
07/04/2023	18:10:00	4.2	5.7	24	77

Date	Time	Wind speed average	Wind Speed maximum	Temperature	Wind Direction
07/04/2023	18:11:00	5	6.5	24	72
07/04/2023	18:12:00	4.6	6.4	24	73
07/04/2023	18:13:00	4.8	6.3	24	71
07/04/2023	18:14:00	4.3	5.8	24	74
07/04/2023	18:15:00	4.9	6.6	24	75
07/04/2023	18:16:00	5.3	6.7	24	71
07/04/2023	18:17:00	5.3	6.9	24	76
07/04/2023	18:18:00	5.2	7	24	68
07/04/2023	18:19:00	4.7	6.8	24	73
07/04/2023	18:20:00	5.2	6.4	24	73
07/04/2023	18:21:00	5.2	6.7	24	69
07/04/2023	18:22:00	4.7	6.1	24	64
07/04/2023	18:23:00	3.6	5.6	24	67
07/04/2023	18:24:00	5.2	7.3	24	66
07/04/2023	18:25:00	4.4	5.7	24	63
07/04/2023	18:26:00	4.7	5.6	24	67
07/04/2023	18:27:00	4.3	5.2	24	61
07/04/2023	18:28:00	4.4	5.8	24	60
07/04/2023	18:29:00	5.6	7	24	60
07/04/2023	18:30:00	4.3	6.3	24	57
07/04/2023	18:31:00	5.4	6.7	24	60
07/04/2023	18:32:00	5	6.9	24	60
07/04/2023	18:33:00	4.7	5.8	24	64
07/04/2023	18:34:00	4.3	5.5	24	62
07/04/2023	18:35:00	3.7	5.3	24	62
07/04/2023	18:36:00	3.6	4.9	24	62
07/04/2023	18:37:00	6	8.1	23	66
07/04/2023	18:38:00	4.8	6	23	64
07/04/2023	18:39:00	5	6.4	23	63
07/04/2023	18:40:00	4.6	5.5	23	62
07/04/2023	18:41:00	4	5.5	23	60
07/04/2023	18:42:00	4.5	6.5	23	63
07/04/2023	18:43:00	4.5	5.7	23	60
07/04/2023	18:44:00	4.2	6.5	23	57
07/04/2023	18:45:00	4.2	6	23	59
07/04/2023	18:46:00	4.2	5.9	23	63
07/04/2023	18:47:00	4.6	6	23	65
07/04/2023	18:48:00	4.3	5.3	23	67
07/04/2023	18:49:00	5.3	6.5	23	69
07/04/2023	18:50:00	4.7	6.4	23	66
07/04/2023	18:51:00	4.9	5.9	23	64
07/04/2023	18:52:00	4.6	6	23	64
07/04/2023	18:53:00	4.3	5	23	59
07/04/2023	18:54:00	3.4	4.5	23	65
07/04/2023	18:55:00	4.6	5.9	22	60
07/04/2023	18:56:00	4	5	22	61
07/04/2023	18:57:00	4.1	5.5	22	58
07/04/2023	18:58:00	4.1	5.3	22	59
07/04/2023	18:59:00	4.2	5.8	22	57
07/04/2023	19:00:00	4.7	6.1	22	63
07/04/2023	19:01:00	4.3	5.3	22	63
07/04/2023	19:02:00	4.3	5.4	22	57
07/04/2023	19:03:00	3.6	5	22	54
07/04/2023	19:04:00	4.3	6.1	22	49
07/04/2023	19:05:00	4.3	5.3	22	49
07/04/2023	19:06:00	3.7	4.9	22	50
07/04/2023	19:07:00	4.8	5.5	22	48
07/04/2023	19:08:00	4	5	22	41
07/04/2023	19:09:00	3.9	4.8	22	40
07/04/2023	19:10:00	4.4	6.1	22	43
07/04/2023	19:11:00	3.4	4.5	22	46
07/04/2023	19:12:00	4	5.1	22	55

Date	Time	Wind speed average	Wind Speed maximum	Temperature	Wind Direction
07/04/2023	19:13:00	3.9	5.5	22	51
07/04/2023	19:14:00	4.5	5.9	22	52
07/04/2023	19:15:00	4.4	6	22	50
07/04/2023	19:16:00	4.5	5.5	22	48
07/04/2023	19:17:00	3.8	5.1	22	48
07/04/2023	19:18:00	4.4	5.4	21	50
07/04/2023	19:19:00	4.5	6.2	21	51
07/04/2023	19:20:00	4.2	5.7	21	50
07/04/2023	19:21:00	3.9	5.1	21	49
07/04/2023	19:22:00	4.5	6	21	47
07/04/2023	19:23:00	4.1	5.6	21	50
07/04/2023	19:24:00	4.3	5.6	21	45
07/04/2023	19:25:00	4.2	5.6	21	49
07/04/2023	19:26:00	3.4	4.4	21	47
07/04/2023	19:27:00	3.6	4.7	21	50
07/04/2023	19:28:00	4.3	5.5	21	53
07/04/2023	19:29:00	3.7	6.3	21	54
07/04/2023	19:30:00	4.8	5.9	21	57
07/04/2023	19:31:00	4.5	5.7	21	63
07/04/2023	19:32:00	4.7	5.8	21	60
07/04/2023	19:33:00	4.7	5.6	21	55
07/04/2023	19:34:00	4.4	5.7	21	58
07/04/2023	19:35:00	4.1	5.2	21	56
07/04/2023	19:36:00	4.1	5.9	21	56
07/04/2023	19:37:00	3.6	5.3	21	62
07/04/2023	19:38:00	4	5.4	21	66
07/04/2023	19:39:00	3.6	4.8	21	66
07/04/2023	19:40:00	4.4	6.2	21	67
07/04/2023	19:41:00	4.1	5.4	21	73
07/04/2023	19:42:00	3.6	5.2	21	66
07/04/2023	19:43:00	3.8	5	21	61
07/04/2023	19:44:00	4.2	5.7	21	61
07/04/2023	19:45:00	4.8	6.4	21	61
07/04/2023	19:46:00	4	4.9	21	62
07/04/2023	19:47:00	3.4	4.5	21	67
07/04/2023	19:48:00	4.6	6.2	21	71
07/04/2023	19:49:00	3.5	4.2	21	71
07/04/2023	19:50:00	3.7	5.5	21	75
07/04/2023	19:51:00	4.5	6.1	21	73
07/04/2023	19:52:00	3.9	5.3	21	72
07/04/2023	19:53:00	3.4	5.2	21	63
07/04/2023	19:54:00	3.8	4.5	21	62
07/04/2023	19:55:00	4	4.9	21	57
07/04/2023	19:56:00	3.9	5.7	21	56
07/04/2023	19:57:00	3.2	4	21	64
07/04/2023	19:58:00	3.1	3.9	21	67
07/04/2023	19:59:00	3.6	4.5	21	63
07/04/2023	20:00:00	3.2	3.9	21	62
07/04/2023	20:01:00	4	5.2	21	63
07/04/2023	20:02:00	4.1	5.4	21	68
07/04/2023	20:03:00	3.9	5	21	73
07/04/2023	20:04:00	3.8	5.6	21	69
07/04/2023	20:05:00	3.2	3.9	21	70
07/04/2023	20:06:00	3.6	4.6	21	74
07/04/2023	20:07:00	4	5	21	67
07/04/2023	20:08:00	4.2	5.7	21	66
07/04/2023	20:09:00	3.8	4.8	21	60
07/04/2023	20:10:00	3.8	5	21	59
07/04/2023	20:11:00	3.5	4.6	21	59
07/04/2023	20:12:00	3.6	4.7	21	61
07/04/2023	20:13:00	4.2	5.2	21	59
07/04/2023	20:14:00	3.4	5	21	58

Date	Time	Wind speed average	Wind Speed maximum	Temperature	Wind Direction
07/04/2023	20:15:00	3.8	5.3	21	63
07/04/2023	20:16:00	4.3	6	21	64
07/04/2023	20:17:00	3.4	4.3	21	62
07/04/2023	20:18:00	3.9	5.3	21	65
07/04/2023	20:19:00	4	4.9	21	63
07/04/2023	20:20:00	3.7	4.5	21	64
07/04/2023	20:21:00	3.8	5	21	65
07/04/2023	20:22:00	3.2	4.1	21	63
07/04/2023	20:23:00	3.5	5.1	21	58
07/04/2023	20:24:00	3.3	4	21	55
07/04/2023	20:25:00	3.3	4.4	21	57
07/04/2023	20:26:00	2.9	3.4	21	58
07/04/2023	20:27:00	3.7	4.7	21	56
07/04/2023	20:28:00	3.5	4.6	21	57
07/04/2023	20:29:00	3.2	4	21	59
07/04/2023	20:30:00	3.2	4.4	21	57
07/04/2023	20:31:00	3.1	3.9	21	60
07/04/2023	20:32:00	3.3	4.4	21	64
07/04/2023	20:33:00	3.2	4.1	21	58
07/04/2023	20:34:00	2.6	3.8	21	60
07/04/2023	20:35:00	3.6	4.4	21	65
07/04/2023	20:36:00	2.7	3.5	21	64
07/04/2023	20:37:00	3	3.9	21	64
07/04/2023	20:38:00	3.2	4.2	21	70
07/04/2023	20:39:00	2.6	3.9	21	71
07/04/2023	20:40:00	2.8	3.8	21	68
07/04/2023	20:41:00	3.9	4.9	21	70
07/04/2023	20:42:00	3.9	4.6	21	73
07/04/2023	20:43:00	3.6	4.7	21	69
07/04/2023	20:44:00	3.2	4.2	21	79
07/04/2023	20:45:00	3.7	5	21	76
07/04/2023	20:46:00	3.4	5.1	21	82
07/04/2023	20:47:00	3.2	4.8	21	82
07/04/2023	20:48:00	3.2	4.3	21	81
07/04/2023	20:49:00	3.4	4.2	21	72
07/04/2023	20:50:00	3.1	4.6	21	74
07/04/2023	20:51:00	3.3	4.5	21	76
07/04/2023	20:52:00	3.9	5.7	21	71
07/04/2023	20:53:00	3.1	3.9	21	69
07/04/2023	20:54:00	3.9	5.4	21	65
07/04/2023	20:55:00	3.3	4.8	21	67
07/04/2023	20:56:00	3.5	4.6	21	72
07/04/2023	20:57:00	3.2	4.9	21	68
07/04/2023	20:58:00	3	4	21	72
07/04/2023	20:59:00	3.3	4.3	21	74
07/04/2023	21:00:00	3.5	4.5	21	72
07/04/2023	21:01:00	3.7	5.2	21	74
07/04/2023	21:02:00	3.2	4.5	21	74
07/04/2023	21:03:00	3.4	4.9	21	78
07/04/2023	21:04:00	3.7	4.9	21	79
07/04/2023	21:05:00	4.1	5.1	21	75
07/04/2023	21:06:00	3.2	5	21	76
07/04/2023	21:07:00	4.1	5.2	21	76
07/04/2023	21:08:00	3.2	4.2	21	81
07/04/2023	21:09:00	3.7	5	21	76
07/04/2023	21:10:00	3.4	4.5	21	80
07/04/2023	21:11:00	3.4	5.4	21	84
07/04/2023	21:12:00	3.7	5	21	88
07/04/2023	21:13:00	3.7	5.8	21	86
07/04/2023	21:14:00	3.4	4.2	21	90
07/04/2023	21:15:00	3.4	4.8	21	91
07/04/2023	21:16:00	2.8	3.6	21	91

Date	Time	Wind speed average	Wind Speed maximum	Temperature	Wind Direction
07/04/2023	21:17:00	3.3	4.2	21	87
07/04/2023	21:18:00	3	4	21	83
07/04/2023	21:19:00	2.8	4	21	89
07/04/2023	21:20:00	3.1	4.4	21	88
07/04/2023	21:21:00	3.3	4.5	21	93
07/04/2023	21:22:00	2.8	3.6	21	95
07/04/2023	21:23:00	3.4	4.4	21	97
07/04/2023	21:24:00	3	3.8	21	98
07/04/2023	21:25:00	2.6	3.1	21	97
07/04/2023	21:26:00	2.9	4.7	21	90
07/04/2023	21:27:00	3.1	4.3	21	87
07/04/2023	21:28:00	2.3	3.9	21	88
07/04/2023	21:29:00	2.9	4.1	21	92
07/04/2023	21:30:00	2.9	4.2	21	90
07/04/2023	21:31:00	3.1	4.1	21	87
07/04/2023	21:32:00	2.4	3.6	21	82
07/04/2023	21:33:00	2.7	3.5	21	81
07/04/2023	21:34:00	3	3.7	21	82
07/04/2023	21:35:00	3	4	21	85
07/04/2023	21:36:00	3	3.9	21	84
07/04/2023	21:37:00	2.8	3.5	21	81
07/04/2023	21:38:00	2.9	3.7	21	76
07/04/2023	21:39:00	2.5	3.3	21	73
07/04/2023	21:40:00	2.6	3.5	21	72
07/04/2023	21:41:00	2.8	3.8	21	75
07/04/2023	21:42:00	2.6	3.1	21	83
07/04/2023	21:43:00	2.8	3.5	21	79
07/04/2023	21:44:00	2.6	3.4	21	80
07/04/2023	21:45:00	2.3	2.9	21	78
07/04/2023	21:46:00	1.9	2.4	21	83
07/04/2023	21:47:00	1.8	2.7	21	89
07/04/2023	21:48:00	2.1	3.1	21	98
07/04/2023	21:49:00	1.4	1.8	21	100
07/04/2023	21:50:00	1.9	2.3	21	111
07/04/2023	21:51:00	1.5	2.5	21	108
07/04/2023	21:52:00	1.5	2.1	20	111
07/04/2023	21:53:00	1.4	2.4	20	115
07/04/2023	21:54:00	1.9	2.8	20	101
07/04/2023	21:55:00	1.9	3.1	20	105
07/04/2023	21:56:00	2.3	3.7	20	111
07/04/2023	21:57:00	2.2	3	20	100
07/04/2023	21:58:00	2.4	3.4	20	96
07/04/2023	21:59:00	2.9	4.3	20	96
07/04/2023	22:00:00	2.8	3.7	20	96
07/04/2023	22:01:00	2.6	3.4	21	97
07/04/2023	22:02:00	2.8	4.1	21	99
07/04/2023	22:03:00	2.5	3.2	21	88
07/04/2023	22:04:00	2.6	3.2	21	85
07/04/2023	22:05:00	2.2	2.7	21	84
07/04/2023	22:06:00	2.5	3	21	76
07/04/2023	22:07:00	2.4	3.2	21	73
07/04/2023	22:08:00	2.5	3.1	21	70
07/04/2023	22:09:00	2.7	3.3	21	70
07/04/2023	22:10:00	2.8	3.5	21	63
07/04/2023	22:11:00	2.9	3.6	21	58
07/04/2023	22:12:00	3.1	4.2	21	59
07/04/2023	22:13:00	2.8	3.6	21	57
07/04/2023	22:14:00	3.3	4.5	21	58
07/04/2023	22:15:00	3.6	4.8	21	64
07/04/2023	22:16:00	3.6	5.1	21	66
07/04/2023	22:17:00	3.4	4.9	21	68
07/04/2023	22:18:00	2.9	3.9	21	75

Date	Time	Wind speed average	Wind Speed maximum	Temperature	Wind Direction
07/04/2023	22:19:00	2.6	4.1	20	74
07/04/2023	22:20:00	3.9	5.7	20	60
07/04/2023	22:21:00	3.8	4.8	20	53
07/04/2023	22:22:00	3.6	4.8	20	57
07/04/2023	22:23:00	3.6	5	20	63
07/04/2023	22:24:00	3	4	20	74
07/04/2023	22:25:00	2.9	3.6	20	77
07/04/2023	22:26:00	2.6	3.2	20	83
07/04/2023	22:27:00	2.4	2.8	20	90
07/04/2023	22:28:00	2.6	3.2	20	99
07/04/2023	22:29:00	3.3	4.5	20	96
07/04/2023	22:30:00	2.9	4.1	20	96
07/04/2023	22:31:00	3.1	4	20	98
07/04/2023	22:32:00	3.6	5	20	102
07/04/2023	22:33:00	2.9	3.8	20	108
07/04/2023	22:34:00	2.9	3.7	20	111
07/04/2023	22:35:00	3	3.9	20	111
07/04/2023	22:36:00	2.9	4.2	20	110
07/04/2023	22:37:00	3	3.8	19	118
07/04/2023	22:38:00	2.8	4.2	19	117
07/04/2023	22:39:00	2.9	3.8	19	117
07/04/2023	22:40:00	2.7	3.4	19	118
07/04/2023	22:41:00	2.8	4.3	19	123
07/04/2023	22:42:00	3.1	4.8	19	125
07/04/2023	22:43:00	3.2	4.5	19	124
07/04/2023	22:44:00	3.6	4.4	19	123
07/04/2023	22:45:00	3.5	4.7	19	122
07/04/2023	22:46:00	3.3	5	19	121
07/04/2023	22:47:00	3.5	4.9	19	118
07/04/2023	22:48:00	3.5	5.3	19	116
07/04/2023	22:49:00	3.2	5	19	116
07/04/2023	22:50:00	2.5	3.5	19	121
07/04/2023	22:51:00	2.4	3.4	19	127
07/04/2023	22:52:00	2.6	4	19	129
07/04/2023	22:53:00	2.8	4.3	20	131
07/04/2023	22:54:00	3.5	5.1	20	131
07/04/2023	22:55:00	3.1	4.4	20	130
07/04/2023	22:56:00	2.9	4.4	20	137
07/04/2023	22:57:00	3.2	4.6	20	144
07/04/2023	22:58:00	2.8	3.6	20	146
07/04/2023	22:59:00	1.9	2.6	20	143
07/04/2023	23:00:00	1.9	2.6	20	141
07/04/2023	23:01:00	2.3	3.2	20	135
07/04/2023	23:02:00	2.2	3.7	20	126
07/04/2023	23:03:00	2.2	3.5	20	133
07/04/2023	23:04:00	3	4.3	20	146
07/04/2023	23:05:00	2.5	3.6	21	131
07/04/2023	23:06:00	2.2	2.9	21	125
07/04/2023	23:07:00	2.6	4.3	21	115
07/04/2023	23:08:00	3.5	4.4	21	124
07/04/2023	23:09:00	3	3.9	21	121
07/04/2023	23:10:00	2.3	3.2	21	125
07/04/2023	23:11:00	2.3	2.8	21	114
07/04/2023	23:12:00	2.4	3.5	21	109
07/04/2023	23:13:00	1.7	2.4	21	111
07/04/2023	23:14:00	2.1	2.9	21	98
07/04/2023	23:15:00	2.6	3.1	21	73
07/04/2023	23:16:00	2.3	3	21	60
07/04/2023	23:17:00	1.8	2.5	21	50
07/04/2023	23:18:00	1.6	2.1	21	43
07/04/2023	23:19:00	2.6	4.3	21	129
07/04/2023	23:20:00	2.7	3.8	21	123

Date	Time	Wind speed average	Wind Speed maximum	Temperature	Wind Direction
07/04/2023	23:21:00	2.6	4.2	21	145
07/04/2023	23:22:00	1.8	2.5	21	147
07/04/2023	23:23:00	1	1.6	21	147
07/04/2023	23:24:00	0.4	0.7	21	146
07/04/2023	23:25:00	1.4	3.3	21	166
07/04/2023	23:26:00	1	1.8	21	238
07/04/2023	23:27:00	2	3.9	21	183
07/04/2023	23:28:00	3	4.1	21	208
07/04/2023	23:29:00	3.6	4.5	21	205
07/04/2023	23:30:00	3.9	5.2	21	205
07/04/2023	23:31:00	4	5.5	21	188
07/04/2023	23:32:00	5	7.1	21	185
07/04/2023	23:33:00	5.1	6	21	186
07/04/2023	23:34:00	6.1	8.6	21	185
07/04/2023	23:35:00	4.9	6.3	21	185
07/04/2023	23:36:00	4.4	5.9	22	185
07/04/2023	23:37:00	4.9	6.1	22	185
07/04/2023	23:38:00	4.4	6.4	22	183
07/04/2023	23:39:00	4.3	6.2	22	182
07/04/2023	23:40:00	3.7	4.9	22	182
07/04/2023	23:41:00	4.1	5.3	22	182
07/04/2023	23:42:00	3.8	5.7	22	183
07/04/2023	23:43:00	3.6	5.2	22	184
07/04/2023	23:44:00	4	5.5	22	184
07/04/2023	23:45:00	3.8	4.7	22	183
07/04/2023	23:46:00	4.2	5.8	22	183
07/04/2023	23:47:00	3.1	4.3	22	184
07/04/2023	23:48:00	3.7	5.1	22	184
07/04/2023	23:49:00	3.8	4.9	22	183
07/04/2023	23:50:00	3.9	5.5	22	182
07/04/2023	23:51:00	4.3	6	22	183
07/04/2023	23:52:00	3.2	4.8	22	184
07/04/2023	23:53:00	3	4.1	22	184
07/04/2023	23:54:00	3	5.3	22	184
07/04/2023	23:55:00	3.6	5.2	22	184
07/04/2023	23:56:00	3.8	5.5	22	184
07/04/2023	23:57:00	4	5.1	22	182
07/04/2023	23:58:00	3.9	5.1	22	183
07/04/2023	23:59:00	3.4	4.6	22	183
08/04/2023	00:00:00	3.4	4.5	22	183
08/04/2023	00:01:00	3.8	5.3	22	183
08/04/2023	00:02:00	3.7	4.9	22	182
08/04/2023	00:03:00	4.6	6.8	22	181
08/04/2023	00:04:00	5.4	7.7	22	181
08/04/2023	00:05:00	5	7.1	22	182
08/04/2023	00:06:00	4.1	5.6	22	183
08/04/2023	00:07:00	4.1	5.4	22	182
08/04/2023	00:08:00	3.9	5	22	183
08/04/2023	00:09:00	4.2	5	22	183
08/04/2023	00:10:00	4.4	5.7	22	182
08/04/2023	00:11:00	3.3	4.6	22	183
08/04/2023	00:12:00	3.6	4.5	22	183
08/04/2023	00:13:00	3.2	4.6	22	183
08/04/2023	00:14:00	4	5.3	22	183
08/04/2023	00:15:00	3.4	4.5	22	184
08/04/2023	00:16:00	3.4	4.6	22	183
08/04/2023	00:17:00	3.3	4.7	22	183
08/04/2023	00:18:00	3.3	4.8	22	183
08/04/2023	00:19:00	3.6	4.6	22	183
08/04/2023	00:20:00	3.3	4.3	22	183
08/04/2023	00:21:00	3.6	4.8	22	183
08/04/2023	00:22:00	3.2	3.9	22	183

Date	Time	Wind speed average	Wind Speed maximum	Temperature	Wind Direction
08/04/2023	00:23:00	3.1	4.3	22	183
08/04/2023	00:24:00	3.1	4.5	22	183
08/04/2023	00:25:00	2.5	3.1	22	183
08/04/2023	00:26:00	3.1	4	22	183
08/04/2023	00:27:00	2.9	3.7	22	183
08/04/2023	00:28:00	3.3	4.4	22	184
08/04/2023	00:29:00	3.1	4.5	22	184
08/04/2023	00:30:00	4.1	4.8	22	184
08/04/2023	00:31:00	3.9	5.4	22	184
08/04/2023	00:32:00	3.8	5.3	22	184
08/04/2023	00:33:00	4.3	5.3	22	184
08/04/2023	00:34:00	4.1	5.5	22	187
08/04/2023	00:35:00	4	5	22	187
08/04/2023	00:36:00	4	5.6	22	187
08/04/2023	00:37:00	3.7	4.8	22	187
08/04/2023	00:38:00	3.7	5.1	22	187
08/04/2023	00:39:00	3	4	22	187
08/04/2023	00:40:00	3.3	4.5	22	187
08/04/2023	00:41:00	3.2	4.1	22	187
08/04/2023	00:42:00	3.1	4.1	22	187
08/04/2023	00:43:00	4.6	5.8	22	187
08/04/2023	00:44:00	4.3	5.5	22	187
08/04/2023	00:45:00	4.2	5.5	22	186
08/04/2023	00:46:00	4.2	5.2	22	186
08/04/2023	00:47:00	4.7	6.3	22	187
08/04/2023	00:48:00	4.5	6.7	22	187
08/04/2023	00:49:00	4.7	6.4	22	187
08/04/2023	00:50:00	4.8	5.8	22	186
08/04/2023	00:51:00	4.5	5.9	22	187
08/04/2023	00:52:00	4.7	6.8	22	187
08/04/2023	00:53:00	5	6.6	22	186
08/04/2023	00:54:00	5.4	7.5	22	186
08/04/2023	00:55:00	5.2	7.2	22	186
08/04/2023	00:56:00	4.8	6	22	187
08/04/2023	00:57:00	4.9	6.2	22	187
08/04/2023	00:58:00	5.4	7.6	22	186
08/04/2023	00:59:00	5.7	8.4	22	187
08/04/2023	01:00:00	5.6	7.4	22	187
08/04/2023	01:01:00	5.4	6.8	22	187
08/04/2023	01:02:00	5.2	7.2	22	187
08/04/2023	01:03:00	4.2	6	22	187
08/04/2023	01:04:00	5.3	6.8	22	187
08/04/2023	01:05:00	4.9	7.6	22	187
08/04/2023	01:06:00	4.4	6	22	187
08/04/2023	01:07:00	5.1	6.8	23	187
08/04/2023	01:08:00	4.5	6.6	23	187
08/04/2023	01:09:00	4.3	5.4	23	187
08/04/2023	01:10:00	3.5	4.4	23	187
08/04/2023	01:11:00	3.3	5.3	23	187
08/04/2023	01:12:00	3.4	4.5	23	187
08/04/2023	01:13:00	3.1	4.8	23	187
08/04/2023	01:14:00	4.1	5.9	23	187
08/04/2023	01:15:00	3.8	5.4	23	187
08/04/2023	01:16:00	3.6	4.8	23	187
08/04/2023	01:17:00	3.9	5.4	23	187
08/04/2023	01:18:00	5	6.9	23	187
08/04/2023	01:19:00	4.7	6.1	23	187
08/04/2023	01:20:00	3.8	5.3	23	187
08/04/2023	01:21:00	5	6.9	23	187
08/04/2023	01:22:00	4.1	5.5	23	187
08/04/2023	01:23:00	4.3	5.7	23	187
08/04/2023	01:24:00	4.3	5.3	23	187

Date	Time	Wind speed average	Wind Speed maximum	Temperature	Wind Direction
08/04/2023	01:25:00	4	5.1	23	187
08/04/2023	01:26:00	5	6.8	23	187
08/04/2023	01:27:00	4.9	6.7	23	187
08/04/2023	01:28:00	5.1	6.3	23	187
08/04/2023	01:29:00	4.4	5.6	23	187
08/04/2023	01:30:00	3.6	4.9	23	186
08/04/2023	01:31:00	3.9	5.6	23	186
08/04/2023	01:32:00	4.1	5.5	23	187
08/04/2023	01:33:00	3.4	4.5	23	186
08/04/2023	01:34:00	4.1	5	23	187
08/04/2023	01:35:00	3.9	5.7	23	187
08/04/2023	01:36:00	3.2	4.1	23	186
08/04/2023	01:37:00	3.7	4.8	23	186
08/04/2023	01:38:00	3.4	4.8	23	186
08/04/2023	01:39:00	3.5	4.6	23	186
08/04/2023	01:40:00	3.9	5.5	23	186
08/04/2023	01:41:00	4.8	6.2	23	187
08/04/2023	01:42:00	4.5	6.2	23	187
08/04/2023	01:43:00	5.9	8.4	23	195
08/04/2023	01:44:00	5.5	7.3	23	194
08/04/2023	01:45:00	4.9	6.6	23	195
08/04/2023	01:46:00	5.9	8	23	194
08/04/2023	01:47:00	4.6	5.8	23	194
08/04/2023	01:48:00	4.9	6.7	23	193
08/04/2023	01:49:00	5.3	7.6	23	193
08/04/2023	01:50:00	5.7	7.4	23	195
08/04/2023	01:51:00	6	7.7	23	197
08/04/2023	01:52:00	5.4	7	23	196
08/04/2023	01:53:00	5.2	6.7	23	196
08/04/2023	01:54:00	5.3	6.7	24	195
08/04/2023	01:55:00	4.3	5.8	24	195
08/04/2023	01:56:00	4.2	5.2	24	194
08/04/2023	01:57:00	4.7	6.4	24	194
08/04/2023	01:58:00	5.5	7.1	24	196
08/04/2023	01:59:00	4.8	6.6	24	196
08/04/2023	02:00:00	6.3	7.8	24	196
08/04/2023	02:01:00	6	7.1	24	196
08/04/2023	02:02:00	4.5	5.8	24	195
08/04/2023	02:03:00	4.9	7.7	24	196
08/04/2023	02:04:00	5	6.9	24	195
08/04/2023	02:05:00	4.4	6.4	24	195
08/04/2023	02:06:00	5.1	6.8	24	194
08/04/2023	02:07:00	4.4	6.3	24	193
08/04/2023	02:08:00	5.2	6.7	24	194
08/04/2023	02:09:00	4.7	6.4	24	193
08/04/2023	02:10:00	4.5	5.3	24	193
08/04/2023	02:11:00	5.1	7.1	24	193
08/04/2023	02:12:00	5.3	6.6	24	192
08/04/2023	02:13:00	4.7	5.8	24	192
08/04/2023	02:14:00	4.8	6	24	193
08/04/2023	02:15:00	4.9	6.5	23	192
08/04/2023	02:16:00	5.3	7.4	23	192
08/04/2023	02:17:00	4.2	5.6	23	192
08/04/2023	02:18:00	4.9	7	23	192
08/04/2023	02:19:00	4.8	5.9	23	192
08/04/2023	02:20:00	5.1	6.4	23	192
08/04/2023	02:21:00	4.5	6	23	192
08/04/2023	02:22:00	4.7	6.1	23	192
08/04/2023	02:23:00	4.6	6.2	23	191
08/04/2023	02:24:00	5	6.9	23	191
08/04/2023	02:25:00	4.7	6.6	23	191
08/04/2023	02:26:00	4.4	5.7	23	191

Date	Time	Wind speed average	Wind Speed maximum	Temperature	Wind Direction
08/04/2023	02:27:00	4.7	6	23	190
08/04/2023	02:28:00	5.4	7.1	23	191
08/04/2023	02:29:00	5.1	6.4	23	190
08/04/2023	02:30:00	4.2	5.7	23	189
08/04/2023	02:31:00	4	5.1	23	190
08/04/2023	02:32:00	4.1	5.9	23	190
08/04/2023	02:33:00	4.5	6.4	23	190
08/04/2023	02:34:00	4.8	6.4	23	190
08/04/2023	02:35:00	4.8	6.4	23	190
08/04/2023	02:36:00	4.4	6.7	23	190
08/04/2023	02:37:00	5	6.3	23	190
08/04/2023	02:38:00	4.7	6.6	23	190
08/04/2023	02:39:00	5	6.2	23	190
08/04/2023	02:40:00	5.5	7.4	23	190
08/04/2023	02:41:00	4.6	5.5	23	190
08/04/2023	02:42:00	5.2	7.1	23	190
08/04/2023	02:43:00	5	6.3	23	190
08/04/2023	02:44:00	4.6	6.6	23	189
08/04/2023	02:45:00	5	6	23	189
08/04/2023	02:46:00	4.5	5.8	23	188
08/04/2023	02:47:00	4.5	6	23	187
08/04/2023	02:48:00	4.5	5.9	23	188
08/04/2023	02:49:00	4.6	6.3	23	187
08/04/2023	02:50:00	4.5	5.9	23	188
08/04/2023	02:51:00	4.5	5.9	23	188
08/04/2023	02:52:00	4.6	6	23	187
08/04/2023	02:53:00	4.8	6	23	188
08/04/2023	02:54:00	5.2	6.6	23	188
08/04/2023	02:55:00	4.6	5.9	23	188
08/04/2023	02:56:00	4.9	6.4	23	188
08/04/2023	02:57:00	4	5	23	188
08/04/2023	02:58:00	4.3	5.9	23	188
08/04/2023	02:59:00	4.1	5.4	23	187
08/04/2023	03:00:00	3.7	5.7	23	188
08/04/2023	03:01:00	3.9	5.1	23	188
08/04/2023	03:02:00	3.7	4.8	23	187
08/04/2023	03:03:00	3.4	5.6	23	186
08/04/2023	03:04:00	4.3	5.3	23	186
08/04/2023	03:05:00	4.6	6.5	22	186
08/04/2023	03:06:00	4.1	5.7	22	185
08/04/2023	03:07:00	4.1	5.1	22	185
08/04/2023	03:08:00	4.1	5.4	22	184
08/04/2023	03:09:00	3.6	4.8	22	184
08/04/2023	03:10:00	3.9	5.5	22	184
08/04/2023	03:11:00	3.6	5.1	22	184
08/04/2023	03:12:00	3.4	4.8	22	184
08/04/2023	03:13:00	3	4.1	22	184
08/04/2023	03:14:00	3.5	4	22	184
08/04/2023	03:15:00	3.1	4.4	22	184
08/04/2023	03:16:00	3.3	4.5	22	184
08/04/2023	03:17:00	3.4	4.5	22	184
08/04/2023	03:18:00	3.4	5.1	22	184
08/04/2023	03:19:00	3.9	4.9	22	184
08/04/2023	03:20:00	3.4	4.4	22	184
08/04/2023	03:21:00	3.6	4.4	22	184
08/04/2023	03:22:00	3.1	4	22	184
08/04/2023	03:23:00	3.1	3.8	22	184
08/04/2023	03:24:00	3.6	4.4	22	184
08/04/2023	03:25:00	3.5	4.4	22	184
08/04/2023	03:26:00	3	4.4	22	184
08/04/2023	03:27:00	3.3	4.2	22	184
08/04/2023	03:28:00	3.2	4.2	22	184

Date	Time	Wind speed average	Wind Speed maximum	Temperature	Wind Direction
08/04/2023	03:29:00	3.1	3.7	22	184
08/04/2023	03:30:00	3.6	4.5	22	184
08/04/2023	03:31:00	3	3.7	22	184
08/04/2023	03:32:00	3	4.1	22	184
08/04/2023	03:33:00	3	3.9	22	184
08/04/2023	03:34:00	2.6	3.5	22	184
08/04/2023	03:35:00	2.7	3.3	22	184
08/04/2023	03:36:00	2.8	4.3	22	184
08/04/2023	03:37:00	2.8	3.9	22	184
08/04/2023	03:38:00	2.9	3.9	22	184
08/04/2023	03:39:00	3.1	3.7	22	184
08/04/2023	03:40:00	2.4	3.1	22	184
08/04/2023	03:41:00	2.7	4.2	22	185
08/04/2023	03:42:00	3.1	4.2	22	185
08/04/2023	03:43:00	3.1	4.1	22	185
08/04/2023	03:44:00	2.6	3.4	22	185
08/04/2023	03:45:00	2.9	4.1	22	185
08/04/2023	03:46:00	2.6	3.4	22	185
08/04/2023	03:47:00	3	4.2	22	185
08/04/2023	03:48:00	2.8	3.7	22	185
08/04/2023	03:49:00	2.4	3	22	185
08/04/2023	03:50:00	2.6	4	22	185
08/04/2023	03:51:00	2.5	3.4	22	185
08/04/2023	03:52:00	3.5	5.4	22	186
08/04/2023	03:53:00	3.1	4.1	22	185
08/04/2023	03:54:00	3.1	4.1	22	185
08/04/2023	03:55:00	3.4	4.8	22	185
08/04/2023	03:56:00	3.2	4.5	22	185
08/04/2023	03:57:00	3.5	4.6	22	185
08/04/2023	03:58:00	3.2	4.2	22	185
08/04/2023	03:59:00	3.8	5	22	185
08/04/2023	04:00:00	4.2	5.5	22	185
08/04/2023	04:01:00	4.3	5.8	22	185
08/04/2023	04:02:00	4.2	5.3	22	185
08/04/2023	04:03:00	3.8	5	22	185
08/04/2023	04:04:00	3.2	4.7	22	185
08/04/2023	04:05:00	3	4.2	22	185
08/04/2023	04:06:00	2.7	3.5	22	185
08/04/2023	04:07:00	3.4	4.5	22	185
08/04/2023	04:08:00	3.1	4	22	185
08/04/2023	04:09:00	3.2	4	22	185
08/04/2023	04:10:00	2.8	3.5	22	185
08/04/2023	04:11:00	2.7	3.5	22	185
08/04/2023	04:12:00	2.5	3.1	22	185
08/04/2023	04:13:00	2.8	3.7	22	185
08/04/2023	04:14:00	2.1	3.3	22	185
08/04/2023	04:15:00	2.8	3.7	22	185
08/04/2023	04:16:00	2.6	3.3	22	185
08/04/2023	04:17:00	2.4	3.7	22	185
08/04/2023	04:18:00	2.9	3.8	22	185
08/04/2023	04:19:00	2.8	3.6	22	185
08/04/2023	04:20:00	2.8	3.8	22	185
08/04/2023	04:21:00	3.6	4.8	22	185
08/04/2023	04:22:00	3.3	4.2	22	185
08/04/2023	04:23:00	3.3	4.3	22	185
08/04/2023	04:24:00	3.7	5.1	22	185
08/04/2023	04:25:00	3.9	4.9	22	185
08/04/2023	04:26:00	3.7	4.8	22	185
08/04/2023	04:27:00	3.9	4.8	22	186
08/04/2023	04:28:00	4.2	5.6	22	186
08/04/2023	04:29:00	4	4.8	22	186
08/04/2023	04:30:00	3.7	4.6	22	185

Date	Time	Wind speed average	Wind Speed maximum	Temperature	Wind Direction
08/04/2023	04:31:00	4	4.9	22	185
08/04/2023	04:32:00	4.7	6.3	22	185
08/04/2023	04:33:00	3.7	4.9	22	185
08/04/2023	04:34:00	4.4	5.5	22	185
08/04/2023	04:35:00	4	5.1	22	185
08/04/2023	04:36:00	3.9	5.2	22	185
08/04/2023	04:37:00	3.8	5.3	22	185
08/04/2023	04:38:00	4.5	5.7	22	185
08/04/2023	04:39:00	4.5	6.2	22	185
08/04/2023	04:40:00	4.3	5.6	22	185
08/04/2023	04:41:00	4	5.6	22	186
08/04/2023	04:42:00	4.2	6	22	186
08/04/2023	04:43:00	3.2	4.1	22	185
08/04/2023	04:44:00	3.8	4.9	22	186
08/04/2023	04:45:00	4.6	6.5	22	187
08/04/2023	04:46:00	4.2	5.3	22	186
08/04/2023	04:47:00	5.1	6.7	22	187
08/04/2023	04:48:00	5.1	6.4	22	187
08/04/2023	04:49:00	4.7	6.2	22	188
08/04/2023	04:50:00	4.6	6.1	22	187
08/04/2023	04:51:00	4.8	6.3	22	187
08/04/2023	04:52:00	5.4	6.8	22	187
08/04/2023	04:53:00	4.1	5.9	22	186
08/04/2023	04:54:00	4.9	6.8	22	186
08/04/2023	04:55:00	4.7	6.6	22	186
08/04/2023	04:56:00	4.3	5.3	22	186
08/04/2023	04:57:00	4.2	5.4	22	186
08/04/2023	04:58:00	4.1	5.9	22	186
08/04/2023	04:59:00	4.4	5.4	22	186
08/04/2023	05:00:00	4	5.1	22	186
08/04/2023	05:01:00	4.3	5.9	22	185
08/04/2023	05:02:00	4.5	5.8	22	185
08/04/2023	05:03:00	4.1	5.4	22	185
08/04/2023	05:04:00	3.7	4.6	22	185
08/04/2023	05:05:00	3.8	5.1	22	185
08/04/2023	05:06:00	3.9	5.5	22	185
08/04/2023	05:07:00	3.8	5.2	22	185
08/04/2023	05:08:00	4.4	6.1	22	185
08/04/2023	05:09:00	4.1	5.5	22	185
08/04/2023	05:10:00	4	5.6	22	185
08/04/2023	05:11:00	3.7	4.6	22	185
08/04/2023	05:12:00	3	4.5	22	185
08/04/2023	05:13:00	3.7	4.6	22	184
08/04/2023	05:14:00	3.8	5.5	22	184
08/04/2023	05:15:00	3.7	4.6	22	184
08/04/2023	05:16:00	3.8	5.4	22	184
08/04/2023	05:17:00	4.2	5.4	22	185
08/04/2023	05:18:00	3.4	4.3	22	185
08/04/2023	05:19:00	3.9	4.9	21	185
08/04/2023	05:20:00	3.5	4.5	21	185
08/04/2023	05:21:00	3.2	5.1	21	185
08/04/2023	05:22:00	3.7	4.6	21	185
08/04/2023	05:23:00	3.3	4.4	21	185
08/04/2023	05:24:00	3.7	4.6	21	184
08/04/2023	05:25:00	3.1	4	21	184
08/04/2023	05:26:00	2.9	3.5	21	184
08/04/2023	05:27:00	3.1	4.3	21	185
08/04/2023	05:28:00	2.7	3.8	21	185
08/04/2023	05:29:00	3.1	4	21	185
08/04/2023	05:30:00	2.5	4	21	185
08/04/2023	05:31:00	2.9	4.2	21	185
08/04/2023	05:32:00	2.8	4	21	184

Date	Time	Wind speed average	Wind Speed maximum	Temperature	Wind Direction
08/04/2023	05:33:00	3.1	4.2	21	184
08/04/2023	05:34:00	2.7	3.5	21	184
08/04/2023	05:35:00	2.9	4.2	21	184
08/04/2023	05:36:00	2.5	3.9	21	184
08/04/2023	05:37:00	2.8	4	21	184
08/04/2023	05:38:00	2.2	2.7	21	184
08/04/2023	05:39:00	2.5	3.6	21	184
08/04/2023	05:40:00	2.3	3.6	21	184
08/04/2023	05:41:00	2.2	2.8	21	184
08/04/2023	05:42:00	2.1	3.3	21	184
08/04/2023	05:43:00	3	3.6	21	184
08/04/2023	05:44:00	2.5	3.2	21	184
08/04/2023	05:45:00	2.3	3.2	21	184
08/04/2023	05:46:00	2.2	2.9	21	184
08/04/2023	05:47:00	2.6	3.4	21	184
08/04/2023	05:48:00	2.3	2.8	21	184
08/04/2023	05:49:00	2.5	3.7	20	184
08/04/2023	05:50:00	1.9	2.5	20	184
08/04/2023	05:51:00	2.4	3.7	20	184
08/04/2023	05:52:00	2.9	4	20	184
08/04/2023	05:53:00	2.3	3.1	20	184
08/04/2023	05:54:00	2.7	3.6	20	184
08/04/2023	05:55:00	2.6	3.5	20	184
08/04/2023	05:56:00	2.4	3.5	20	184
08/04/2023	05:57:00	2.8	4.2	20	184
08/04/2023	05:58:00	2.4	4.3	20	184
08/04/2023	05:59:00	2.6	4.1	20	184
08/04/2023	06:00:00	2.7	3.9	20	184
08/04/2023	06:01:00	2.2	3	20	184
08/04/2023	06:02:00	2.7	3.7	20	184
08/04/2023	06:03:00	2.4	3.4	20	184
08/04/2023	06:04:00	2.8	3.7	20	183
08/04/2023	06:05:00	2.1	2.5	20	184
08/04/2023	06:06:00	2.4	3.7	20	184
08/04/2023	06:07:00	2.3	3.4	20	184
08/04/2023	06:08:00	1.8	2.3	20	184
08/04/2023	06:09:00	1.7	2.4	20	184
08/04/2023	06:10:00	1.3	1.8	20	184
08/04/2023	06:11:00	1.4	1.6	20	184
08/04/2023	06:12:00	1.5	1.9	21	185
08/04/2023	06:13:00	1.8	2.3	20	185
08/04/2023	06:14:00	1.7	2.1	20	184
08/04/2023	06:15:00	1.4	1.9	20	185
08/04/2023	06:16:00	1.4	1.7	20	185
08/04/2023	06:17:00	1.1	1.4	20	185
08/04/2023	06:18:00	1	1.4	20	184
08/04/2023	06:19:00	1.8	3	20	185
08/04/2023	06:20:00	2.9	4	20	194
08/04/2023	06:21:00	2.4	2.8	20	195
08/04/2023	06:22:00	3	3.8	20	197
08/04/2023	06:23:00	2.6	3.3	20	197
08/04/2023	06:24:00	3.1	4.6	19	197
08/04/2023	06:25:00	4.7	5.8	19	203
08/04/2023	06:26:00	5.1	7.2	19	204
08/04/2023	06:27:00	5.9	7.8	19	212
08/04/2023	06:28:00	4.9	6.6	19	216
08/04/2023	06:29:00	4.4	6.2	19	219
08/04/2023	06:30:00	5.4	7.8	19	312
08/04/2023	06:31:00	3.9	5.3	19	320
08/04/2023	06:32:00	4	5.2	19	326
08/04/2023	06:33:00	3.3	4.3	19	339
08/04/2023	06:34:00	2.5	3.8	19	336

Date	Time	Wind speed average	Wind Speed maximum	Temperature	Wind Direction
08/04/2023	06:35:00	1.6	2.1	19	326
08/04/2023	06:36:00	1.5	2.4	19	261
08/04/2023	06:37:00	0.9	1.4	19	268
08/04/2023	06:38:00	1.6	2.3	20	271
08/04/2023	06:39:00	1.9	2.7	20	273
08/04/2023	06:40:00	1.9	3	20	282
08/04/2023	06:41:00	3.2	4.6	20	310
08/04/2023	06:42:00	3.1	4.2	20	317
08/04/2023	06:43:00	2.5	3.7	20	318
08/04/2023	06:44:00	3	5.1	20	312
08/04/2023	06:45:00	2.4	3.5	21	313
08/04/2023	06:46:00	2.8	4.5	21	311
08/04/2023	06:47:00	3	3.9	21	317
08/04/2023	06:48:00	2.9	4.2	21	306
08/04/2023	06:49:00	2.7	3.7	21	303
08/04/2023	06:50:00	2.5	3	21	314
08/04/2023	06:51:00	2.8	4	21	318
08/04/2023	06:52:00	2.6	3.8	21	314
08/04/2023	06:53:00	2.3	3	21	287
08/04/2023	06:54:00	2.4	3	21	299
08/04/2023	06:55:00	1.9	2.4	21	295
08/04/2023	06:56:00	1.7	2.5	21	296
08/04/2023	06:57:00	1.3	1.7	21	286
08/04/2023	06:58:00	1.1	1.7	21	286
08/04/2023	06:59:00	0.6	0.9	22	287
08/04/2023	07:00:00	0.8	1.2	22	297
08/04/2023	07:01:00	0.8	1.3	22	291
08/04/2023	07:02:00	1.1	1.3	22	319
08/04/2023	07:03:00	1.4	1.8	22	5
08/04/2023	07:04:00	1.7	2.1	22	76
08/04/2023	07:05:00	1.4	1.8	22	74
08/04/2023	07:06:00	1.4	2.1	22	69
08/04/2023	07:07:00	1.4	1.6	22	74
08/04/2023	07:08:00	1.9	2.7	22	75
08/04/2023	07:09:00	2.1	3	21	72
08/04/2023	07:10:00	3.1	4	21	73
08/04/2023	07:11:00	2.8	3.3	21	77
08/04/2023	07:12:00	2.4	2.9	21	81
08/04/2023	07:13:00	2.1	3	21	97
08/04/2023	07:14:00	1.5	2.2	21	103
08/04/2023	07:15:00	1.2	1.7	21	111
08/04/2023	07:16:00	1	1.4	21	108
08/04/2023	07:17:00	1.2	1.5	21	107
08/04/2023	07:18:00	1	1.3	21	104
08/04/2023	07:19:00	1.1	1.5	21	106
08/04/2023	07:20:00	1.2	1.9	21	108
08/04/2023	07:21:00	1.3	1.7	21	108
08/04/2023	07:22:00	1.2	1.5	21	109
08/04/2023	07:23:00	1.1	1.5	21	108
08/04/2023	07:24:00	1.2	1.6	20	111
08/04/2023	07:25:00	1.1	1.6	20	116
08/04/2023	07:26:00	1.4	1.7	20	129
08/04/2023	07:27:00	1.5	1.9	20	130
08/04/2023	07:28:00	1.8	2.3	20	132
08/04/2023	07:29:00	1.8	2.3	20	134
08/04/2023	07:30:00	1.7	2.2	20	134
08/04/2023	07:31:00	1.8	2.5	20	134
08/04/2023	07:32:00	2.2	2.7	20	134
08/04/2023	07:33:00	2	2.6	20	133
08/04/2023	07:34:00	2.2	2.7	21	134
08/04/2023	07:35:00	2.3	2.9	21	134
08/04/2023	07:36:00	2.8	3.8	21	135

Date	Time	Wind speed average	Wind Speed maximum	Temperature	Wind Direction
08/04/2023	07:37:00	3.3	4.4	21	136
08/04/2023	07:38:00	3.2	4.4	21	136
08/04/2023	07:39:00	3.3	4	21	136
08/04/2023	07:40:00	3	4	21	136
08/04/2023	07:41:00	3.4	4.2	21	137
08/04/2023	07:42:00	2.7	3.9	21	136
08/04/2023	07:43:00	3	3.8	21	136
08/04/2023	07:44:00	2.8	3.4	21	136
08/04/2023	07:45:00	2.1	2.7	21	135
08/04/2023	07:46:00	2.3	2.8	21	135
08/04/2023	07:47:00	1.9	2.7	21	135
08/04/2023	07:48:00	2.5	3.4	21	138
08/04/2023	07:49:00	2.2	3.3	21	146
08/04/2023	07:50:00	2.3	3	21	148
08/04/2023	07:51:00	2.4	3.4	21	157
08/04/2023	07:52:00	2.2	3.1	21	157
08/04/2023	07:53:00	2.3	3.2	21	157
08/04/2023	07:54:00	2.1	2.4	21	157
08/04/2023	07:55:00	2.6	3.1	21	157
08/04/2023	07:56:00	3	3.7	21	157
08/04/2023	07:57:00	2.5	3.3	21	157
08/04/2023	07:58:00	2.5	3.4	21	157
08/04/2023	07:59:00	2.3	3.1	21	157
08/04/2023	08:00:00	2.1	3.5	21	157
08/04/2023	08:01:00	1.8	2.7	21	159
08/04/2023	08:02:00	2.5	3.4	21	167
08/04/2023	08:03:00	2.3	3.3	21	168
08/04/2023	08:04:00	2.5	3.5	21	165
08/04/2023	08:05:00	2.3	3.1	21	165
08/04/2023	08:06:00	2.3	3.3	21	166
08/04/2023	08:07:00	2.5	3.4	21	167
08/04/2023	08:08:00	2.2	2.8	22	167
08/04/2023	08:09:00	2.5	2.9	22	168
08/04/2023	08:10:00	2.8	3.8	22	167
08/04/2023	08:11:00	2.9	3.8	22	167
08/04/2023	08:12:00	3.1	4.2	22	168
08/04/2023	08:13:00	3.1	4.1	22	167
08/04/2023	08:14:00	3	4.3	22	167
08/04/2023	08:15:00	2.5	3.3	22	167
08/04/2023	08:16:00	2.7	3.8	22	166
08/04/2023	08:17:00	2.7	3.3	22	165
08/04/2023	08:18:00	2.6	3.5	22	165
08/04/2023	08:19:00	2.5	3.2	22	165
08/04/2023	08:20:00	2.5	3.5	22	165
08/04/2023	08:21:00	2.3	2.9	22	165
08/04/2023	08:22:00	2.7	3.4	23	164
08/04/2023	08:23:00	2.4	3.1	23	164
08/04/2023	08:24:00	2.3	2.7	23	165
08/04/2023	08:25:00	2.6	3.3	23	164
08/04/2023	08:26:00	2.1	2.9	23	165
08/04/2023	08:27:00	2.2	3.4	23	165
08/04/2023	08:28:00	2.5	3	23	165
08/04/2023	08:29:00	2.5	3.7	23	165
08/04/2023	08:30:00	2	2.6	23	165
08/04/2023	08:31:00	2.2	2.6	23	166
08/04/2023	08:32:00	2.2	3.2	23	166
08/04/2023	08:33:00	1.8	2.6	24	166
08/04/2023	08:34:00	1.8	2.3	24	166
08/04/2023	08:35:00	2.3	3.1	24	166
08/04/2023	08:36:00	2	2.5	24	166
08/04/2023	08:37:00	2.3	3.2	24	166
08/04/2023	08:38:00	1.8	2.2	24	166

Date	Time	Wind speed average	Wind Speed maximum	Temperature	Wind Direction
08/04/2023	08:39:00	2	2.8	24	166
08/04/2023	08:40:00	1.7	2.2	24	166
08/04/2023	08:41:00	1.9	2.5	24	168
08/04/2023	08:42:00	2.1	2.6	24	169
08/04/2023	08:43:00	2	2.4	25	169
08/04/2023	08:44:00	1.8	2.2	25	169
08/04/2023	08:45:00	1.7	2.4	25	168
08/04/2023	08:46:00	1.6	1.9	25	168
08/04/2023	08:47:00	1.7	2.1	25	168
08/04/2023	08:48:00	1.5	1.8	25	168
08/04/2023	08:49:00	1.6	2.1	25	168
08/04/2023	08:50:00	1.6	2.1	25	168
08/04/2023	08:51:00	2	2.4	25	168
08/04/2023	08:52:00	2.5	3.3	25	182
08/04/2023	08:53:00	2.8	4	25	187
08/04/2023	08:54:00	2.5	3.4	25	187
08/04/2023	08:55:00	2.9	4.6	25	195
08/04/2023	08:56:00	3.6	4.9	25	302
08/04/2023	08:57:00	4.5	6	25	307
08/04/2023	08:58:00	3.1	4.6	25	316
08/04/2023	08:59:00	3.5	4.5	24	323
08/04/2023	09:00:00	3.6	4.8	24	321
08/04/2023	09:01:00	2.9	4.1	24	308
08/04/2023	09:02:00	4.3	6.3	24	303
08/04/2023	09:03:00	5.1	6.7	24	314
08/04/2023	09:04:00	4.5	5.9	24	309
08/04/2023	09:05:00	4.1	6.2	24	308
08/04/2023	09:06:00	3.6	5.4	24	302
08/04/2023	09:07:00	3.1	4.4	24	308
08/04/2023	09:08:00	3.7	4.9	24	317
08/04/2023	09:09:00	3.7	4.5	23	320
08/04/2023	09:10:00	3.2	4.5	23	319
08/04/2023	09:11:00	3.6	4.6	23	324
08/04/2023	09:12:00	3.3	4.8	23	312
08/04/2023	09:13:00	3.2	5.1	23	316
08/04/2023	09:14:00	4	5.4	23	322
08/04/2023	09:15:00	3.4	4.1	23	318
08/04/2023	09:16:00	3.6	4.9	23	318
08/04/2023	09:17:00	2.6	3.7	23	332
08/04/2023	09:18:00	3.2	4.4	23	324
08/04/2023	09:19:00	2.7	3.4	23	318
08/04/2023	09:20:00	3.2	4.1	23	324
08/04/2023	09:21:00	3.2	4.1	23	330
08/04/2023	09:22:00	2.9	3.6	23	330
08/04/2023	09:23:00	2.8	4.2	23	325
08/04/2023	09:24:00	3.2	4.2	23	323
08/04/2023	09:25:00	2.6	3.1	23	323
08/04/2023	09:26:00	2.6	3.8	23	331
08/04/2023	09:27:00	3.1	4	23	336
08/04/2023	09:28:00	3.3	4.7	23	347
08/04/2023	09:29:00	2.7	3.6	23	351
08/04/2023	09:30:00	3.1	3.9	23	355
08/04/2023	09:31:00	3.2	4	23	354
08/04/2023	09:32:00	2.7	3.4	23	335
08/04/2023	09:33:00	2.5	3.4	23	334
08/04/2023	09:34:00	2.4	3.2	23	342
08/04/2023	09:35:00	1.9	2.7	23	335
08/04/2023	09:36:00	2.8	3.6	23	344
08/04/2023	09:37:00	2.4	3.1	23	341
08/04/2023	09:38:00	2.5	3.2	24	349
08/04/2023	09:39:00	2	2.4	24	17
08/04/2023	09:40:00	2	2.6	24	4

Date	Time	Wind speed average	Wind Speed maximum	Temperature	Wind Direction
08/04/2023	09:41:00	2.6	4.4	24	36
08/04/2023	09:42:00	3.3	4	24	39
08/04/2023	09:43:00	2.5	3.7	24	40
08/04/2023	09:44:00	2.4	3.4	24	40
08/04/2023	09:45:00	2.7	3.4	25	31
08/04/2023	09:46:00	2.7	3.6	25	17
08/04/2023	09:47:00	2.4	3.1	25	22
08/04/2023	09:48:00	1.8	2.3	25	24
08/04/2023	09:49:00	2.2	2.9	25	20
08/04/2023	09:50:00	1.6	2.2	25	18
08/04/2023	09:51:00	2.1	2.6	26	24
08/04/2023	09:52:00	1.9	2.6	26	15
08/04/2023	09:53:00	2.5	3.2	26	15
08/04/2023	09:54:00	2.1	2.9	26	19
08/04/2023	09:55:00	2.5	3.6	26	32
08/04/2023	09:56:00	3	4.1	26	18
08/04/2023	09:57:00	2.4	2.9	26	25
08/04/2023	09:58:00	2.3	2.8	26	17
08/04/2023	09:59:00	2.3	2.8	26	10
08/04/2023	10:00:00	2.6	3.1	26	346
08/04/2023	10:01:00	2.1	2.9	26	355
08/04/2023	10:02:00	2.8	3.8	26	14
08/04/2023	10:03:00	2.8	3.5	26	356
08/04/2023	10:04:00	3.1	4.3	26	350
08/04/2023	10:05:00	2.7	3.2	26	346
08/04/2023	10:06:00	2.5	3.4	26	352
08/04/2023	10:07:00	2.2	3	26	3
08/04/2023	10:08:00	2.5	3.1	26	14
08/04/2023	10:09:00	2.7	3.4	26	26
08/04/2023	10:10:00	3.2	3.8	26	28
08/04/2023	10:11:00	2.5	3.2	26	25
08/04/2023	10:12:00	2.1	2.5	26	20
08/04/2023	10:13:00	2.3	3.1	26	343
08/04/2023	10:14:00	2.1	2.8	26	29
08/04/2023	10:15:00	2.2	2.9	26	29
08/04/2023	10:16:00	2.2	3	26	354
08/04/2023	10:17:00	2.6	3.6	27	7
08/04/2023	10:18:00	2.3	3	27	17
08/04/2023	10:19:00	2.7	3.1	27	34
08/04/2023	10:20:00	2.6	3.2	27	35
08/04/2023	10:21:00	2.4	3.5	27	8
08/04/2023	10:22:00	2.3	3.2	27	3
08/04/2023	10:23:00	3	4.1	27	20
08/04/2023	10:24:00	2.4	3.3	27	24
08/04/2023	10:25:00	1.9	2.1	27	15
08/04/2023	10:26:00	2.8	3.7	27	357
08/04/2023	10:27:00	2.6	3.2	27	352
08/04/2023	10:28:00	2.9	3.7	27	22
08/04/2023	10:29:00	2.9	3.5	27	359
08/04/2023	10:30:00	2.6	3.5	27	354
08/04/2023	10:31:00	2.6	4.2	27	351
08/04/2023	10:32:00	2.5	3.4	27	336
08/04/2023	10:33:00	2.8	3.6	27	321
08/04/2023	10:34:00	2.2	3.5	27	324
08/04/2023	10:35:00	2.2	3.2	27	5
08/04/2023	10:36:00	3	4.3	27	355
08/04/2023	10:37:00	2	2.6	27	355
08/04/2023	10:38:00	2.5	3.3	27	5
08/04/2023	10:39:00	3.2	4.8	27	2
08/04/2023	10:40:00	3.5	4.6	27	345
08/04/2023	10:41:00	3	5.4	28	343
08/04/2023	10:42:00	2.3	3.4	28	24

Date	Time	Wind speed average	Wind Speed maximum	Temperature	Wind Direction
08/04/2023	10:43:00	3.4	4.1	28	37
08/04/2023	10:44:00	3	4.6	28	39
08/04/2023	10:45:00	3.1	3.9	28	40
08/04/2023	10:46:00	3.3	4.6	28	16
08/04/2023	10:47:00	3.2	4.1	28	2
08/04/2023	10:48:00	2.4	3.2	28	3
08/04/2023	10:49:00	2.8	3.5	28	14
08/04/2023	10:50:00	2.3	3.3	28	10
08/04/2023	10:51:00	3.2	4.2	28	0
08/04/2023	10:52:00	3.5	5.1	28	46
08/04/2023	10:53:00	3.9	5.1	28	53
08/04/2023	10:54:00	3.1	5	28	38
08/04/2023	10:55:00	3.8	4.9	28	42
08/04/2023	10:56:00	3.9	4.7	28	43
08/04/2023	10:57:00	2.9	4.4	28	42
08/04/2023	10:58:00	2.7	4	28	33
08/04/2023	10:59:00	3.8	5.3	28	30
08/04/2023	11:00:00	2.5	2.9	28	26
08/04/2023	11:01:00	2.8	3.3	28	35
08/04/2023	11:02:00	3	3.9	28	50
08/04/2023	11:03:00	2.8	3.9	28	66
08/04/2023	11:04:00	3.1	3.7	28	60
08/04/2023	11:05:00	3.2	4	28	62
08/04/2023	11:06:00	3.2	4.4	28	68
08/04/2023	11:07:00	2.4	2.8	28	62
08/04/2023	11:08:00	2.7	3.6	28	40
08/04/2023	11:09:00	3.6	4.6	28	40
08/04/2023	11:10:00	3	3.8	28	18
08/04/2023	11:11:00	1.7	3.5	28	38
08/04/2023	11:12:00	0.8	1.8	28	15
08/04/2023	11:13:00	1.2	1.9	28	304
08/04/2023	11:14:00	1.8	2.6	28	1
08/04/2023	11:15:00	2.3	3	29	27
08/04/2023	11:16:00	1.7	2.2	29	45
08/04/2023	11:17:00	2.7	3.5	29	9
08/04/2023	11:18:00	2.3	3.1	29	354
08/04/2023	11:19:00	1.6	2.4	29	333
08/04/2023	11:20:00	1.1	1.9	29	349
08/04/2023	11:21:00	2.5	3.7	29	358
08/04/2023	11:22:00	3	4.1	29	11
08/04/2023	11:23:00	2.5	3.2	29	21
08/04/2023	11:24:00	2.8	3.9	29	21
08/04/2023	11:25:00	2.9	3.4	29	44
08/04/2023	11:26:00	2.4	3.6	29	33
08/04/2023	11:27:00	2.5	3.8	29	49
08/04/2023	11:28:00	1.5	3.2	29	51
08/04/2023	11:29:00	0.9	1.6	29	12
08/04/2023	11:30:00	1.2	1.8	29	47
08/04/2023	11:31:00	1.2	1.6	29	90
08/04/2023	11:32:00	1	1.7	29	346
08/04/2023	11:33:00	1.4	1.8	29	83
08/04/2023	11:34:00	2.4	3.6	29	103
08/04/2023	11:35:00	2.4	3.9	29	119
08/04/2023	11:36:00	2.5	3.4	29	120
08/04/2023	11:37:00	1.5	2.3	29	123
08/04/2023	11:38:00	1.6	2.7	29	136
08/04/2023	11:39:00	2.9	4.4	29	111
08/04/2023	11:40:00	3	3.6	29	108
08/04/2023	11:41:00	2.4	2.9	29	107
08/04/2023	11:42:00	2	2.5	29	91
08/04/2023	11:43:00	1.6	2.1	29	77
08/04/2023	11:44:00	1.1	1.4	29	91

Date	Time	Wind speed average	Wind Speed maximum	Temperature	Wind Direction
08/04/2023	11:45:00	0.7	1.8	29	90
08/04/2023	11:46:00	2.8	4.5	29	73
08/04/2023	11:47:00	2.8	4	29	144
08/04/2023	11:48:00	2.3	3.3	29	136
08/04/2023	11:49:00	3.1	4.2	29	125
08/04/2023	11:50:00	2.3	2.9	29	134
08/04/2023	11:51:00	2.6	3.2	29	134
08/04/2023	11:52:00	2.8	4.5	29	136
08/04/2023	11:53:00	1.8	2.6	29	105
08/04/2023	11:54:00	2.4	3.3	29	113
08/04/2023	11:55:00	2.7	3.8	29	149
08/04/2023	11:56:00	2.5	3.9	29	140
08/04/2023	11:57:00	3.1	4.7	29	149
08/04/2023	11:58:00	3	4.8	29	153
08/04/2023	11:59:00	2.8	3.7	29	155
08/04/2023	12:00:00	2.6	3.7	29	161
08/04/2023	12:01:00	2.4	3.3	29	151
08/04/2023	12:02:00	2.1	3.3	29	162
08/04/2023	12:03:00	2.5	3.2	29	183
08/04/2023	12:04:00	2.5	3.2	29	177
08/04/2023	12:05:00	2.3	3.1	29	167
08/04/2023	12:06:00	2.5	3.3	29	177
08/04/2023	12:07:00	1.8	2.7	29	185
08/04/2023	12:08:00	2.4	3.2	29	166
08/04/2023	12:09:00	2.3	3.4	29	163
08/04/2023	12:10:00	1.2	2.4	29	134
08/04/2023	12:11:00	2.6	3.3	29	58
08/04/2023	12:12:00	2.3	3	29	56
08/04/2023	12:13:00	1.8	2.6	29	85
08/04/2023	12:14:00	2.1	3.2	29	199
08/04/2023	12:15:00	2.4	3	29	191
08/04/2023	12:16:00	2	2.6	29	240
08/04/2023	12:17:00	1.2	1.8	29	294
08/04/2023	12:18:00	1.6	2.3	29	167
08/04/2023	12:19:00	0.4	0.9	29	160
08/04/2023	12:20:00	1.1	1.9	29	142
08/04/2023	12:21:00	1.2	1.9	29	150
08/04/2023	12:22:00	0.9	1.4	29	150
08/04/2023	12:23:00	2.1	3.3	29	86
08/04/2023	12:24:00	1.2	2.2	29	75
08/04/2023	12:25:00	3.1	3.8	29	57
08/04/2023	12:26:00	2.6	3.6	29	49
08/04/2023	12:27:00	2.4	3.7	29	21
08/04/2023	12:28:00	2	2.8	29	10
08/04/2023	12:29:00	1.7	2.5	29	16
08/04/2023	12:30:00	1	1.8	29	99
08/04/2023	12:31:00	1.4	2.3	29	152
08/04/2023	12:32:00	1.1	1.8	30	144
08/04/2023	12:33:00	1.7	2.2	30	179
08/04/2023	12:34:00	0.4	1.7	30	206
08/04/2023	12:35:00	0.7	2.1	30	167
08/04/2023	12:36:00	2.1	2.6	30	137
08/04/2023	12:37:00	1.8	2.6	30	138
08/04/2023	12:38:00	2	3.2	30	114
08/04/2023	12:39:00	2.3	3	30	154
08/04/2023	12:40:00	3.2	4.3	30	164
08/04/2023	12:41:00	3.4	4.2	31	161
08/04/2023	12:42:00	2.9	4.6	31	155
08/04/2023	12:43:00	1.8	2.7	31	143
08/04/2023	12:44:00	2.7	4	31	184
08/04/2023	12:45:00	2.6	3.7	31	171
08/04/2023	12:46:00	3.5	4.5	31	159

Date	Time	Wind speed average	Wind Speed maximum	Temperature	Wind Direction
08/04/2023	12:47:00	3	3.6	31	163
08/04/2023	12:48:00	2.7	3.4	31	153
08/04/2023	12:49:00	1.9	2.6	31	146
08/04/2023	12:50:00	1.9	3	31	158
08/04/2023	12:51:00	2.5	3.2	31	191
08/04/2023	12:52:00	2.3	3.4	31	195
08/04/2023	12:53:00	2.3	2.9	31	210
08/04/2023	12:54:00	2.9	5.1	31	193
08/04/2023	12:55:00	2.7	3.3	31	198
08/04/2023	12:56:00	3.6	4.6	31	196
08/04/2023	12:57:00	3.8	4.9	31	199
08/04/2023	12:58:00	2.7	4	31	190
08/04/2023	12:59:00	1.2	2.2	31	184
08/04/2023	13:00:00	2.1	3	31	188
08/04/2023	13:01:00	1.9	3.6	31	173
08/04/2023	13:02:00	1.7	2.5	31	141
08/04/2023	13:03:00	1.8	2.6	31	118
08/04/2023	13:04:00	1.8	3.5	31	124
08/04/2023	13:05:00	3.2	4.3	31	157
08/04/2023	13:06:00	1.6	2.7	31	161
08/04/2023	13:07:00	1.5	2.1	31	224
08/04/2023	13:08:00	0.7	1.2	31	223
08/04/2023	13:09:00	1.5	2.3	31	145
08/04/2023	13:10:00	1.5	2.4	31	121
08/04/2023	13:11:00	1.5	2.1	31	117
08/04/2023	13:12:00	1	1.5	31	125
08/04/2023	13:13:00	1.4	1.9	31	134
08/04/2023	13:14:00	2.2	3.5	31	153
08/04/2023	13:15:00	2.4	3.2	31	179
08/04/2023	13:16:00	2.6	3.6	31	190
08/04/2023	13:17:00	3.5	4.8	31	172
08/04/2023	13:18:00	2.8	4.1	31	176
08/04/2023	13:19:00	3.1	4.1	31	184
08/04/2023	13:20:00	2.3	3.6	31	164
08/04/2023	13:21:00	1.3	2.2	31	193
08/04/2023	13:22:00	1.8	2.8	31	192
08/04/2023	13:23:00	1.5	2.5	31	175
08/04/2023	13:24:00	1.5	2	31	147
08/04/2023	13:25:00	1.9	2.8	31	108
08/04/2023	13:26:00	2.1	3.1	31	100
08/04/2023	13:27:00	1.6	2.3	31	114
08/04/2023	13:28:00	1.7	3.4	31	114
08/04/2023	13:29:00	1.7	3.6	31	116
08/04/2023	13:30:00	3.3	4.3	31	91
08/04/2023	13:30:00	3.3	4.3	31	91
08/04/2023	13:31:00	2.5	3.6	31	83
08/04/2023	13:32:00	1.6	2.3	31	102
08/04/2023	13:33:00	2.3	3.2	31	91

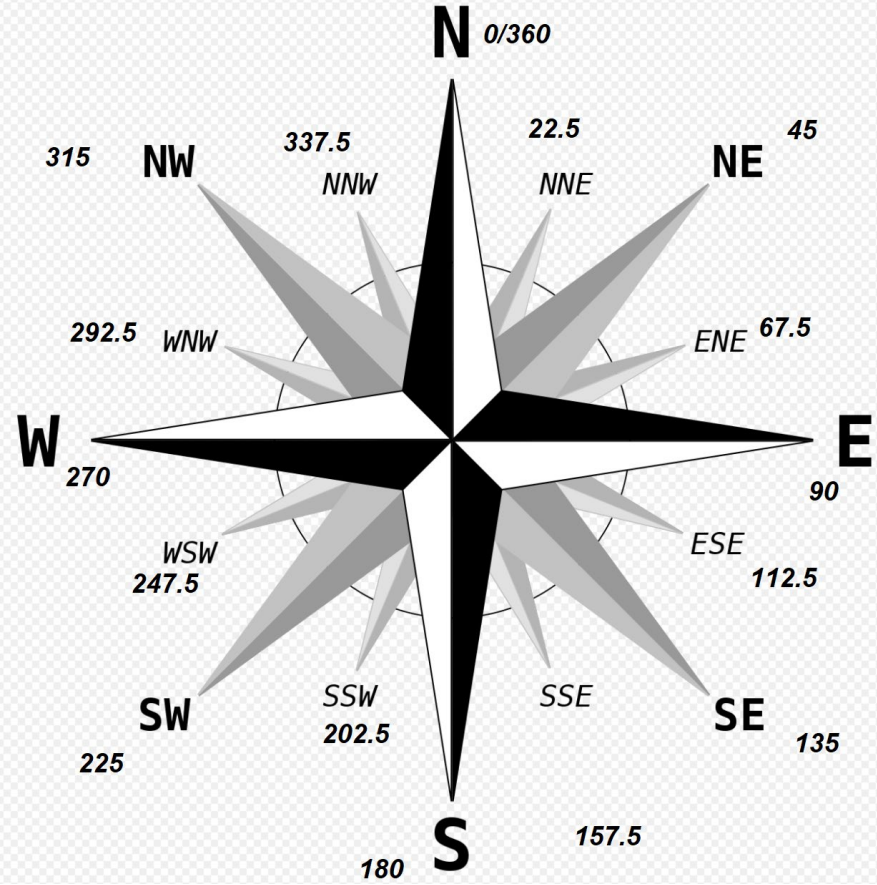

Figure 12: Wind direction degree explanation

Table 8: Weather data for air monitoring, AN 1

Date	Time	Windspeed average	Wind speed maximum	Temperature	Wind Direction
08/04/2023	18:00:00	2.3	4.8	26	298
08/04/2023	18:01:00	2.6	5.2	26	295
08/04/2023	18:02:00	2.5	3.8	26	282
08/04/2023	18:03:00	2.5	3.5	26	304
08/04/2023	18:04:00	2.9	4.6	26	293
08/04/2023	18:05:00	2	3.5	26	299
08/04/2023	18:06:00	2.4	3.9	26	287
08/04/2023	18:07:00	2.6	5.1	26	285
08/04/2023	18:08:00	2.6	4.7	26	295
08/04/2023	18:09:00	3.4	5.9	26	281
08/04/2023	18:10:00	2.8	4.2	26	283
08/04/2023	18:11:00	2.4	3.5	26	304
08/04/2023	18:12:00	2.9	4.8	26	309
08/04/2023	18:13:00	2.8	4.1	26	311
08/04/2023	18:14:00	3.4	4.5	26	315
08/04/2023	18:15:00	2.9	4.7	26	310
08/04/2023	18:16:00	3.2	4.6	26	314
08/04/2023	18:17:00	2.8	4.1	26	318
08/04/2023	18:18:00	3	6.3	26	303
08/04/2023	18:19:00	2.5	4.7	26	312
08/04/2023	18:20:00	2	3.2	26	319
08/04/2023	18:21:00	2.2	3.6	26	316
08/04/2023	18:22:00	2.6	3.6	26	317
08/04/2023	18:23:00	2.4	3.7	26	303
08/04/2023	18:24:00	2.4	3.5	26	309

Date	Time	Windspeed average	Wind speed maximum	Temperature	Wind Direction
08/04/2023	18:25:00	2.6	3.8	26	317
08/04/2023	18:26:00	3	4.5	26	315
08/04/2023	18:27:00	2.9	3.9	26	326
08/04/2023	18:28:00	3.1	4.6	25	319
08/04/2023	18:29:00	2.7	5	25	312
08/04/2023	18:30:00	2.7	3.9	25	317
08/04/2023	18:31:00	2.5	4.3	25	322
08/04/2023	18:32:00	2.8	3.9	25	321
08/04/2023	18:33:00	2.6	3.9	25	318
08/04/2023	18:34:00	2.7	3.3	25	323
08/04/2023	18:35:00	2.5	3.4	25	315
08/04/2023	18:36:00	2.6	3.6	25	304
08/04/2023	18:37:00	2.7	4.3	25	315
08/04/2023	18:38:00	2.8	4.4	25	317
08/04/2023	18:39:00	2.1	3.1	24	318
08/04/2023	18:40:00	1.9	2.9	24	315
08/04/2023	18:41:00	2.8	4.3	24	317
08/04/2023	18:42:00	2.6	4.3	24	315
08/04/2023	18:43:00	2.7	4.8	24	315
08/04/2023	18:44:00	2.6	3.7	24	318
08/04/2023	18:45:00	2.8	4.3	24	317
08/04/2023	18:46:00	2.3	4.1	24	319
08/04/2023	18:47:00	1.8	2.9	24	310
08/04/2023	18:48:00	2	3.3	24	302
08/04/2023	18:49:00	2.1	3.5	24	322
08/04/2023	18:50:00	2.3	3.3	24	310
08/04/2023	18:51:00	2.2	3.5	24	313
08/04/2023	18:52:00	2.3	3.3	24	313
08/04/2023	18:53:00	2.1	3.3	24	314
08/04/2023	18:54:00	2.5	3.8	24	314
08/04/2023	18:55:00	2.5	3.3	24	320
08/04/2023	18:56:00	2.4	4.8	24	309
08/04/2023	18:57:00	1.9	3	24	316
08/04/2023	18:58:00	2.3	3.4	24	319
08/04/2023	18:59:00	2.1	3.1	24	318
08/04/2023	19:00:00	1.5	2	24	306
08/04/2023	19:01:00	1.9	3.7	24	306
08/04/2023	19:02:00	1.9	3.3	23	300
08/04/2023	19:03:00	2.2	3.1	23	311
08/04/2023	19:04:00	1.6	2.7	23	294
08/04/2023	19:05:00	2	3.3	23	317
08/04/2023	19:06:00	1.7	3	23	321
08/04/2023	19:07:00	1.6	2.1	23	310
08/04/2023	19:08:00	1.4	1.9	23	306
08/04/2023	19:09:00	1.6	2.6	23	318
08/04/2023	19:10:00	2	3.5	23	313
08/04/2023	19:11:00	1.9	2.5	23	313
08/04/2023	19:12:00	2.1	2.7	23	319
08/04/2023	19:13:00	1.7	2.5	23	317
08/04/2023	19:14:00	1.7	2.4	23	325
08/04/2023	19:15:00	1.6	2.2	23	325
08/04/2023	19:16:00	1.7	2.4	23	328
08/04/2023	19:17:00	1.4	2.3	23	327
08/04/2023	19:18:00	1.3	1.9	23	324
08/04/2023	19:19:00	1.5	1.8	23	324
08/04/2023	19:20:00	1.6	2.1	23	324
08/04/2023	19:21:00	1.5	2	23	322
08/04/2023	19:22:00	1.3	2.1	23	329
08/04/2023	19:23:00	1.3	1.8	23	323
08/04/2023	19:24:00	1.5	2.2	22	323
08/04/2023	19:25:00	1.5	2.1	22	321
08/04/2023	19:26:00	1.5	2.1	22	329

Date	Time	Windspeed average	Wind speed maximum	Temperature	Wind Direction
08/04/2023	19:27:00	1.5	2.1	22	324
08/04/2023	19:28:00	1.4	1.7	22	315
08/04/2023	19:29:00	1.5	2.1	22	323
08/04/2023	19:30:00	1.4	2	22	328
08/04/2023	19:31:00	1.3	1.8	22	318
08/04/2023	19:32:00	1.4	2.1	22	321
08/04/2023	19:33:00	1.4	2.2	22	327
08/04/2023	19:34:00	1.1	1.4	22	322
08/04/2023	19:35:00	1.3	1.9	22	318
08/04/2023	19:36:00	1.4	2	22	319
08/04/2023	19:37:00	1.4	1.8	22	323
08/04/2023	19:38:00	1.3	1.6	22	324
08/04/2023	19:39:00	1.3	1.9	22	328
08/04/2023	19:40:00	1.2	1.9	22	324
08/04/2023	19:41:00	1.3	1.9	22	331
08/04/2023	19:42:00	1.3	1.7	22	323
08/04/2023	19:43:00	1.2	1.6	22	313
08/04/2023	19:44:00	1.4	1.7	22	322
08/04/2023	19:45:00	1.3	1.7	22	326
08/04/2023	19:46:00	1.2	1.8	22	329
08/04/2023	19:47:00	1.3	1.8	22	328
08/04/2023	19:48:00	1.4	1.8	22	323
08/04/2023	19:49:00	1.2	1.4	21	324
08/04/2023	19:50:00	1.2	1.6	21	331
08/04/2023	19:51:00	1.2	1.8	21	327
08/04/2023	19:52:00	1.3	1.5	21	326
08/04/2023	19:53:00	1.1	1.6	21	334
08/04/2023	19:54:00	1.2	1.7	21	322
08/04/2023	19:55:00	1.1	1.6	21	320
08/04/2023	19:56:00	1.1	1.6	21	332
08/04/2023	19:57:00	1.1	1.5	21	332
08/04/2023	19:58:00	1	1.3	21	340
08/04/2023	19:59:00	1.3	1.6	21	325
08/04/2023	20:00:00	1	1.4	21	336
08/04/2023	20:01:00	0.9	1.4	21	336
08/04/2023	20:02:00	0.9	1.3	21	341
08/04/2023	20:03:00	0.9	1.2	21	328
08/04/2023	20:04:00	0.8	1	21	332
08/04/2023	20:05:00	0.9	1.2	21	333
08/04/2023	20:06:00	1	1.2	21	329
08/04/2023	20:07:00	0.8	1	21	333
08/04/2023	20:08:00	0.8	1.1	21	324
08/04/2023	20:09:00	0.9	1.5	21	338
08/04/2023	20:10:00	0.8	1.1	21	333
08/04/2023	20:11:00	0.8	1.1	21	327
08/04/2023	20:12:00	0.7	0.9	21	324
08/04/2023	20:13:00	0.2	0.8	20	323
08/04/2023	20:14:00	0	0	20	nW
08/04/2023	20:15:00	0	0	20	nW
08/04/2023	20:16:00	0	0	20	nW
08/04/2023	20:17:00	0.1	0.6	20	334
08/04/2023	20:18:00	0.4	0.9	20	39
08/04/2023	20:19:00	0.8	1	20	24
08/04/2023	20:20:00	0.8	1.1	19	32
08/04/2023	20:21:00	0.5	0.7	19	33
08/04/2023	20:22:00	0.6	0.9	19	44
08/04/2023	20:23:00	0.7	1.1	19	33
08/04/2023	20:24:00	0.6	0.9	19	29
08/04/2023	20:25:00	0.7	0.9	19	34
08/04/2023	20:26:00	0.3	0.9	19	34
08/04/2023	20:27:00	0.8	1	19	34
08/04/2023	20:28:00	0.9	1.2	19	33

Date	Time	Windspeed average	Wind speed maximum	Temperature	Wind Direction
08/04/2023	20:29:00	0.5	1	19	38
08/04/2023	20:30:00	0.5	0.9	19	81
08/04/2023	20:31:00	0	0	19	nW
08/04/2023	20:32:00	0.5	1	19	76
08/04/2023	20:33:00	0.8	1.1	19	28
08/04/2023	20:34:00	0.8	1	18	40
08/04/2023	20:35:00	1	1.3	18	35
08/04/2023	20:36:00	1	1.6	18	31
08/04/2023	20:37:00	1.4	1.7	18	25
08/04/2023	20:38:00	1.2	1.6	18	21
08/04/2023	20:39:00	1.1	1.5	18	25
08/04/2023	20:40:00	1	1.5	18	18
08/04/2023	20:41:00	1.1	1.6	18	27
08/04/2023	20:42:00	1.2	1.6	18	21
08/04/2023	20:43:00	1.4	1.7	18	16
08/04/2023	20:44:00	1.4	1.8	18	14
08/04/2023	20:45:00	0.9	1.4	18	13
08/04/2023	20:46:00	0.9	1.4	18	22
08/04/2023	20:47:00	1.2	1.6	18	13
08/04/2023	20:48:00	1.2	1.6	18	20
08/04/2023	20:49:00	1.2	1.5	18	7
08/04/2023	20:50:00	1.3	2	19	357
08/04/2023	20:51:00	0.9	1.3	19	6
08/04/2023	20:52:00	0.8	1.3	19	4
08/04/2023	20:53:00	0.8	1.1	19	354
08/04/2023	20:54:00	0.9	1.6	19	350
08/04/2023	20:55:00	0.9	1.2	19	352
08/04/2023	20:56:00	0.8	1.1	19	346
08/04/2023	20:57:00	0.6	0.8	19	345
08/04/2023	20:58:00	0.7	0.8	19	7
08/04/2023	20:59:00	0.7	1.1	19	12
08/04/2023	21:00:00	0.8	1	19	4
08/04/2023	21:01:00	0.7	1	19	5
08/04/2023	21:02:00	0.9	1.3	19	18
08/04/2023	21:03:00	1.1	1.7	19	2
08/04/2023	21:04:00	1	1.4	19	6
08/04/2023	21:05:00	1	1.2	18	5
08/04/2023	21:06:00	1	1.6	18	17
08/04/2023	21:07:00	1.1	1.5	18	11
08/04/2023	21:08:00	1	1.7	18	12
08/04/2023	21:09:00	0.8	1.1	18	12
08/04/2023	21:10:00	1.1	1.7	18	8
08/04/2023	21:11:00	0.8	1.1	18	13
08/04/2023	21:12:00	1	1.4	18	10
08/04/2023	21:13:00	0.7	1.1	18	358
08/04/2023	21:14:00	0.9	1.3	18	339
08/04/2023	21:15:00	0.7	1	18	347
08/04/2023	21:16:00	0.7	1.1	18	335
08/04/2023	21:17:00	0.8	1.2	18	10
08/04/2023	21:18:00	1	1.3	18	10
08/04/2023	21:19:00	0.9	1.5	18	345
08/04/2023	21:20:00	0.9	1.2	18	343
08/04/2023	21:21:00	1.1	2.1	18	336
08/04/2023	21:22:00	0.8	1.3	18	343
08/04/2023	21:23:00	0.8	1.2	18	338
08/04/2023	21:24:00	0.4	0.8	18	351
08/04/2023	21:25:00	0.7	1.5	18	15
08/04/2023	21:26:00	0.9	1.2	18	19
08/04/2023	21:27:00	0.9	1.3	18	15
08/04/2023	21:28:00	1	1.5	18	14
08/04/2023	21:29:00	1.3	1.8	18	25
08/04/2023	21:30:00	0.9	1.1	18	23

Date	Time	Windspeed average	Wind speed maximum	Temperature	Wind Direction
08/04/2023	21:31:00	1.1	1.5	18	8
08/04/2023	21:32:00	1	1.4	18	22
08/04/2023	21:33:00	1	1.4	18	7
08/04/2023	21:34:00	0.9	1.3	18	22
08/04/2023	21:35:00	1	1.7	18	29
08/04/2023	21:36:00	0.9	1.2	18	17
08/04/2023	21:37:00	1	1.4	18	15
08/04/2023	21:38:00	0.9	1.1	18	25
08/04/2023	21:39:00	0.8	1.1	18	49
08/04/2023	21:40:00	0.7	0.9	18	37
08/04/2023	21:41:00	0.9	1.1	18	37
08/04/2023	21:42:00	0.9	1.2	18	39
08/04/2023	21:43:00	0.9	1.2	18	27
08/04/2023	21:44:00	1.1	1.5	18	34
08/04/2023	21:45:00	1	1.4	18	27
08/04/2023	21:46:00	1.3	1.8	18	19
08/04/2023	21:47:00	1.3	1.7	18	28
08/04/2023	21:48:00	1.1	1.5	18	29
08/04/2023	21:49:00	1.5	2	18	26
08/04/2023	21:50:00	1.3	1.6	18	21
08/04/2023	21:51:00	1.1	1.5	18	22
08/04/2023	21:52:00	1.2	2.1	18	20
08/04/2023	21:53:00	1.2	1.6	18	21
08/04/2023	21:54:00	1.2	1.5	18	33
08/04/2023	21:55:00	1	1.3	18	26
08/04/2023	21:56:00	1.1	1.3	18	26
08/04/2023	21:57:00	1.1	1.4	18	34
08/04/2023	21:58:00	1	1.3	18	23
08/04/2023	21:59:00	0.9	1.2	18	38
08/04/2023	22:00:00	0.8	1	18	38
08/04/2023	22:01:00	0.8	1.1	18	36
08/04/2023	22:02:00	0.8	1.1	18	47
08/04/2023	22:03:00	0.7	1	18	51
08/04/2023	22:04:00	0.9	1.1	18	46
08/04/2023	22:05:00	0.8	1	18	42
08/04/2023	22:06:00	0.9	1.5	18	39
08/04/2023	22:07:00	0.9	1.3	18	27
08/04/2023	22:08:00	1.1	1.6	18	36
08/04/2023	22:09:00	1.1	1.4	18	37
08/04/2023	22:10:00	1.2	1.7	17	31
08/04/2023	22:11:00	1.2	1.5	17	27
08/04/2023	22:12:00	1.1	1.3	17	29
08/04/2023	22:13:00	1	1.1	17	26
08/04/2023	22:14:00	1	1.3	17	21
08/04/2023	22:15:00	0.8	1.1	17	27
08/04/2023	22:16:00	0.8	1.1	17	29
08/04/2023	22:17:00	0.9	1.2	17	35
08/04/2023	22:18:00	0.9	1.1	17	32
08/04/2023	22:19:00	0.9	1.2	17	38
08/04/2023	22:20:00	1	1.3	17	30
08/04/2023	22:21:00	1.1	1.3	17	21
08/04/2023	22:22:00	1	1.4	17	34
08/04/2023	22:23:00	1.1	1.4	17	28
08/04/2023	22:24:00	1	1.3	17	30
08/04/2023	22:25:00	0.9	1.1	17	37
08/04/2023	22:26:00	0.9	1.2	17	31
08/04/2023	22:27:00	0.8	1.1	17	39
08/04/2023	22:28:00	0.9	1.1	17	39
08/04/2023	22:29:00	0.9	1.2	17	38
08/04/2023	22:30:00	0.7	1.2	17	30
08/04/2023	22:31:00	0.6	0.8	17	42
08/04/2023	22:32:00	0.4	0.7	17	67

Date	Time	Windspeed average	Wind speed maximum	Temperature	Wind Direction
08/04/2023	22:33:00	0.6	0.9	17	56
08/04/2023	22:34:00	0.4	0.8	17	29
08/04/2023	22:35:00	0	0	17	nW
08/04/2023	22:36:00	0	0	17	nW
08/04/2023	22:37:00	0	0	17	nW
08/04/2023	22:38:00	0	0.6	17	nW
08/04/2023	22:39:00	0.1	0.7	17	57
08/04/2023	22:40:00	0	0.6	17	nW
08/04/2023	22:41:00	0.2	0.7	17	104
08/04/2023	22:42:00	0.2	0.7	16	121
08/04/2023	22:43:00	0	0.6	16	nW
08/04/2023	22:44:00	0	0	16	nW
08/04/2023	22:45:00	0	0	16	nW
08/04/2023	22:46:00	0	0	16	nW
08/04/2023	22:47:00	0	0	16	nW
08/04/2023	22:48:00	0	0	16	nW
08/04/2023	22:49:00	0.2	0.8	16	62
08/04/2023	22:50:00	0.1	0.7	16	52
08/04/2023	22:51:00	0.5	1.3	16	46
08/04/2023	22:52:00	1	1.2	15	34
08/04/2023	22:53:00	1	1.3	15	39
08/04/2023	22:54:00	0.9	1.2	15	42
08/04/2023	22:55:00	1.1	1.3	15	39
08/04/2023	22:56:00	1	1.4	15	33
08/04/2023	22:57:00	0.9	1.1	15	27
08/04/2023	22:58:00	1	1.3	15	28
08/04/2023	22:59:00	1	1.3	15	37
08/04/2023	23:00:00	1.1	1.7	15	28
08/04/2023	23:01:00	1.1	1.4	15	24
08/04/2023	23:02:00	1.2	1.6	15	22
08/04/2023	23:03:00	1	1.2	15	25
08/04/2023	23:04:00	1	1.4	15	23
08/04/2023	23:05:00	1.2	1.9	16	19
08/04/2023	23:06:00	1.3	1.8	16	26
08/04/2023	23:07:00	1.3	1.6	16	24
08/04/2023	23:08:00	1.9	3	16	27
08/04/2023	23:09:00	1.3	2	16	16
08/04/2023	23:10:00	1.3	2	16	16
08/04/2023	23:11:00	1.4	2.6	16	16
08/04/2023	23:12:00	1.6	2.2	16	14
08/04/2023	23:13:00	1.6	2.4	16	21
08/04/2023	23:14:00	1.3	1.7	16	11
08/04/2023	23:15:00	1.2	1.8	17	18
08/04/2023	23:16:00	1.3	2.2	17	18
08/04/2023	23:17:00	1.2	1.9	17	21
08/04/2023	23:18:00	1.5	2	17	24
08/04/2023	23:19:00	1.6	2.4	17	21
08/04/2023	23:20:00	1.5	1.8	17	18
08/04/2023	23:21:00	1.4	2	17	14
08/04/2023	23:22:00	1.4	1.9	17	19
08/04/2023	23:23:00	1.3	1.8	17	25
08/04/2023	23:24:00	1.5	2.1	17	26
08/04/2023	23:25:00	1.4	2	17	33
08/04/2023	23:26:00	1.3	2.2	17	24
08/04/2023	23:27:00	1.6	2.4	17	30
08/04/2023	23:28:00	1.6	2.2	17	35
08/04/2023	23:29:00	1.9	2.9	17	27
08/04/2023	23:30:00	1.9	2.7	17	28
08/04/2023	23:31:00	1.6	2.2	17	30
08/04/2023	23:32:00	1.4	2	17	51
08/04/2023	23:33:00	1.2	2.3	17	37
08/04/2023	23:34:00	1	1.7	17	48

Date	Time	Windspeed average	Wind speed maximum	Temperature	Wind Direction
08/04/2023	23:35:00	0.9	1.4	17	61
08/04/2023	23:36:00	1.1	1.7	17	39
08/04/2023	23:37:00	1.4	2.4	17	41
08/04/2023	23:38:00	1.5	2.4	17	38
08/04/2023	23:39:00	1.7	2.8	17	35
08/04/2023	23:40:00	1.6	2.4	17	44
08/04/2023	23:41:00	1.4	2.3	17	43
08/04/2023	23:42:00	1.5	2.3	17	50
08/04/2023	23:43:00	1.3	2.1	17	55
08/04/2023	23:44:00	1	1.5	17	47
08/04/2023	23:45:00	1.2	2.1	17	44
08/04/2023	23:46:00	1	1.7	17	32
08/04/2023	23:47:00	1	1.4	17	48
08/04/2023	23:48:00	1	1.8	17	44
08/04/2023	23:49:00	1	1.8	17	51
08/04/2023	23:50:00	1	1.8	17	50
08/04/2023	23:51:00	0.9	1.5	17	79
08/04/2023	23:52:00	1.1	1.7	17	52
08/04/2023	23:53:00	0.8	1.2	17	27
08/04/2023	23:54:00	0.7	1.3	17	70
08/04/2023	23:55:00	0.5	0.8	17	61
08/04/2023	23:56:00	0.2	0.7	17	70
08/04/2023	23:57:00	0.8	1.3	17	64
08/04/2023	23:58:00	0.9	1.4	17	60
08/04/2023	23:59:00	1.1	1.9	17	65
09/04/2023	00:00:00	0.8	1.4	17	69
09/04/2023	00:01:00	0.9	1.4	16	53
09/04/2023	00:02:00	0.9	1.5	16	51
09/04/2023	00:03:00	0.7	1.1	16	61
09/04/2023	00:04:00	0.7	0.8	16	56
09/04/2023	00:05:00	0.3	0.8	16	78
09/04/2023	00:06:00	0	0	16	nW
09/04/2023	00:07:00	0	0	16	nW
09/04/2023	00:08:00	0	0	16	nW
09/04/2023	00:09:00	0	0	16	nW
09/04/2023	00:10:00	0	0	16	nW
09/04/2023	00:11:00	0	0	16	nW
09/04/2023	00:12:00	0	0	16	nW
09/04/2023	00:13:00	0	0.8	16	nW
09/04/2023	00:14:00	0.1	0.7	16	77
09/04/2023	00:15:00	0	0	16	nW
09/04/2023	00:16:00	0.1	0.8	15	71
09/04/2023	00:17:00	0	0	15	nW
09/04/2023	00:18:00	0.1	0.9	15	66
09/04/2023	00:19:00	0.8	1.1	15	48
09/04/2023	00:20:00	0.7	1.7	15	54
09/04/2023	00:21:00	1.3	1.8	14	33
09/04/2023	00:22:00	1.1	1.7	14	43
09/04/2023	00:23:00	1	1.4	14	47
09/04/2023	00:24:00	1.1	2.2	14	48
09/04/2023	00:25:00	1	1.7	14	57
09/04/2023	00:26:00	1	1.4	14	49
09/04/2023	00:27:00	1.3	2	14	41
09/04/2023	00:28:00	1.3	2.3	14	47
09/04/2023	00:29:00	1.1	1.6	14	35
09/04/2023	00:30:00	1.1	2	14	40
09/04/2023	00:31:00	1.2	2.1	14	45
09/04/2023	00:32:00	1.3	2.1	14	41
09/04/2023	00:33:00	1	2	15	57
09/04/2023	00:34:00	1.3	2	15	37
09/04/2023	00:35:00	1.1	1.9	15	77
09/04/2023	00:36:00	1.1	1.9	15	64

Date	Time	Windspeed average	Wind speed maximum	Temperature	Wind Direction
09/04/2023	00:37:00	1	2	15	64
09/04/2023	00:38:00	0.9	1.6	16	64
09/04/2023	00:39:00	0.7	1.4	16	50
09/04/2023	00:40:00	0.8	1.3	16	91
09/04/2023	00:41:00	0.8	1.1	16	78
09/04/2023	00:42:00	0.6	1.4	16	91
09/04/2023	00:43:00	0.5	1	16	88
09/04/2023	00:44:00	0.4	0.8	16	72
09/04/2023	00:45:00	0.3	0.8	16	111
09/04/2023	00:46:00	0	0	16	nW
09/04/2023	00:47:00	0	0	16	nW
09/04/2023	00:48:00	0.4	1	16	65
09/04/2023	00:49:00	0.7	1.7	16	55
09/04/2023	00:50:00	0.7	1.5	16	65
09/04/2023	00:51:00	0.7	0.9	16	69
09/04/2023	00:52:00	0.9	1.4	16	50
09/04/2023	00:53:00	0.9	1.5	16	61
09/04/2023	00:54:00	1	1.9	16	52
09/04/2023	00:55:00	1	2.1	16	44
09/04/2023	00:56:00	1.1	2.2	16	57
09/04/2023	00:57:00	1.1	2	16	65
09/04/2023	00:58:00	1.5	2	16	49
09/04/2023	00:59:00	1	1.5	16	60
09/04/2023	01:00:00	1.2	1.9	16	20
09/04/2023	01:01:00	1.4	2	16	46
09/04/2023	01:02:00	1.5	2.5	16	35
09/04/2023	01:03:00	1.3	2	16	21
09/04/2023	01:04:00	1.3	2	16	37
09/04/2023	01:05:00	1.5	2.6	16	21
09/04/2023	01:06:00	1.3	2.4	16	51
09/04/2023	01:07:00	1.2	2	16	60
09/04/2023	01:08:00	1.2	1.9	16	51
09/04/2023	01:09:00	1.3	2.4	16	36
09/04/2023	01:10:00	1.2	2	16	63
09/04/2023	01:11:00	1.4	2.2	16	48
09/04/2023	01:12:00	1.5	2.6	16	50
09/04/2023	01:13:00	1.1	1.7	16	43
09/04/2023	01:14:00	0.9	1.5	16	47
09/04/2023	01:15:00	1.1	1.9	16	42
09/04/2023	01:16:00	1.2	1.8	16	61
09/04/2023	01:17:00	1	1.8	16	67
09/04/2023	01:18:00	0.7	1.7	16	84
09/04/2023	01:19:00	0.7	1.2	16	127
09/04/2023	01:20:00	0.9	1.6	16	90
09/04/2023	01:21:00	0.6	1.3	16	57
09/04/2023	01:22:00	0.6	1.1	16	42
09/04/2023	01:23:00	0.4	0.9	16	102
09/04/2023	01:24:00	0.7	1.6	16	80
09/04/2023	01:25:00	0.2	0.8	16	101
09/04/2023	01:26:00	0.6	1	16	54
09/04/2023	01:27:00	0.6	1	16	72
09/04/2023	01:28:00	0.8	1.1	16	80
09/04/2023	01:29:00	0.4	1.5	16	67
09/04/2023	01:30:00	0.8	1.3	16	67
09/04/2023	01:31:00	0.7	1.5	16	79
09/04/2023	01:32:00	0.4	0.8	16	109
09/04/2023	01:33:00	0.5	1.2	16	99
09/04/2023	01:34:00	0.6	1.2	16	68
09/04/2023	01:35:00	0.3	0.9	16	97
09/04/2023	01:36:00	0.4	1.4	16	89
09/04/2023	01:37:00	0.3	0.9	16	68
09/04/2023	01:38:00	0	0	16	nW

Date	Time	Windspeed average	Wind speed maximum	Temperature	Wind Direction
09/04/2023	01:39:00	0.1	0.8	16	77
09/04/2023	01:40:00	0	0	16	nW
09/04/2023	01:41:00	0	0	16	nW
09/04/2023	01:42:00	0.1	0.7	16	86
09/04/2023	01:43:00	0	0	16	nW
09/04/2023	01:44:00	0	0	16	nW
09/04/2023	01:45:00	0.3	1.3	16	116
09/04/2023	01:46:00	0.6	0.8	16	118
09/04/2023	01:47:00	0.4	0.9	16	140
09/04/2023	01:48:00	0.7	1	15	125
09/04/2023	01:49:00	0.7	1	15	115
09/04/2023	01:50:00	0.6	0.8	15	106
09/04/2023	01:51:00	0.2	0.9	15	84
09/04/2023	01:52:00	0.3	0.8	15	111
09/04/2023	01:53:00	0.5	1	15	112
09/04/2023	01:54:00	0.8	1.4	15	115
09/04/2023	01:55:00	1	1.5	15	128
09/04/2023	01:56:00	0.7	1.1	15	118
09/04/2023	01:57:00	0.6	0.9	15	129
09/04/2023	01:58:00	0.7	0.9	15	127
09/04/2023	01:59:00	0.6	0.8	15	132
09/04/2023	02:00:00	0.7	0.8	15	125
09/04/2023	02:01:00	0.5	0.8	15	133
09/04/2023	02:02:00	0.4	0.7	15	123
09/04/2023	02:03:00	0.4	0.7	15	122
09/04/2023	02:04:00	0.7	1	15	133
09/04/2023	02:05:00	0.8	1.3	15	137
09/04/2023	02:06:00	0.9	1.4	15	130
09/04/2023	02:07:00	0.7	0.9	15	115
09/04/2023	02:08:00	0.8	1.5	15	122
09/04/2023	02:09:00	0.7	0.9	15	117
09/04/2023	02:10:00	0.7	0.9	15	124
09/04/2023	02:11:00	0.7	0.9	15	126
09/04/2023	02:12:00	0.7	1	15	123
09/04/2023	02:13:00	0.5	0.9	15	133
09/04/2023	02:14:00	0.8	1.5	15	126
09/04/2023	02:15:00	0.8	1.6	15	124
09/04/2023	02:16:00	0.8	1	15	120
09/04/2023	02:17:00	0.4	0.8	15	110
09/04/2023	02:18:00	0.3	0.7	15	108
09/04/2023	02:19:00	0.6	0.7	15	108
09/04/2023	02:20:00	0.4	0.7	15	104
09/04/2023	02:21:00	0	0.6	15	nW
09/04/2023	02:22:00	0	0	15	nW
09/04/2023	02:23:00	0	0.6	15	nW
09/04/2023	02:24:00	0.1	0.9	15	101
09/04/2023	02:25:00	0.6	1	15	158
09/04/2023	02:26:00	0.6	1	15	124
09/04/2023	02:27:00	0.6	0.9	15	126
09/04/2023	02:28:00	0.7	0.9	15	131
09/04/2023	02:29:00	0.8	1.3	15	125
09/04/2023	02:30:00	0.8	1.2	15	129
09/04/2023	02:31:00	0.8	1.2	15	129
09/04/2023	02:32:00	0.7	0.9	15	111
09/04/2023	02:33:00	0.2	0.8	15	154
09/04/2023	02:34:00	0.3	0.8	15	160
09/04/2023	02:35:00	0.5	0.8	15	120
09/04/2023	02:36:00	0.4	0.8	15	170
09/04/2023	02:37:00	0.2	0.7	15	94
09/04/2023	02:38:00	0	0	15	nW
09/04/2023	02:39:00	0.1	0.7	15	90
09/04/2023	02:40:00	0.1	0.6	15	76

Date	Time	Windspeed average	Wind speed maximum	Temperature	Wind Direction
09/04/2023	02:41:00	0.5	0.8	15	184
09/04/2023	02:42:00	0.4	1	15	129
09/04/2023	02:43:00	0.3	0.9	16	105
09/04/2023	02:44:00	0	0	16	nW
09/04/2023	02:45:00	0.7	2.1	16	39
09/04/2023	02:46:00	1.6	2.2	16	26
09/04/2023	02:47:00	2.4	3.2	16	28
09/04/2023	02:48:00	2.5	3.5	16	28
09/04/2023	02:49:00	3.1	4	16	23
09/04/2023	02:50:00	1.6	2.4	16	59
09/04/2023	02:51:00	0.9	1.4	16	80
09/04/2023	02:52:00	1.1	2.4	16	66
09/04/2023	02:53:00	1	1.5	16	286
09/04/2023	02:54:00	1.1	1.7	16	144
09/04/2023	02:55:00	1.3	2.1	16	137
09/04/2023	02:56:00	1.1	1.8	16	256
09/04/2023	02:57:00	1.4	2.3	16	64
09/04/2023	02:58:00	0.9	1.4	16	79
09/04/2023	02:59:00	1	1.6	16	44
09/04/2023	03:00:00	1.3	1.8	16	12
09/04/2023	03:01:00	1.8	2.5	17	18
09/04/2023	03:02:00	1.9	2.6	17	42
09/04/2023	03:03:00	1	1.7	17	117
09/04/2023	03:04:00	1	1.3	17	183
09/04/2023	03:05:00	1.7	2.1	17	168
09/04/2023	03:06:00	2	2.8	17	166
09/04/2023	03:07:00	2	3.1	17	143
09/04/2023	03:08:00	1	1.5	17	128
09/04/2023	03:09:00	0.5	1	17	87
09/04/2023	03:10:00	0.7	0.9	17	313
09/04/2023	03:11:00	0.9	2.6	17	84
09/04/2023	03:12:00	1.9	3.1	17	46
09/04/2023	03:13:00	3.9	4.9	17	16
09/04/2023	03:14:00	3.9	4.8	17	25
09/04/2023	03:15:00	3.8	5.3	17	10
09/04/2023	03:16:00	3.7	5.6	17	358
09/04/2023	03:17:00	3.1	5.1	17	359
09/04/2023	03:18:00	3.8	6.4	17	3
09/04/2023	03:19:00	4.7	6.6	18	360
09/04/2023	03:20:00	4.5	6.8	18	10
09/04/2023	03:21:00	2.7	4.5	18	27
09/04/2023	03:22:00	2.4	4	18	32
09/04/2023	03:23:00	2.2	4.9	18	50
09/04/2023	03:24:00	2.1	4	18	74
09/04/2023	03:25:00	1.8	3.6	18	110
09/04/2023	03:26:00	1	1.4	18	191
09/04/2023	03:27:00	1.1	1.4	18	132
09/04/2023	03:28:00	1.1	1.6	19	125
09/04/2023	03:29:00	1	1.3	19	204
09/04/2023	03:30:00	0.8	1.1	19	151
09/04/2023	03:31:00	1.2	2.4	19	128
09/04/2023	03:32:00	1	1.7	19	123
09/04/2023	03:33:00	0.8	1.4	19	93
09/04/2023	03:34:00	1.1	1.6	19	314
09/04/2023	03:35:00	1.1	1.9	19	69
09/04/2023	03:36:00	1.7	3.6	19	35
09/04/2023	03:37:00	1.3	2.1	19	57
09/04/2023	03:38:00	2.2	3.5	19	36
09/04/2023	03:39:00	1.3	2.3	19	52
09/04/2023	03:40:00	0.7	1.1	19	136
09/04/2023	03:41:00	0.9	1.3	19	118
09/04/2023	03:42:00	0.1	0.7	19	119

Date	Time	Windspeed average	Wind speed maximum	Temperature	Wind Direction
09/04/2023	03:43:00	0.2	0.8	19	113
09/04/2023	03:44:00	0	0	19	nW
09/04/2023	03:45:00	0.1	0.7	19	80
09/04/2023	03:46:00	0.6	2	19	70
09/04/2023	03:47:00	1	2.3	19	203
09/04/2023	03:48:00	1.5	2.6	19	47
09/04/2023	03:49:00	0.9	1.7	19	129
09/04/2023	03:50:00	1.2	1.9	19	226
09/04/2023	03:51:00	0.9	1.5	19	141
09/04/2023	03:52:00	0.7	1.2	19	155
09/04/2023	03:53:00	0.3	0.9	19	110
09/04/2023	03:54:00	0.2	0.7	19	127
09/04/2023	03:55:00	0.4	1	19	46
09/04/2023	03:56:00	0.7	1.1	19	148
09/04/2023	03:57:00	1.2	1.5	19	149
09/04/2023	03:58:00	0.7	1.6	19	100
09/04/2023	03:59:00	0.6	1.1	19	334
09/04/2023	04:00:00	1.1	1.4	19	315
09/04/2023	04:01:00	1.4	1.6	19	321
09/04/2023	04:02:00	1.4	1.8	19	318
09/04/2023	04:03:00	1.4	2.7	19	208
09/04/2023	04:04:00	1.5	2.4	19	187
09/04/2023	04:05:00	1.5	2.8	19	205
09/04/2023	04:06:00	1.7	2.9	19	172
09/04/2023	04:07:00	1.5	2.8	19	169
09/04/2023	04:08:00	2.3	4.3	19	167
09/04/2023	04:09:00	1.9	3.4	19	180
09/04/2023	04:10:00	1.7	3.1	19	258
09/04/2023	04:11:00	2.2	3.1	19	265
09/04/2023	04:12:00	1.4	2.4	19	250
09/04/2023	04:13:00	0.4	0.9	19	160
09/04/2023	04:14:00	0	0.6	19	nW
09/04/2023	04:15:00	0.7	1.2	19	178
09/04/2023	04:16:00	0.4	0.9	19	174
09/04/2023	04:17:00	0.4	1	19	175
09/04/2023	04:18:00	0.6	0.9	19	46
09/04/2023	04:19:00	0.2	0.9	19	41
09/04/2023	04:20:00	0.1	0.8	19	36
09/04/2023	04:21:00	0.4	1.3	19	73
09/04/2023	04:22:00	0.8	2	19	133
09/04/2023	04:23:00	0.9	1.6	19	41
09/04/2023	04:24:00	1	1.7	19	72
09/04/2023	04:25:00	0.3	0.9	19	77
09/04/2023	04:26:00	0.5	1.2	19	23
09/04/2023	04:27:00	1.3	1.9	19	41
09/04/2023	04:28:00	1	1.7	19	77
09/04/2023	04:29:00	1	1.7	19	47
09/04/2023	04:30:00	1.2	1.9	19	31
09/04/2023	04:31:00	1.7	2.5	19	30
09/04/2023	04:32:00	1.5	2.7	19	26
09/04/2023	04:33:00	1.7	2.9	19	30
09/04/2023	04:34:00	1.3	1.9	19	2
09/04/2023	04:35:00	1.3	1.7	19	42
09/04/2023	04:36:00	0.4	1.2	19	36
09/04/2023	04:37:00	0.5	1.2	19	54
09/04/2023	04:38:00	0.8	1.6	19	192
09/04/2023	04:39:00	0.6	1	19	128
09/04/2023	04:40:00	0.8	1.3	19	110
09/04/2023	04:41:00	0.7	1.1	18	337
09/04/2023	04:42:00	0.6	1.1	18	130
09/04/2023	04:43:00	0.9	1.2	18	24
09/04/2023	04:44:00	0.7	1.5	18	295

Date	Time	Windspeed average	Wind speed maximum	Temperature	Wind Direction
09/04/2023	04:45:00	1	1.6	18	68
09/04/2023	04:46:00	1.1	2.1	18	64
09/04/2023	04:47:00	0.9	1.8	18	167
09/04/2023	04:48:00	0.9	1.4	18	144
09/04/2023	04:49:00	0.9	1.3	18	95
09/04/2023	04:50:00	0.9	1.5	18	170
09/04/2023	04:51:00	1.3	2.8	18	4
09/04/2023	04:52:00	0.9	1.3	18	35
09/04/2023	04:53:00	0.6	1	18	196
09/04/2023	04:54:00	0.8	1.6	18	101
09/04/2023	04:55:00	0.9	1.6	18	71
09/04/2023	04:56:00	0.2	0.8	18	90
09/04/2023	04:57:00	0.8	2.1	18	107
09/04/2023	04:58:00	0.7	1.1	18	106
09/04/2023	04:59:00	0.9	1.5	18	56
09/04/2023	05:00:00	0.7	1.5	18	29
09/04/2023	05:01:00	0.9	1.6	18	84
09/04/2023	05:02:00	0.6	1.6	18	51
09/04/2023	05:03:00	0.9	1.7	18	58
09/04/2023	05:04:00	1.3	1.8	18	46
09/04/2023	05:05:00	1.1	1.7	18	48
09/04/2023	05:06:00	1.2	2	18	40
09/04/2023	05:07:00	1.4	2.7	18	48
09/04/2023	05:08:00	1.6	2.5	18	42
09/04/2023	05:09:00	1.2	2.1	18	58
09/04/2023	05:10:00	1.1	1.8	18	22
09/04/2023	05:11:00	1	1.5	18	34
09/04/2023	05:12:00	1	2	18	77
09/04/2023	05:13:00	1.1	1.7	18	50
09/04/2023	05:14:00	1.4	2.4	18	63
09/04/2023	05:15:00	1.6	2.4	18	32
09/04/2023	05:16:00	1.8	2.5	18	21
09/04/2023	05:17:00	1.9	2.6	18	25
09/04/2023	05:18:00	1.8	2.6	18	31
09/04/2023	05:19:00	2.1	3.4	18	13
09/04/2023	05:20:00	2.4	3.2	18	3
09/04/2023	05:21:00	1.6	2.6	18	0
09/04/2023	05:22:00	1.1	1.6	18	352
09/04/2023	05:23:00	1.2	1.7	19	344
09/04/2023	05:24:00	1.3	1.6	19	322
09/04/2023	05:25:00	1.2	1.5	19	311
09/04/2023	05:26:00	1.1	1.5	19	294
09/04/2023	05:27:00	1.3	1.9	18	298
09/04/2023	05:28:00	1.4	1.8	18	313
09/04/2023	05:29:00	1.6	2.1	18	318
09/04/2023	05:30:00	1.6	2.3	18	314
09/04/2023	05:31:00	1.7	2.1	18	318
09/04/2023	05:32:00	1.5	2.1	18	325
09/04/2023	05:33:00	1.6	2.3	18	331
09/04/2023	05:34:00	1.4	1.8	18	318
09/04/2023	05:35:00	1.5	2	18	318
09/04/2023	05:36:00	1.1	1.7	18	308
09/04/2023	05:37:00	1.4	3	18	305
09/04/2023	05:38:00	1.2	1.9	18	306
09/04/2023	05:39:00	1.3	1.9	18	291
09/04/2023	05:40:00	1.6	2.3	18	291
09/04/2023	05:41:00	1.5	2.6	18	291
09/04/2023	05:42:00	2.5	3.8	18	283
09/04/2023	05:43:00	2.4	4.2	18	285
09/04/2023	05:44:00	1.7	3.2	18	296
09/04/2023	05:45:00	2.1	2.9	18	283
09/04/2023	05:46:00	2.1	3.6	18	277

Date	Time	Windspeed average	Wind speed maximum	Temperature	Wind Direction
09/04/2023	05:47:00	2.1	3.7	18	321
09/04/2023	05:48:00	3.5	5.9	18	287
09/04/2023	05:49:00	2.5	3.7	18	280
09/04/2023	05:50:00	3.5	5.1	18	284
09/04/2023	05:51:00	3	4.9	18	292
09/04/2023	05:52:00	2.6	4.2	18	301
09/04/2023	05:53:00	2.1	3.4	18	304
09/04/2023	05:54:00	2.2	3.3	18	316
09/04/2023	05:55:00	1.5	2.8	18	289
09/04/2023	05:56:00	1.4	2.3	18	306
09/04/2023	05:57:00	1.1	2	19	309
09/04/2023	05:58:00	1.2	1.9	19	290
09/04/2023	05:59:00	1.1	1.9	19	265
09/04/2023	06:00:00	1.1	1.8	19	296
09/04/2023	06:01:00	1.2	1.8	19	272
09/04/2023	06:02:00	0.9	1.4	19	290
09/04/2023	06:03:00	0.5	0.9	19	263
09/04/2023	06:04:00	0	0.6	19	nW
09/04/2023	06:05:00	0.4	0.7	19	75
09/04/2023	06:06:00	0.6	0.9	19	69
09/04/2023	06:07:00	0.7	1.4	19	98
09/04/2023	06:08:00	0.7	1.1	19	225
09/04/2023	06:09:00	0.6	1.4	19	159
09/04/2023	06:10:00	0.8	1.8	19	191
09/04/2023	06:11:00	0.9	1.3	18	210
09/04/2023	06:12:00	1	1.8	18	201
09/04/2023	06:13:00	0.9	1.3	18	227
09/04/2023	06:14:00	0.8	1.4	18	185
09/04/2023	06:15:00	0.8	1.5	18	165
09/04/2023	06:16:00	0.9	1.2	18	219
09/04/2023	06:17:00	1	1.6	18	14
09/04/2023	06:18:00	1.4	2.1	18	23
09/04/2023	06:19:00	1.4	2	18	31
09/04/2023	06:20:00	0.9	1.3	18	16
09/04/2023	06:21:00	0.6	0.8	18	338
09/04/2023	06:22:00	0.7	1	18	247
09/04/2023	06:23:00	0.1	0.7	18	242
09/04/2023	06:24:00	0.3	0.8	18	272
09/04/2023	06:25:00	0.9	1.4	18	17
09/04/2023	06:26:00	1.5	1.7	18	20
09/04/2023	06:27:00	1.2	1.6	18	352
09/04/2023	06:28:00	0.9	1.4	18	299
09/04/2023	06:29:00	1.1	1.4	18	181
09/04/2023	06:30:00	1	1.4	18	219
09/04/2023	06:31:00	0.9	1.2	18	291
09/04/2023	06:32:00	0.7	1	18	11
09/04/2023	06:33:00	0.7	0.9	18	85
09/04/2023	06:34:00	0.4	0.8	18	106
09/04/2023	06:35:00	0.6	1.4	18	106
09/04/2023	06:36:00	1.1	2	18	211
09/04/2023	06:37:00	0.5	1.2	18	167
09/04/2023	06:38:00	0.3	0.8	18	277
09/04/2023	06:39:00	1.1	2	18	174
09/04/2023	06:40:00	2.7	4.1	18	155
09/04/2023	06:41:00	2.1	3	18	156
09/04/2023	06:42:00	2.1	3.3	18	154
09/04/2023	06:43:00	2	3	18	172
09/04/2023	06:44:00	1.1	1.5	18	181
09/04/2023	06:45:00	1.3	2.2	18	176
09/04/2023	06:46:00	0.7	1.1	18	206
09/04/2023	06:47:00	0.5	1	18	219
09/04/2023	06:48:00	0.5	0.9	18	194

Date	Time	Windspeed average	Wind speed maximum	Temperature	Wind Direction
09/04/2023	06:49:00	1.2	2.1	18	228
09/04/2023	06:50:00	0.4	1.3	18	197
09/04/2023	06:51:00	1	1.2	18	224
09/04/2023	06:52:00	0.8	1.2	18	192
09/04/2023	06:53:00	1.3	2	18	302
09/04/2023	06:54:00	1.6	2.5	18	308
09/04/2023	06:55:00	1.9	2.9	18	288
09/04/2023	06:56:00	2.8	4.4	18	266
09/04/2023	06:57:00	2.8	3.9	18	258
09/04/2023	06:58:00	2.2	3.3	18	268
09/04/2023	06:59:00	1.6	3	18	285
09/04/2023	07:00:00	1.5	2.1	18	272
09/04/2023	07:01:00	1.7	2.7	18	267
09/04/2023	07:02:00	1.1	1.6	18	304
09/04/2023	07:03:00	1.1	1.5	18	350
09/04/2023	07:04:00	1.1	1.5	18	311
09/04/2023	07:05:00	1.5	2.4	18	275
09/04/2023	07:06:00	1.1	1.6	18	179
09/04/2023	07:07:00	0.8	1.4	18	123
09/04/2023	07:08:00	1.1	1.6	18	182
09/04/2023	07:09:00	1.2	1.9	17	256
09/04/2023	07:10:00	1.7	2.9	17	306
09/04/2023	07:11:00	1.4	1.9	17	349
09/04/2023	07:12:00	1	1.9	17	6
09/04/2023	07:13:00	1.4	2.1	17	43
09/04/2023	07:14:00	1.7	3.3	17	47
09/04/2023	07:15:00	1.9	3.3	17	18
09/04/2023	07:16:00	1	1.4	17	19
09/04/2023	07:17:00	0.9	1.4	17	163
09/04/2023	07:18:00	1.7	2.5	17	157
09/04/2023	07:19:00	1.7	2.3	17	168
09/04/2023	07:20:00	1.5	2.5	17	155
09/04/2023	07:21:00	1	1.7	16	79
09/04/2023	07:22:00	0.7	1.1	16	99
09/04/2023	07:23:00	1.1	1.9	16	174
09/04/2023	07:24:00	1.7	3.4	16	129
09/04/2023	07:25:00	0.9	1.3	16	147
09/04/2023	07:26:00	1	1.5	16	179
09/04/2023	07:27:00	1.1	1.5	16	138
09/04/2023	07:28:00	1.1	1.9	16	128
09/04/2023	07:29:00	0.8	1.1	16	50
09/04/2023	07:30:00	1	1.5	16	60
09/04/2023	07:31:00	0.9	2.4	16	345
09/04/2023	07:32:00	0.9	1.6	16	190
09/04/2023	07:33:00	0.9	1.3	16	32
09/04/2023	07:34:00	0.7	1.1	16	10
09/04/2023	07:35:00	0.6	1.2	16	350
09/04/2023	07:36:00	1	1.5	16	38
09/04/2023	07:37:00	0.3	1.3	16	6
09/04/2023	07:38:00	0.9	1.8	16	65
09/04/2023	07:39:00	0.6	1.1	16	133
09/04/2023	07:40:00	0	0	16	nW
09/04/2023	07:41:00	0.1	0.7	16	96
09/04/2023	07:42:00	0.3	0.9	16	111
09/04/2023	07:43:00	0.9	1.4	16	128
09/04/2023	07:44:00	1.1	1.5	16	128
09/04/2023	07:45:00	1.2	1.7	16	129
09/04/2023	07:46:00	1.6	2.4	16	138
09/04/2023	07:47:00	2	3.3	16	148
09/04/2023	07:48:00	1.5	2.8	16	141
09/04/2023	07:49:00	1.8	2.6	16	140
09/04/2023	07:50:00	2	3.2	16	139

Date	Time	Windspeed average	Wind speed maximum	Temperature	Wind Direction
09/04/2023	07:51:00	1.9	2.7	16	135
09/04/2023	07:52:00	2.2	2.9	16	149
09/04/2023	07:53:00	2.1	3.3	16	148
09/04/2023	07:54:00	1.9	3.3	16	152
09/04/2023	07:55:00	2.2	3.6	17	142
09/04/2023	07:56:00	0.9	1.8	17	95
09/04/2023	07:57:00	1.1	1.7	17	113
09/04/2023	07:58:00	1.3	2.8	17	125
09/04/2023	07:59:00	1.2	2.9	17	157
09/04/2023	08:00:00	1.1	1.8	17	170
09/04/2023	08:01:00	0.6	0.9	17	127
09/04/2023	08:02:00	0.6	1.2	17	102
09/04/2023	08:03:00	0.8	1.8	17	49
09/04/2023	08:04:00	1	2.1	17	71
09/04/2023	08:05:00	0.9	1.5	17	130
09/04/2023	08:06:00	1	1.8	17	150
09/04/2023	08:07:00	1.1	1.9	17	121
09/04/2023	08:08:00	1.3	3.1	17	60
09/04/2023	08:09:00	0.9	3.1	17	132
09/04/2023	08:10:00	1.1	3.9	17	76
09/04/2023	08:11:00	0.7	0.9	17	118
09/04/2023	08:12:00	0.4	0.9	17	124
09/04/2023	08:13:00	0.8	2.2	17	164
09/04/2023	08:14:00	1	2.1	17	162
09/04/2023	08:15:00	1	2.4	17	242
09/04/2023	08:16:00	0.9	1.8	17	122
09/04/2023	08:17:00	0.8	1.5	17	202
09/04/2023	08:18:00	0.7	1.2	17	157
09/04/2023	08:19:00	0.8	1.5	17	224
09/04/2023	08:20:00	0.9	1.5	17	200
09/04/2023	08:21:00	0.8	1.1	17	271
09/04/2023	08:22:00	0.7	1.1	17	228
09/04/2023	08:23:00	0.6	0.9	17	144
09/04/2023	08:24:00	1	1.9	17	121
09/04/2023	08:25:00	1.2	2	17	82
09/04/2023	08:26:00	1.2	2.5	17	120
09/04/2023	08:27:00	1	1.9	17	154
09/04/2023	08:28:00	1	2	17	74
09/04/2023	08:29:00	1	1.5	17	182
09/04/2023	08:30:00	0.8	1.3	17	135
09/04/2023	08:31:00	1.1	2.2	17	98
09/04/2023	08:32:00	1	1.6	17	38
09/04/2023	08:33:00	1.1	2	17	79
09/04/2023	08:34:00	0.9	1.3	17	153
09/04/2023	08:35:00	0.7	1	17	102
09/04/2023	08:36:00	0.6	1	17	144
09/04/2023	08:37:00	0.7	1.1	17	190
09/04/2023	08:38:00	0.8	1.1	17	119
09/04/2023	08:39:00	0.6	1.4	17	109
09/04/2023	08:40:00	1.1	1.9	17	158
09/04/2023	08:41:00	0.9	2	17	174
09/04/2023	08:42:00	0.8	1.3	17	167
09/04/2023	08:43:00	0.7	1.1	17	165
09/04/2023	08:44:00	0.8	1.2	17	141
09/04/2023	08:45:00	0.7	1.3	17	100
09/04/2023	08:46:00	0.8	1.1	17	184
09/04/2023	08:47:00	0.8	1.2	17	82
09/04/2023	08:48:00	0.9	1.3	17	191
09/04/2023	08:49:00	0.9	1.5	17	176
09/04/2023	08:50:00	0.9	1.3	17	197
09/04/2023	08:51:00	1.2	1.9	17	169
09/04/2023	08:52:00	1.1	2	17	207

Date	Time	Windspeed average	Wind speed maximum	Temperature	Wind Direction
09/04/2023	08:53:00	1.1	2.4	17	129
09/04/2023	08:54:00	1	1.6	17	102
09/04/2023	08:55:00	1	1.4	18	269
09/04/2023	08:56:00	0.9	1.2	18	330
09/04/2023	08:57:00	1	1.6	18	184
09/04/2023	08:58:00	1	1.5	18	196
09/04/2023	08:59:00	0.8	1.1	18	155
09/04/2023	09:00:00	0.9	1.2	18	128
09/04/2023	09:01:00	1.1	2.9	18	165
09/04/2023	09:02:00	0.9	1.4	18	234
09/04/2023	09:03:00	0.9	1.3	18	128
09/04/2023	09:04:00	0.8	1.2	18	156
09/04/2023	09:05:00	1	1.8	18	133
09/04/2023	09:06:00	1	1.5	19	169
09/04/2023	09:07:00	1	1.5	19	7
09/04/2023	09:08:00	1	2.2	19	62
09/04/2023	09:09:00	1	2.2	19	125
09/04/2023	09:10:00	1.3	3.1	19	85
09/04/2023	09:11:00	1.1	2.3	19	36
09/04/2023	09:12:00	1.2	3	19	111
09/04/2023	09:13:00	1.2	1.8	19	84
09/04/2023	09:14:00	0.9	1.9	19	84
09/04/2023	09:15:00	1.1	1.9	19	319
09/04/2023	09:16:00	1.3	2.4	19	105
09/04/2023	09:17:00	1	2.1	19	329
09/04/2023	09:18:00	1.2	1.7	19	91
09/04/2023	09:19:00	1.7	2.9	19	50
09/04/2023	09:20:00	1	1.8	19	78
09/04/2023	09:21:00	1.2	2.2	19	46
09/04/2023	09:22:00	1.1	2	19	60
09/04/2023	09:23:00	1.4	2.1	19	66
09/04/2023	09:24:00	1.8	4	19	11
09/04/2023	09:25:00	1.2	2.3	19	90
09/04/2023	09:26:00	0.9	1.5	19	358
09/04/2023	09:27:00	1	1.7	20	111
09/04/2023	09:28:00	1.4	2.6	20	30
09/04/2023	09:29:00	1.4	2.5	20	350
09/04/2023	09:30:00	1.5	4	20	28
09/04/2023	09:31:00	1.5	2.5	20	90
09/04/2023	09:32:00	1.1	2	20	146
09/04/2023	09:33:00	1.4	2.3	20	245
09/04/2023	09:34:00	1.8	3.5	20	50
09/04/2023	09:35:00	1.5	2.6	20	87
09/04/2023	09:36:00	1	2	20	45
09/04/2023	09:37:00	1.4	3.1	20	66
09/04/2023	09:38:00	1.4	2.7	20	72
09/04/2023	09:39:00	1	2	20	95
09/04/2023	09:40:00	1.1	1.5	20	36
09/04/2023	09:41:00	1	1.8	20	83
09/04/2023	09:42:00	1.2	1.8	20	160
09/04/2023	09:43:00	1	1.8	20	225
09/04/2023	09:44:00	1.4	2.6	21	29
09/04/2023	09:45:00	1.5	2.8	21	100
09/04/2023	09:46:00	1	1.7	21	135
09/04/2023	09:47:00	1.1	1.8	21	86
09/04/2023	09:48:00	1.1	1.7	21	214
09/04/2023	09:49:00	0.8	1.7	21	104
09/04/2023	09:50:00	1	1.6	21	167
09/04/2023	09:51:00	1.1	1.5	21	167
09/04/2023	09:52:00	1.1	1.4	21	143
09/04/2023	09:53:00	1	1.9	21	122
09/04/2023	09:54:00	1.1	1.8	21	149

Date	Time	Windspeed average	Wind speed maximum	Temperature	Wind Direction
09/04/2023	09:55:00	1.1	2.2	21	213
09/04/2023	09:56:00	1	1.9	21	69
09/04/2023	09:57:00	1.3	1.9	21	66
09/04/2023	09:58:00	1	1.7	21	164
09/04/2023	09:59:00	1	1.8	21	240
09/04/2023	10:00:00	1.1	1.4	21	72
09/04/2023	10:01:00	0.9	1.3	21	117
09/04/2023	10:02:00	0.9	1.3	21	268
09/04/2023	10:03:00	1.1	1.6	21	133
09/04/2023	10:04:00	1.2	1.9	21	209
09/04/2023	10:05:00	1.2	2.1	22	109
09/04/2023	10:06:00	1.3	2.4	22	72
09/04/2023	10:07:00	1	1.9	22	179
09/04/2023	10:08:00	1.1	1.5	22	171
09/04/2023	10:09:00	1.2	2.1	22	232
09/04/2023	10:10:00	1.3	2.6	22	139
09/04/2023	10:11:00	1.4	2.8	22	191
09/04/2023	10:12:00	1.3	1.9	22	188
09/04/2023	10:13:00	1.1	2.2	22	170
09/04/2023	10:14:00	1.2	2	23	183
09/04/2023	10:15:00	1.2	1.8	23	157
09/04/2023	10:16:00	1.2	2	23	164
09/04/2023	10:17:00	1.1	2.3	23	145
09/04/2023	10:18:00	1	1.8	23	117
09/04/2023	10:19:00	0.8	1.2	23	182
09/04/2023	10:20:00	1.1	1.7	23	175
09/04/2023	10:21:00	1	1.5	23	190
09/04/2023	10:22:00	1.1	2.6	23	198
09/04/2023	10:23:00	1.2	1.7	23	205
09/04/2023	10:24:00	1.1	1.7	23	167
09/04/2023	10:25:00	1.1	1.4	24	166
09/04/2023	10:26:00	1.2	1.9	24	141
09/04/2023	10:27:00	1.2	2.1	24	144
09/04/2023	10:28:00	1.3	2.4	24	157
09/04/2023	10:29:00	1.2	2.4	24	136
09/04/2023	10:30:00	1.3	2	24	176
09/04/2023	10:31:00	1.6	2.6	24	161
09/04/2023	10:32:00	1.2	1.8	24	179
09/04/2023	10:33:00	1.2	2.1	24	128
09/04/2023	10:34:00	1.4	2.1	24	155
09/04/2023	10:35:00	1.1	2	24	127
09/04/2023	10:36:00	1	2.4	24	143
09/04/2023	10:37:00	1.5	2.9	24	162
09/04/2023	10:38:00	1.4	2.6	24	177
09/04/2023	10:39:00	1.3	2.2	24	202
09/04/2023	10:40:00	1	1.4	24	145
09/04/2023	10:41:00	1.2	2	24	236
09/04/2023	10:42:00	1.3	1.7	24	149
09/04/2023	10:43:00	1.3	2.6	24	151
09/04/2023	10:44:00	1.2	2.2	24	165
09/04/2023	10:45:00	1.1	1.7	24	190
09/04/2023	10:46:00	1.8	3.3	24	145
09/04/2023	10:47:00	1.6	3.2	24	150
09/04/2023	10:48:00	1.4	2.1	24	163
09/04/2023	10:49:00	1.2	2.1	24	182
09/04/2023	10:50:00	1.3	2	25	132
09/04/2023	10:51:00	1.4	2.2	25	163
09/04/2023	10:52:00	1.5	2.2	25	180
09/04/2023	10:53:00	1.4	2	25	147
09/04/2023	10:54:00	1.3	3.4	25	167
09/04/2023	10:55:00	1.4	2.3	25	172
09/04/2023	10:56:00	2	3.8	25	149

Date	Time	Windspeed average	Wind speed maximum	Temperature	Wind Direction
09/04/2023	10:57:00	1.7	3	25	182
09/04/2023	10:58:00	1.8	4.8	25	154
09/04/2023	10:59:00	1.5	2.4	25	189
09/04/2023	11:00:00	1.7	3.4	25	202
09/04/2023	11:01:00	1.4	2.2	25	143
09/04/2023	11:02:00	1.5	2.9	25	159
09/04/2023	11:03:00	2.1	4	25	169
09/04/2023	11:04:00	1.5	4	25	202
09/04/2023	11:05:00	1.9	3.3	25	151
09/04/2023	11:06:00	1.7	3	25	161
09/04/2023	11:07:00	1.5	2.6	25	163
09/04/2023	11:08:00	1.7	2.8	25	146
09/04/2023	11:09:00	1.8	4.1	25	164
09/04/2023	11:10:00	1.8	3.8	25	143
09/04/2023	11:11:00	1.5	3.3	25	180
09/04/2023	11:12:00	1.5	2.9	25	166
09/04/2023	11:13:00	1.6	3.9	25	151
09/04/2023	11:14:00	1.8	3.6	25	140
09/04/2023	11:15:00	1.5	2.1	26	129
09/04/2023	11:16:00	1.4	3.4	26	196
09/04/2023	11:17:00	1.4	3.7	26	146
09/04/2023	11:18:00	1.7	3.8	26	186
09/04/2023	11:19:00	1.5	3.5	26	160
09/04/2023	11:20:00	1.4	2.6	26	174
09/04/2023	11:21:00	1.6	2.4	26	168
09/04/2023	11:22:00	1.5	2.9	26	177
09/04/2023	11:23:00	1.6	3	26	160
09/04/2023	11:24:00	1.3	1.8	26	135
09/04/2023	11:25:00	1.3	1.8	26	203
09/04/2023	11:26:00	1.3	2.8	26	189
09/04/2023	11:27:00	1.4	2.1	26	165
09/04/2023	11:28:00	1.4	2	26	198
09/04/2023	11:29:00	1.4	2.4	26	180
09/04/2023	11:30:00	1.4	2.5	26	188
09/04/2023	11:31:00	1.3	2	26	200
09/04/2023	11:32:00	1.7	3.6	26	161
09/04/2023	11:33:00	1.8	3.4	26	176
09/04/2023	11:34:00	1.8	3	26	146
09/04/2023	11:35:00	1.8	3.1	26	171
09/04/2023	11:36:00	1.4	3.8	26	150
09/04/2023	11:37:00	1.9	3.4	26	161
09/04/2023	11:38:00	1.5	2.3	26	154
09/04/2023	11:39:00	1.5	3	26	194
09/04/2023	11:40:00	1.4	3.1	26	93
09/04/2023	11:41:00	1.6	3.1	26	193
09/04/2023	11:42:00	1.8	4.1	26	168
09/04/2023	11:43:00	2	3.9	26	166
09/04/2023	11:44:00	1.9	4.2	26	152
09/04/2023	11:45:00	1.4	2.1	26	162
09/04/2023	11:46:00	1.5	2.5	26	157
09/04/2023	11:47:00	1.4	2.3	26	155
09/04/2023	11:48:00	1.9	3	26	135
09/04/2023	11:49:00	1.4	2.4	26	157
09/04/2023	11:50:00	1.4	2.6	26	194
09/04/2023	11:51:00	1.7	2.8	26	165
09/04/2023	11:52:00	1.5	2.2	26	175
09/04/2023	11:53:00	1.8	3.1	26	157
09/04/2023	11:54:00	2	3.1	26	138
09/04/2023	11:55:00	1.4	2	26	172
09/04/2023	11:56:00	1.9	3.5	26	154
09/04/2023	11:57:00	2.2	3.8	26	151
09/04/2023	11:58:00	1.8	3.1	26	164

Date	Time	Windspeed average	Wind speed maximum	Temperature	Wind Direction
09/04/2023	11:59:00	1.7	2.4	26	223
09/04/2023	12:00:00	1.2	2.3	26	171
09/04/2023	12:01:00	1.5	2.6	26	214
09/04/2023	12:02:00	2	3.4	26	164
09/04/2023	12:03:00	1.3	2.7	26	178
09/04/2023	12:04:00	1.4	2.3	26	217
09/04/2023	12:05:00	1.5	3.3	26	182
09/04/2023	12:06:00	1.3	2.5	26	205
09/04/2023	12:07:00	1.5	2.4	26	246
09/04/2023	12:08:00	1.4	2.9	26	225
09/04/2023	12:09:00	1.6	2.6	26	189
09/04/2023	12:10:00	1.5	3.6	26	186
09/04/2023	12:11:00	1.7	2.8	26	166
09/04/2023	12:12:00	1.5	3.3	26	184
09/04/2023	12:13:00	1.6	3.3	26	166
09/04/2023	12:14:00	2.2	4.5	26	170
09/04/2023	12:15:00	1.7	4.1	26	175
09/04/2023	12:16:00	1.4	3.3	26	170
09/04/2023	12:17:00	1.4	2.6	26	160
09/04/2023	12:18:00	1.9	3	26	145
09/04/2023	12:19:00	1.7	2.9	26	148
09/04/2023	12:20:00	2	4	26	168
09/04/2023	12:21:00	1.3	2.8	26	193
09/04/2023	12:22:00	1.6	2.6	26	160
09/04/2023	12:23:00	2	3.8	26	156
09/04/2023	12:24:00	1.8	2.7	26	141
09/04/2023	12:25:00	1.9	3.3	26	122
09/04/2023	12:26:00	1.6	3	26	187
09/04/2023	12:27:00	1.4	2.4	26	196
09/04/2023	12:28:00	1.8	2.4	26	151
09/04/2023	12:29:00	1.2	1.7	26	160
09/04/2023	12:30:00	1.7	3.3	26	150
09/04/2023	12:31:00	1.3	2.5	26	181
09/04/2023	12:32:00	1.6	3.5	26	170
09/04/2023	12:33:00	1.6	2.7	26	181
09/04/2023	12:34:00	1.4	2.7	26	151
09/04/2023	12:35:00	1.6	2.9	26	174
09/04/2023	12:36:00	1.9	4.5	27	146
09/04/2023	12:37:00	1.4	2.2	27	182
09/04/2023	12:38:00	1.3	2.2	27	163
09/04/2023	12:39:00	1.7	2.7	27	192
09/04/2023	12:40:00	1.6	2.7	27	174
09/04/2023	12:41:00	1.8	3.2	27	161
09/04/2023	12:42:00	1.6	3	27	193
09/04/2023	12:43:00	1.7	3.1	27	161
09/04/2023	12:44:00	1.7	2.3	27	147
09/04/2023	12:45:00	2.1	5.1	27	141
09/04/2023	12:46:00	1.7	3.3	27	198
09/04/2023	12:47:00	1.4	2.6	27	174
09/04/2023	12:48:00	1.6	3.9	27	145
09/04/2023	12:49:00	2	3.5	27	172
09/04/2023	12:50:00	1.7	3.2	27	200
09/04/2023	12:51:00	1.7	3.4	27	205
09/04/2023	12:52:00	1.7	2.6	27	191
09/04/2023	12:53:00	1.4	2.2	27	195
09/04/2023	12:54:00	1.7	3.4	27	141
09/04/2023	12:55:00	1.9	3.2	27	135
09/04/2023	12:56:00	1.7	3.1	27	148
09/04/2023	12:57:00	1.5	2.1	27	181
09/04/2023	12:58:00	1.8	3.8	27	162
09/04/2023	12:59:00	2.3	4.3	27	167
09/04/2023	13:00:00	1.9	2.7	27	158

Date	Time	Windspeed average	Wind speed maximum	Temperature	Wind Direction
09/04/2023	13:01:00	2.2	4.2	27	155
09/04/2023	13:02:00	1.3	2.3	27	147
09/04/2023	13:03:00	1.3	2.3	27	184
09/04/2023	13:04:00	2	3.6	27	166
09/04/2023	13:05:00	2.5	4.6	27	138
09/04/2023	13:06:00	1.6	2.4	27	148
09/04/2023	13:07:00	2.1	3.1	27	146
09/04/2023	13:08:00	2	3.8	27	154
09/04/2023	13:09:00	1.5	2.4	27	139
09/04/2023	13:10:00	1.9	3.5	27	147
09/04/2023	13:11:00	2.3	4.5	27	139
09/04/2023	13:12:00	2.1	4	27	156
09/04/2023	13:13:00	1.6	2.8	27	172
09/04/2023	13:14:00	1.6	3.1	27	132
09/04/2023	13:15:00	1.6	3.3	27	197
09/04/2023	13:16:00	1.8	3.4	27	154
09/04/2023	13:17:00	2	3.5	27	144
09/04/2023	13:18:00	2.2	4.6	27	140
09/04/2023	13:19:00	2.2	3.6	27	135
09/04/2023	13:20:00	1.7	3.2	27	189
09/04/2023	13:21:00	1.6	3.1	27	174
09/04/2023	13:22:00	1.5	3	27	177
09/04/2023	13:23:00	1.6	2.9	27	161
09/04/2023	13:24:00	2.5	5.7	27	147
09/04/2023	13:25:00	1.6	2.6	27	178
09/04/2023	13:26:00	1.7	3.1	27	175
09/04/2023	13:27:00	2	3.5	28	168
09/04/2023	13:28:00	1.8	2.8	28	167
09/04/2023	13:29:00	1.5	2.7	28	158
09/04/2023	13:30:00	1.5	2.2	28	162
09/04/2023	13:31:00	1.6	3.1	28	170
09/04/2023	13:32:00	1.7	2.8	28	156
09/04/2023	13:33:00	1.4	2.3	28	223
09/04/2023	13:34:00	1.9	3.3	28	151
09/04/2023	13:35:00	2	4	28	161
09/04/2023	13:36:00	1.7	3.1	28	166
09/04/2023	13:37:00	1.8	4.1	28	169
09/04/2023	13:38:00	1.5	2.8	28	174
09/04/2023	13:39:00	1.8	3.6	28	175
09/04/2023	13:40:00	1.7	2.9	28	152
09/04/2023	13:41:00	1.4	3.2	28	163
09/04/2023	13:42:00	1.7	3.8	28	211
09/04/2023	13:43:00	2.1	3.2	28	246
09/04/2023	13:44:00	1.7	3.8	28	129
09/04/2023	13:45:00	2.4	4.2	28	145
09/04/2023	13:46:00	2.6	4.6	28	140
09/04/2023	13:47:00	1.5	2.4	28	189
09/04/2023	13:48:00	1.3	2.3	28	197
09/04/2023	13:49:00	1.4	2.6	28	144
09/04/2023	13:50:00	1.6	3.9	28	186
09/04/2023	13:51:00	1.7	3	28	163
09/04/2023	13:52:00	1.4	1.9	28	171
09/04/2023	13:53:00	1.5	2.3	28	161
09/04/2023	13:54:00	2.4	5.8	28	144
09/04/2023	13:55:00	1.6	3	28	168
09/04/2023	13:56:00	1.8	3.8	28	143
09/04/2023	13:57:00	2.4	3.8	28	140
09/04/2023	13:58:00	2.4	4.1	28	143
09/04/2023	13:59:00	1.9	4.2	28	164
09/04/2023	14:00:00	1.4	2.1	28	141
09/04/2023	14:01:00	2.4	4.3	28	148
09/04/2023	14:02:00	1.5	2.1	28	148

Date	Time	Windspeed average	Wind speed maximum	Temperature	Wind Direction
09/04/2023	14:03:00	1.9	3.9	28	158
09/04/2023	14:04:00	2	3.3	28	150
09/04/2023	14:05:00	1.9	4.1	28	150
09/04/2023	14:06:00	2	3.3	28	158
09/04/2023	14:07:00	1.5	2.5	28	179
09/04/2023	14:08:00	2.1	3.4	28	159
09/04/2023	14:09:00	1.8	3.6	28	171
09/04/2023	14:10:00	1.9	4.2	28	147
09/04/2023	14:11:00	1.6	3	28	175
09/04/2023	14:12:00	1.6	2.4	28	212
09/04/2023	14:13:00	1.5	3	28	219
09/04/2023	14:14:00	1.5	3.3	28	196
09/04/2023	14:15:00	1.5	3.3	28	155
09/04/2023	14:16:00	2	4.6	28	181
09/04/2023	14:17:00	1.7	3.2	28	160
09/04/2023	14:18:00	1.4	2.8	28	175
09/04/2023	14:19:00	1.4	2.9	28	197
09/04/2023	14:20:00	1.9	4	28	186
09/04/2023	14:21:00	2.5	3.9	28	148
09/04/2023	14:22:00	2.1	3	28	165
09/04/2023	14:23:00	1.7	2.8	28	159
09/04/2023	14:24:00	1.3	2.3	28	164
09/04/2023	14:25:00	1.4	2.3	28	210
09/04/2023	14:26:00	1.5	2.3	28	169
09/04/2023	14:27:00	1.2	2.3	28	188
09/04/2023	14:28:00	1.3	2.4	28	186
09/04/2023	14:29:00	1.4	2.6	28	208
09/04/2023	14:30:00	1.7	3.4	28	170
09/04/2023	14:31:00	1.6	2.3	28	168
09/04/2023	14:32:00	1.5	2.7	28	162
09/04/2023	14:33:00	1.2	1.9	28	167
09/04/2023	14:34:00	1.5	3	28	180
09/04/2023	14:35:00	1.2	2.2	28	188
09/04/2023	14:36:00	1.9	4.4	28	144
09/04/2023	14:37:00	1.3	1.8	28	165
09/04/2023	14:38:00	1.2	1.8	28	200
09/04/2023	14:39:00	1.2	2.8	28	139
09/04/2023	14:40:00	1.6	3.3	28	156
09/04/2023	14:41:00	1.6	3.4	28	204
09/04/2023	14:42:00	1.5	2.2	28	159
09/04/2023	14:43:00	1.2	1.8	28	202
09/04/2023	14:44:00	1.7	2.4	28	167
09/04/2023	14:45:00	1.5	2.9	28	220
09/04/2023	14:46:00	1.7	3.2	28	147
09/04/2023	14:47:00	1.5	2.8	28	153
09/04/2023	14:48:00	1.6	2.5	28	152
09/04/2023	14:49:00	1.7	3.2	28	184
09/04/2023	14:50:00	1.5	2.7	28	184
09/04/2023	14:51:00	2	3	28	144
09/04/2023	14:52:00	1.8	4.7	28	135
09/04/2023	14:53:00	1.7	3.9	28	148
09/04/2023	14:54:00	1.5	2.8	28	163
09/04/2023	14:55:00	1.6	3	28	155
09/04/2023	14:56:00	1.7	3.1	28	139
09/04/2023	14:57:00	1.3	1.9	28	148
09/04/2023	14:58:00	1.3	1.7	28	213
09/04/2023	14:59:00	1.3	2.7	27	163
09/04/2023	15:00:00	1.7	2.5	27	178
09/04/2023	15:01:00	1.4	2.4	27	180
09/04/2023	15:02:00	1.7	2.5	27	164
09/04/2023	15:03:00	1.3	2	27	143
09/04/2023	15:04:00	1.4	2.5	27	159

Date	Time	Windspeed average	Wind speed maximum	Temperature	Wind Direction
09/04/2023	15:05:00	1.4	3.2	27	177
09/04/2023	15:06:00	1.9	3.4	27	151
09/04/2023	15:07:00	1.5	3.7	27	186
09/04/2023	15:08:00	1.3	2.7	27	193
09/04/2023	15:09:00	0.9	1.3	27	228
09/04/2023	15:10:00	1.3	2.6	27	194
09/04/2023	15:11:00	1.5	2.8	27	121
09/04/2023	15:12:00	1.4	2.4	27	184
09/04/2023	15:13:00	2.1	3.3	27	143
09/04/2023	15:14:00	1.5	2.7	27	159
09/04/2023	15:15:00	1.2	2	27	144
09/04/2023	15:16:00	1.1	1.9	27	159
09/04/2023	15:17:00	1.4	2.5	27	161
09/04/2023	15:18:00	1.3	2.7	27	159
09/04/2023	15:19:00	1.4	2.3	27	154
09/04/2023	15:20:00	1.2	1.8	27	182
09/04/2023	15:21:00	1.3	2	27	151
09/04/2023	15:22:00	1.3	2.1	27	215
09/04/2023	15:23:00	1	1.4	27	167
09/04/2023	15:24:00	1.1	1.8	27	190
09/04/2023	15:25:00	1.7	3.1	27	71
09/04/2023	15:26:00	1.3	2.5	27	230
09/04/2023	15:27:00	1.3	2.5	27	127
09/04/2023	15:28:00	1.2	2.3	27	173
09/04/2023	15:29:00	1.1	1.5	27	187
09/04/2023	15:30:00	1.2	3	27	149
09/04/2023	15:31:00	1	1.9	27	140
09/04/2023	15:32:00	1	1.8	27	152
09/04/2023	15:33:00	1.1	2.6	27	201
09/04/2023	15:34:00	1.3	2.1	27	109
09/04/2023	15:35:00	1.3	3.1	27	356
09/04/2023	15:36:00	1.3	2.4	27	193
09/04/2023	15:37:00	1.6	2.5	28	92
09/04/2023	15:38:00	1.2	1.9	28	96
09/04/2023	15:39:00	1	1.5	28	180
09/04/2023	15:40:00	1.4	2.6	28	194
09/04/2023	15:41:00	1.5	2.7	28	178
09/04/2023	15:42:00	1.8	3.9	28	101
09/04/2023	15:43:00	2.5	4.9	28	11
09/04/2023	15:44:00	1.3	3	28	98
09/04/2023	15:45:00	1.3	2.1	27	216
09/04/2023	15:46:00	1.4	3.2	27	175
09/04/2023	15:47:00	1.2	2.2	27	224
09/04/2023	15:48:00	1.2	1.9	27	216
09/04/2023	15:49:00	1.2	2.4	27	266
09/04/2023	15:50:00	1.2	2.2	27	249
09/04/2023	15:51:00	0.8	1.2	27	159
09/04/2023	15:52:00	1.1	1.9	27	230
09/04/2023	15:53:00	1	1.7	27	234
09/04/2023	15:54:00	0.9	1.6	27	156
09/04/2023	15:55:00	1	1.4	27	97
09/04/2023	15:56:00	1.1	1.8	27	139
09/04/2023	15:57:00	0.8	1	27	61
09/04/2023	15:58:00	0.7	1.1	27	163
09/04/2023	15:59:00	0.9	1.3	27	203
09/04/2023	16:00:00	1.3	2	27	154
09/04/2023	16:01:00	1.1	1.9	27	147
09/04/2023	16:02:00	1.4	3.2	27	134
09/04/2023	16:03:00	1	1.7	27	187
09/04/2023	16:04:00	1.1	2.2	27	121
09/04/2023	16:05:00	1.1	2	27	57
09/04/2023	16:06:00	1.4	3.5	27	290

Date	Time	Windspeed average	Wind speed maximum	Temperature	Wind Direction
09/04/2023	16:07:00	2	3.4	27	70
09/04/2023	16:08:00	1	1.8	27	229
09/04/2023	16:09:00	1	1.8	27	118
09/04/2023	16:10:00	1.1	2	27	213
09/04/2023	16:11:00	1.1	1.8	27	107
09/04/2023	16:12:00	1	1.9	27	151
09/04/2023	16:13:00	1	1.8	27	182
09/04/2023	16:14:00	1.2	1.5	27	166
09/04/2023	16:15:00	0.8	1.5	27	246
09/04/2023	16:16:00	0.7	1.4	27	301
09/04/2023	16:17:00	1.3	2.8	27	216
09/04/2023	16:18:00	1.3	3.6	27	180
09/04/2023	16:19:00	1.2	2.4	27	192
09/04/2023	16:20:00	1	2	27	175
09/04/2023	16:21:00	1.2	2.2	27	45
09/04/2023	16:22:00	1.3	2	27	193
09/04/2023	16:23:00	1.5	2.5	27	42
09/04/2023	16:24:00	1.2	1.7	27	201
09/04/2023	16:25:00	1.2	1.7	27	181
09/04/2023	16:26:00	1.6	3.2	27	98
09/04/2023	16:27:00	1.3	2.2	27	211
09/04/2023	16:28:00	1.7	3.6	27	257
09/04/2023	16:29:00	1.6	2.8	28	23
09/04/2023	16:30:00	1.8	3.3	28	111
09/04/2023	16:31:00	1	1.5	28	117
09/04/2023	16:32:00	1.3	2	28	231
09/04/2023	16:33:00	1.2	2.5	28	186
09/04/2023	16:34:00	1.3	2.5	28	201
09/04/2023	16:35:00	0.9	1.5	28	237
09/04/2023	16:36:00	1.1	1.9	28	209
09/04/2023	16:37:00	1.2	2.4	28	145
09/04/2023	16:38:00	1.4	2.4	28	127
09/04/2023	16:39:00	1.2	2.2	28	194
09/04/2023	16:40:00	1.4	2.2	28	188
09/04/2023	16:41:00	1.5	2.8	28	79
09/04/2023	16:42:00	1.1	1.9	28	194
09/04/2023	16:43:00	1.3	2	28	178
09/04/2023	16:44:00	1.5	2.6	28	127
09/04/2023	16:45:00	1.5	4.2	28	130
09/04/2023	16:46:00	1.2	2.8	28	8
09/04/2023	16:47:00	1.3	2.1	28	182
09/04/2023	16:48:00	1.6	3.6	27	91
09/04/2023	16:49:00	1.3	2	27	62
09/04/2023	16:50:00	1	1.7	27	170
09/04/2023	16:51:00	1.1	1.6	27	256
09/04/2023	16:52:00	1.6	4.2	27	52
09/04/2023	16:53:00	1.4	3.3	27	190
09/04/2023	16:54:00	1	1.6	27	166
09/04/2023	16:55:00	1	2	27	207
09/04/2023	16:56:00	1.2	2.3	27	100
09/04/2023	16:57:00	1.2	1.8	27	214
09/04/2023	16:58:00	1.4	2.2	27	69
09/04/2023	16:59:00	1.2	1.9	27	162
09/04/2023	17:00:00	1.6	3.2	27	236
09/04/2023	17:01:00	1.7	2.5	27	74
09/04/2023	17:02:00	1.5	2.2	27	145
09/04/2023	17:03:00	1.4	2.4	27	186
09/04/2023	17:04:00	1.1	1.5	27	257
09/04/2023	17:05:00	1.1	2.1	27	220
09/04/2023	17:06:00	0.9	1.8	27	184
09/04/2023	17:07:00	1.4	2.3	27	202
09/04/2023	17:08:00	1	1.6	27	249

Date	Time	Windspeed average	Wind speed maximum	Temperature	Wind Direction
09/04/2023	17:09:00	1.1	1.7	28	74
09/04/2023	17:10:00	1.1	1.7	28	331
09/04/2023	17:11:00	1.5	3.2	28	106
09/04/2023	17:12:00	1.4	2.4	28	222
09/04/2023	17:13:00	1.7	2.6	27	283
09/04/2023	17:14:00	1.8	3.6	27	114
09/04/2023	17:15:00	1.2	2.1	27	198
09/04/2023	17:16:00	2.2	4.4	27	347
09/04/2023	17:17:00	1.7	3.7	27	85
09/04/2023	17:18:00	1.5	3.7	27	353
09/04/2023	17:19:00	2.1	5.1	27	138
09/04/2023	17:20:00	2.2	3.8	27	345
09/04/2023	17:21:00	1.1	1.6	27	180
09/04/2023	17:22:00	2.3	5.3	27	13
09/04/2023	17:23:00	1.9	3.9	27	53
09/04/2023	17:24:00	2	4.7	27	43
09/04/2023	17:25:00	2.1	3.5	27	210
09/04/2023	17:26:00	1.5	2.7	27	220
09/04/2023	17:27:00	2.2	4.5	27	46
09/04/2023	17:28:00	2.6	4.6	27	24
09/04/2023	17:29:00	2.7	4.8	27	32
09/04/2023	17:30:00	2.2	4.4	27	90
09/04/2023	17:31:00	2	4.3	27	139
09/04/2023	17:32:00	2.1	4.4	26	124
09/04/2023	17:33:00	2.3	3.9	26	93
09/04/2023	17:34:00	1.7	3.4	26	89
09/04/2023	17:35:00	1.4	3.1	26	96
09/04/2023	17:36:00	1.5	2.8	26	149
09/04/2023	17:37:00	1.7	2.8	26	155
09/04/2023	17:38:00	1.3	1.8	26	176
09/04/2023	17:39:00	1.4	2.3	26	187
09/04/2023	17:40:00	1.8	3.5	26	337
09/04/2023	17:41:00	2	4.6	26	225
09/04/2023	17:42:00	2.3	5.7	26	92
09/04/2023	17:43:00	1.8	3.2	26	132
09/04/2023	17:44:00	1.5	2.5	26	207
09/04/2023	17:45:00	1.7	3.4	26	229
09/04/2023	17:46:00	1.4	3.2	26	200
09/04/2023	17:47:00	1.9	4.2	26	139
09/04/2023	17:48:00	1.6	4	26	168
09/04/2023	17:49:00	1.5	3.2	25	140
09/04/2023	17:50:00	1.8	4.9	25	73
09/04/2023	17:51:00	1.6	3.7	25	179
09/04/2023	17:52:00	1.8	3.6	25	206
09/04/2023	17:53:00	1.8	4.2	25	60
09/04/2023	17:54:00	1.7	3.1	25	359
09/04/2023	17:55:00	2.2	4.1	25	124
09/04/2023	17:56:00	2.3	4.3	24	199
09/04/2023	17:57:00	2	3.1	24	166
09/04/2023	17:58:00	1.8	3.6	24	130
09/04/2023	17:59:00	1.9	4.8	24	196
09/04/2023	18:00:00	1.8	4.3	24	283

Table 9: Weather data air monitoring, AN 2

Date	Time	Wind speed average	Wind Speed maximum	Temperature	Wind Direction
07/04/2023	13:00:00	3.1	3.9	26	270
07/04/2023	13:01:00	2.4	3.5	26	260
07/04/2023	13:02:00	2.6	3.4	26	259
07/04/2023	13:03:00	1.8	2.2	26	260
07/04/2023	13:04:00	1.8	2.2	25	245
07/04/2023	13:05:00	2.1	2.9	25	240
07/04/2023	13:06:00	1.8	2.7	25	251
07/04/2023	13:07:00	1.8	2.9	25	295
07/04/2023	13:08:00	1.5	2.5	25	317
07/04/2023	13:09:00	2.7	3.4	25	302
07/04/2023	13:10:00	2.5	3	25	308
07/04/2023	13:11:00	1.6	2.2	24	309
07/04/2023	13:12:00	1.6	2.1	24	330
07/04/2023	13:13:00	1.5	2	24	355
07/04/2023	13:14:00	2.2	3.1	24	16
07/04/2023	13:15:00	2.7	3.2	24	10
07/04/2023	13:16:00	3.2	4.5	24	359
07/04/2023	13:17:00	2.9	3.4	24	2
07/04/2023	13:18:00	2.5	3.1	24	4
07/04/2023	13:19:00	1.6	2.3	24	339
07/04/2023	13:20:00	1.3	2.2	24	295
07/04/2023	13:21:00	1.3	1.9	24	289
07/04/2023	13:22:00	2.1	3.1	24	325
07/04/2023	13:23:00	1.9	2.6	24	325
07/04/2023	13:24:00	2.7	3.8	25	322
07/04/2023	13:25:00	1.9	2.7	25	358
07/04/2023	13:26:00	2.3	3.4	25	313
07/04/2023	13:27:00	2.5	3.4	25	335
07/04/2023	13:28:00	3	3.8	25	351
07/04/2023	13:29:00	2.6	3.6	25	6
07/04/2023	13:30:00	2	3	25	344
07/04/2023	13:31:00	2.3	3	25	313
07/04/2023	13:32:00	2.3	3.4	26	302
07/04/2023	13:33:00	1.9	2.7	26	349
07/04/2023	13:34:00	0.9	1.5	26	47
07/04/2023	13:35:00	1.5	1.9	26	18
07/04/2023	13:36:00	1.4	2	26	18
07/04/2023	13:37:00	1	1.6	26	335
07/04/2023	13:38:00	1.1	2	26	260
07/04/2023	13:39:00	1.4	1.9	26	274
07/04/2023	13:40:00	2.5	3	26	209
07/04/2023	13:41:00	1.7	2.6	26	217
07/04/2023	13:42:00	1.5	2.3	26	240
07/04/2023	13:43:00	1.8	2.3	26	316
07/04/2023	13:44:00	1.4	2.1	26	312
07/04/2023	13:45:00	2.1	3.5	26	295
07/04/2023	13:46:00	2.4	3	26	302
07/04/2023	13:47:00	2.5	3.4	26	318
07/04/2023	13:48:00	1.8	2.4	26	327
07/04/2023	13:49:00	1.4	1.8	26	344
07/04/2023	13:50:00	1.2	1.7	26	101
07/04/2023	13:51:00	1.2	1.5	27	25
07/04/2023	13:52:00	0.8	1.5	27	79
07/04/2023	13:53:00	1.5	3.2	27	17
07/04/2023	13:54:00	3	3.5	27	311
07/04/2023	13:55:00	2.2	2.9	27	306
07/04/2023	13:56:00	2.4	3	27	337
07/04/2023	13:57:00	2.1	3.1	27	347
07/04/2023	13:58:00	2.9	4.1	27	345
07/04/2023	13:59:00	1.3	1.9	27	326

Date	Time	Wind speed average	Wind Speed maximum	Temperature	Wind Direction
07/04/2023	14:00:00	1.4	1.8	27	332
07/04/2023	14:01:00	1.6	2.6	27	8
07/04/2023	14:02:00	2.1	3	27	32
07/04/2023	14:03:00	1.8	2.5	27	7
07/04/2023	14:04:00	2.7	3.5	27	25
07/04/2023	14:05:00	2.5	3	27	31
07/04/2023	14:06:00	2.1	2.9	27	59
07/04/2023	14:07:00	1.7	2.3	27	67
07/04/2023	14:08:00	1.5	2.5	27	78
07/04/2023	14:09:00	2.1	2.9	27	49
07/04/2023	14:10:00	1.4	2.4	27	63
07/04/2023	14:11:00	1.3	1.8	27	61
07/04/2023	14:12:00	1.1	1.7	27	176
07/04/2023	14:13:00	1.6	2.3	27	262
07/04/2023	14:14:00	1.2	1.7	27	250
07/04/2023	14:15:00	1.8	2.6	27	299
07/04/2023	14:16:00	2.2	3	27	319
07/04/2023	14:17:00	2.3	3.8	27	302
07/04/2023	14:18:00	2.8	3.4	27	312
07/04/2023	14:19:00	2.3	3.5	27	318
07/04/2023	14:20:00	2.6	3.4	27	303
07/04/2023	14:21:00	2.8	4.1	27	314
07/04/2023	14:22:00	3.1	4.6	27	304
07/04/2023	14:23:00	4.1	5	27	330
07/04/2023	14:24:00	2.8	3.7	27	338
07/04/2023	14:25:00	2.5	3.8	27	322
07/04/2023	14:26:00	2.3	3.4	27	277
07/04/2023	14:27:00	2.6	4.1	27	297
07/04/2023	14:28:00	3.4	4.3	27	313
07/04/2023	14:29:00	2.5	3.5	27	318
07/04/2023	14:30:00	2.3	2.9	27	321
07/04/2023	14:31:00	2.5	3.6	27	308
07/04/2023	14:32:00	3	3.7	27	304
07/04/2023	14:33:00	2.9	4.8	27	325
07/04/2023	14:34:00	4.8	5.5	27	334
07/04/2023	14:35:00	3.9	4.7	28	327
07/04/2023	14:36:00	2.8	3.4	28	326
07/04/2023	14:37:00	3	3.6	28	338
07/04/2023	14:38:00	2.6	3.6	27	326
07/04/2023	14:39:00	1.7	2.2	27	320
07/04/2023	14:40:00	1.2	1.5	27	325
07/04/2023	14:41:00	2	2.5	27	343
07/04/2023	14:42:00	3.6	4.2	27	324
07/04/2023	14:43:00	4.5	6	27	349
07/04/2023	14:44:00	4.4	5.8	27	346
07/04/2023	14:45:00	3.9	4.7	27	353
07/04/2023	14:46:00	3.7	4.8	27	348
07/04/2023	14:47:00	3.6	5.5	27	336
07/04/2023	14:48:00	4.1	5.1	27	338
07/04/2023	14:49:00	4.9	6.1	27	339
07/04/2023	14:50:00	3.9	5.4	27	327
07/04/2023	14:51:00	3.9	5.1	27	319
07/04/2023	14:52:00	3.1	3.8	27	331
07/04/2023	14:53:00	4.2	5.3	27	331
07/04/2023	14:54:00	4.2	5.4	27	315
07/04/2023	14:55:00	4.3	5.9	27	313
07/04/2023	14:56:00	3.4	4.3	27	312
07/04/2023	14:57:00	3.2	4.2	26	321
07/04/2023	14:58:00	3.5	4.3	26	331
07/04/2023	14:59:00	3.6	4.8	26	316
07/04/2023	15:00:00	3.2	3.9	26	319
07/04/2023	15:01:00	4	5.3	26	326

Date	Time	Wind speed average	Wind Speed maximum	Temperature	Wind Direction
07/04/2023	15:02:00	4.3	5.3	26	311
07/04/2023	15:03:00	3	3.9	26	311
07/04/2023	15:04:00	3.1	4.1	26	319
07/04/2023	15:05:00	4.3	5.6	26	333
07/04/2023	15:06:00	4.7	6.3	26	337
07/04/2023	15:07:00	4.4	5.5	26	328
07/04/2023	15:08:00	4	4.9	26	325
07/04/2023	15:09:00	4.1	4.9	26	321
07/04/2023	15:10:00	3.9	4.8	26	328
07/04/2023	15:11:00	3.8	4.9	26	330
07/04/2023	15:12:00	3.8	4.7	26	338
07/04/2023	15:13:00	3.6	4.4	26	336
07/04/2023	15:14:00	3.9	5.3	26	330
07/04/2023	15:15:00	3.7	4.8	26	345
07/04/2023	15:16:00	3.7	4.5	26	339
07/04/2023	15:17:00	4.2	5.1	26	335
07/04/2023	15:18:00	3.4	4.1	26	333
07/04/2023	15:19:00	3.2	3.9	26	341
07/04/2023	15:20:00	3.6	4.9	26	333
07/04/2023	15:21:00	3.8	4.7	26	341
07/04/2023	15:22:00	3.4	4.1	26	350
07/04/2023	15:23:00	4.2	5.3	26	343
07/04/2023	15:24:00	3.5	4.6	26	341
07/04/2023	15:25:00	3.5	4.4	26	339
07/04/2023	15:26:00	3.8	5.4	26	345
07/04/2023	15:27:00	3.7	4.9	26	346
07/04/2023	15:28:00	3.5	4.4	26	1
07/04/2023	15:29:00	3.4	4.3	26	355
07/04/2023	15:30:00	3.2	4	26	353
07/04/2023	15:31:00	3.9	4.6	26	349
07/04/2023	15:32:00	3.6	4.6	26	349
07/04/2023	15:33:00	3.8	5	26	355
07/04/2023	15:34:00	3.4	4.3	26	357
07/04/2023	15:35:00	3.3	4.6	26	8
07/04/2023	15:36:00	3.5	4.5	26	360
07/04/2023	15:37:00	2.7	3.6	26	4
07/04/2023	15:38:00	2.8	3.4	26	7
07/04/2023	15:39:00	3.3	4	26	8
07/04/2023	15:40:00	3.1	4.2	26	360
07/04/2023	15:41:00	3.3	4.7	26	12
07/04/2023	15:42:00	3.9	4.7	26	6
07/04/2023	15:43:00	3.5	4.3	26	19
07/04/2023	15:44:00	3.6	4.5	26	14
07/04/2023	15:45:00	3.8	4.6	26	17
07/04/2023	15:46:00	3.9	4.6	26	12
07/04/2023	15:47:00	3.9	4.7	26	14
07/04/2023	15:48:00	3.8	5	26	14
07/04/2023	15:49:00	3.5	4.5	26	10
07/04/2023	15:50:00	3.2	3.8	26	21
07/04/2023	15:51:00	2.3	3	26	22
07/04/2023	15:52:00	2.7	3.3	26	22
07/04/2023	15:53:00	3.6	4.5	26	34
07/04/2023	15:54:00	3.1	4.2	26	27
07/04/2023	15:55:00	2.9	3.6	26	29
07/04/2023	15:56:00	3.5	4.4	26	25
07/04/2023	15:57:00	2.9	3.8	26	23
07/04/2023	15:58:00	2.8	3.6	26	31
07/04/2023	15:59:00	4	4.9	26	41
07/04/2023	16:00:00	4.1	5	26	43
07/04/2023	16:01:00	3.2	4.5	26	32
07/04/2023	16:02:00	3.3	4.6	26	43
07/04/2023	16:03:00	3.5	4.4	26	55

Date	Time	Wind speed average	Wind Speed maximum	Temperature	Wind Direction
07/04/2023	16:04:00	2.9	3.8	26	53
07/04/2023	16:05:00	2.6	3.7	26	54
07/04/2023	16:06:00	2.1	3	26	60
07/04/2023	16:07:00	2.9	3.7	26	47
07/04/2023	16:08:00	3.3	3.7	26	48
07/04/2023	16:09:00	2.7	3.5	26	63
07/04/2023	16:10:00	3	3.7	26	81
07/04/2023	16:11:00	3	4.4	26	54
07/04/2023	16:12:00	2.8	3.6	26	48
07/04/2023	16:13:00	2.6	3.8	26	43
07/04/2023	16:14:00	2.5	3.6	26	46
07/04/2023	16:15:00	2.7	3.4	26	42
07/04/2023	16:16:00	2.7	3.4	26	42
07/04/2023	16:17:00	2.3	2.9	26	46
07/04/2023	16:18:00	2.1	2.8	26	45
07/04/2023	16:19:00	2.3	2.8	26	64
07/04/2023	16:20:00	2.9	3.5	26	48
07/04/2023	16:21:00	2.7	3.4	26	56
07/04/2023	16:22:00	2.8	3.5	26	56
07/04/2023	16:23:00	3	3.7	26	51
07/04/2023	16:24:00	2.9	3.8	26	52
07/04/2023	16:25:00	3	3.8	26	58
07/04/2023	16:26:00	2.4	3.5	26	62
07/04/2023	16:27:00	2.7	3.4	26	65
07/04/2023	16:28:00	2.4	2.9	26	72
07/04/2023	16:29:00	2.3	3.1	26	80
07/04/2023	16:30:00	2.6	3.5	26	67
07/04/2023	16:31:00	2.4	3.1	26	69
07/04/2023	16:32:00	1.9	2.5	26	63
07/04/2023	16:33:00	1.9	2.4	26	63
07/04/2023	16:34:00	1.7	2.3	26	78
07/04/2023	16:35:00	2.1	3.1	26	70
07/04/2023	16:36:00	2.3	3.1	26	62
07/04/2023	16:37:00	2.6	3.9	26	45
07/04/2023	16:38:00	2.8	3.4	26	47
07/04/2023	16:39:00	3.4	4.2	26	51
07/04/2023	16:40:00	3.3	3.9	26	45
07/04/2023	16:41:00	3.4	4.2	26	50
07/04/2023	16:42:00	3.8	4.6	26	57
07/04/2023	16:43:00	3.3	4.6	26	61
07/04/2023	16:44:00	3.3	4.4	26	57
07/04/2023	16:45:00	3	3.9	26	54
07/04/2023	16:46:00	2.8	3.3	26	60
07/04/2023	16:47:00	2.2	3.2	26	67
07/04/2023	16:48:00	2.5	3.3	26	80
07/04/2023	16:49:00	2.7	3.6	26	82
07/04/2023	16:50:00	3.4	4.2	26	87
07/04/2023	16:51:00	2.8	4	26	73
07/04/2023	16:52:00	2.6	3.6	26	69
07/04/2023	16:53:00	3.7	4.6	26	65
07/04/2023	16:54:00	4.1	5.1	26	68
07/04/2023	16:55:00	4.2	5.2	26	71
07/04/2023	16:56:00	4.1	5.3	26	73
07/04/2023	16:57:00	4.9	6.2	26	73
07/04/2023	16:58:00	3.5	4.4	26	63
07/04/2023	16:59:00	4.5	5.9	26	57
07/04/2023	17:00:00	5.2	7.1	26	58
07/04/2023	17:01:00	5.1	6.5	26	63
07/04/2023	17:02:00	4.7	6.3	26	68
07/04/2023	17:03:00	5	5.9	26	66
07/04/2023	17:04:00	4.6	6.6	26	63
07/04/2023	17:05:00	3.6	4.5	26	66

Date	Time	Wind speed average	Wind Speed maximum	Temperature	Wind Direction
07/04/2023	17:06:00	4	5.2	26	62
07/04/2023	17:07:00	3.7	4.9	26	68
07/04/2023	17:08:00	3.8	6	26	68
07/04/2023	17:09:00	4.6	6.9	26	63
07/04/2023	17:10:00	3.7	5.6	26	68
07/04/2023	17:11:00	5.1	6.9	26	69
07/04/2023	17:12:00	4.4	5.8	26	63
07/04/2023	17:13:00	3.7	4.7	25	64
07/04/2023	17:14:00	2.9	3.7	25	65
07/04/2023	17:15:00	2.9	4.2	25	69
07/04/2023	17:16:00	3.8	5.7	25	63
07/04/2023	17:17:00	3.2	4.7	25	72
07/04/2023	17:18:00	2.4	4.2	25	90
07/04/2023	17:19:00	3.6	4.7	25	90
07/04/2023	17:20:00	4	5.3	25	89
07/04/2023	17:21:00	3.5	6	25	84
07/04/2023	17:22:00	4.4	6	25	72
07/04/2023	17:23:00	3.6	4.9	25	70
07/04/2023	17:24:00	4.9	6	25	77
07/04/2023	17:25:00	4.5	5.9	25	71
07/04/2023	17:26:00	5.3	6.8	25	72
07/04/2023	17:27:00	4.5	6.7	25	73
07/04/2023	17:28:00	4.8	6.2	25	80
07/04/2023	17:29:00	3.2	4.6	25	75
07/04/2023	17:30:00	2.9	4.1	25	73
07/04/2023	17:31:00	3.9	5	25	61
07/04/2023	17:32:00	4	6.1	25	59
07/04/2023	17:33:00	4.7	6.4	25	52
07/04/2023	17:34:00	4.9	6	25	46
07/04/2023	17:35:00	4	5.8	25	41
07/04/2023	17:36:00	4.3	5.3	25	40
07/04/2023	17:37:00	4.8	6.1	25	38
07/04/2023	17:38:00	5.3	6.5	25	37
07/04/2023	17:39:00	4.8	6.4	25	39
07/04/2023	17:40:00	5.1	6.2	25	37
07/04/2023	17:41:00	4.9	6.8	25	38
07/04/2023	17:42:00	3.8	4.9	25	44
07/04/2023	17:43:00	4.7	6.6	25	39
07/04/2023	17:44:00	4.8	5.9	25	44
07/04/2023	17:45:00	3.9	5.7	25	58
07/04/2023	17:46:00	4.7	6	25	65
07/04/2023	17:47:00	3.2	4.5	25	44
07/04/2023	17:48:00	5.6	7	25	45
07/04/2023	17:49:00	5.4	6.6	25	53
07/04/2023	17:50:00	4.6	6.3	25	54
07/04/2023	17:51:00	4.9	6.7	25	58
07/04/2023	17:52:00	5	6.4	25	61
07/04/2023	17:53:00	4.5	6	25	60
07/04/2023	17:54:00	3.6	4.7	25	61
07/04/2023	17:55:00	5.4	6.4	25	62
07/04/2023	17:56:00	5.1	6.8	25	59
07/04/2023	17:57:00	5.9	7.5	25	55
07/04/2023	17:58:00	5.4	7.2	25	57
07/04/2023	17:59:00	4.5	6	25	62
07/04/2023	18:00:00	3.5	4.3	25	66
07/04/2023	18:01:00	5.2	6.8	25	65
07/04/2023	18:02:00	5.6	6.7	25	67
07/04/2023	18:03:00	4.9	6.5	25	55
07/04/2023	18:04:00	5.1	6.5	25	59
07/04/2023	18:05:00	4.7	5.7	25	61
07/04/2023	18:06:00	4.9	6.5	25	60
07/04/2023	18:07:00	5.4	6.7	25	61

Date	Time	Wind speed average	Wind Speed maximum	Temperature	Wind Direction
07/04/2023	18:08:00	4.9	6.5	25	58
07/04/2023	18:09:00	4.9	6.3	25	56
07/04/2023	18:10:00	4.9	5.5	24	49
07/04/2023	18:11:00	5.8	7.2	24	44
07/04/2023	18:12:00	5.6	7.1	24	45
07/04/2023	18:13:00	5.8	7.1	24	43
07/04/2023	18:14:00	5	7.4	24	47
07/04/2023	18:15:00	6	7.6	24	46
07/04/2023	18:16:00	6.2	8.1	24	44
07/04/2023	18:17:00	6	7.2	24	48
07/04/2023	18:18:00	5.3	6.6	24	42
07/04/2023	18:19:00	5.3	7.9	24	44
07/04/2023	18:20:00	5.8	8.1	24	43
07/04/2023	18:21:00	5.4	6.9	24	45
07/04/2023	18:22:00	5	6.6	24	38
07/04/2023	18:23:00	3.9	6.8	24	43
07/04/2023	18:24:00	5.5	7.2	24	39
07/04/2023	18:25:00	5.1	6.6	24	40
07/04/2023	18:26:00	5.1	6.4	24	38
07/04/2023	18:27:00	5	6.5	24	37
07/04/2023	18:28:00	5	6.7	24	31
07/04/2023	18:29:00	6.2	8.5	24	33
07/04/2023	18:30:00	4.7	5.6	24	31
07/04/2023	18:31:00	5.4	7.4	24	34
07/04/2023	18:32:00	5.9	7.1	24	33
07/04/2023	18:33:00	5	6.4	24	35
07/04/2023	18:34:00	4.6	6.3	24	36
07/04/2023	18:35:00	3.9	5.9	24	39
07/04/2023	18:36:00	4	5.9	23	38
07/04/2023	18:37:00	6.1	7.5	23	39
07/04/2023	18:38:00	5.2	6.5	23	36
07/04/2023	18:39:00	5.4	6.6	23	37
07/04/2023	18:40:00	5	6	23	37
07/04/2023	18:41:00	4.1	6.1	23	36
07/04/2023	18:42:00	5.5	7.1	23	34
07/04/2023	18:43:00	5	5.9	23	31
07/04/2023	18:44:00	4.2	6.2	23	32
07/04/2023	18:45:00	4.7	6.5	23	30
07/04/2023	18:46:00	5.3	6.4	23	38
07/04/2023	18:47:00	5.3	6.8	23	40
07/04/2023	18:48:00	5.2	6.8	23	41
07/04/2023	18:49:00	5.7	7.5	23	39
07/04/2023	18:50:00	5.5	6.8	23	39
07/04/2023	18:51:00	5.7	6.8	23	40
07/04/2023	18:52:00	5	6.5	23	36
07/04/2023	18:53:00	4	6	23	35
07/04/2023	18:54:00	3.9	5	23	39
07/04/2023	18:55:00	4.7	5.9	23	33
07/04/2023	18:56:00	4.5	5.8	22	34
07/04/2023	18:57:00	4.2	5.7	22	34
07/04/2023	18:58:00	4.6	6.4	22	31
07/04/2023	18:59:00	4.5	5.7	22	33
07/04/2023	19:00:00	5.4	6.6	22	34
07/04/2023	19:01:00	4.8	5.9	22	36
07/04/2023	19:02:00	4.6	6.2	22	29
07/04/2023	19:03:00	4.1	5.7	22	26
07/04/2023	19:04:00	4.7	6.3	22	23
07/04/2023	19:05:00	4.5	5.4	22	22
07/04/2023	19:06:00	4.4	5.6	22	21
07/04/2023	19:07:00	5	5.9	22	18
07/04/2023	19:08:00	4.3	5.2	22	12
07/04/2023	19:09:00	4	5.3	22	12

Date	Time	Wind speed average	Wind Speed maximum	Temperature	Wind Direction
07/04/2023	19:10:00	4.8	5.9	22	16
07/04/2023	19:11:00	3.7	4.7	22	22
07/04/2023	19:12:00	4.3	5.7	22	26
07/04/2023	19:13:00	4.3	5.8	22	26
07/04/2023	19:14:00	4.7	6.1	22	23
07/04/2023	19:15:00	4.7	6	22	22
07/04/2023	19:16:00	4.8	6	22	19
07/04/2023	19:17:00	4.2	5.6	22	22
07/04/2023	19:18:00	4.9	6.1	22	20
07/04/2023	19:19:00	5	6.2	22	24
07/04/2023	19:20:00	4.4	5.4	22	22
07/04/2023	19:21:00	4.2	5.2	21	20
07/04/2023	19:22:00	4.8	6.3	21	20
07/04/2023	19:23:00	4.7	6.3	21	22
07/04/2023	19:24:00	4.7	6.4	21	18
07/04/2023	19:25:00	5.1	6.4	21	20
07/04/2023	19:26:00	4	5.3	21	19
07/04/2023	19:27:00	4	5.4	21	17
07/04/2023	19:28:00	4.6	5.8	21	25
07/04/2023	19:29:00	4.3	7	21	28
07/04/2023	19:30:00	5	6.4	21	25
07/04/2023	19:31:00	5.2	6.4	21	34
07/04/2023	19:32:00	5.2	6.9	21	30
07/04/2023	19:33:00	4.8	5.9	21	30
07/04/2023	19:34:00	4.9	5.9	21	32
07/04/2023	19:35:00	4.6	6.1	21	31
07/04/2023	19:36:00	4.5	6.3	21	31
07/04/2023	19:37:00	4.3	6	21	40
07/04/2023	19:38:00	4.6	6	21	38
07/04/2023	19:39:00	4.6	6.5	21	40
07/04/2023	19:40:00	4.6	6.8	21	42
07/04/2023	19:41:00	5.1	6.5	21	46
07/04/2023	19:42:00	4.2	5.8	21	39
07/04/2023	19:43:00	4.3	6.2	21	34
07/04/2023	19:44:00	4.8	6.7	21	37
07/04/2023	19:45:00	5.2	7.2	21	33
07/04/2023	19:46:00	4.1	5.6	21	34
07/04/2023	19:47:00	4.3	6.1	21	41
07/04/2023	19:48:00	4.5	6.8	21	46
07/04/2023	19:49:00	3.9	5.2	21	45
07/04/2023	19:50:00	4.7	6.7	22	46
07/04/2023	19:51:00	5.4	6.4	22	46
07/04/2023	19:52:00	5	6.3	22	45
07/04/2023	19:53:00	3.7	4.4	22	35
07/04/2023	19:54:00	4.4	5.7	22	34
07/04/2023	19:55:00	4.3	5.2	22	30
07/04/2023	19:56:00	4	5.3	22	30
07/04/2023	19:57:00	3.9	5.2	22	38
07/04/2023	19:58:00	3.7	4.6	22	39
07/04/2023	19:59:00	3.8	5.6	21	35
07/04/2023	20:00:00	3.3	5.4	21	37
07/04/2023	20:01:00	4.6	5.7	21	40
07/04/2023	20:02:00	5	6.6	21	43
07/04/2023	20:03:00	4.5	5.2	21	44
07/04/2023	20:04:00	4	5.9	21	44
07/04/2023	20:05:00	3.2	4.3	21	41
07/04/2023	20:06:00	4.5	5.5	21	46
07/04/2023	20:07:00	4.4	6	21	43
07/04/2023	20:08:00	4.6	6.2	21	37
07/04/2023	20:09:00	4	5.2	21	35
07/04/2023	20:10:00	4.2	5	21	30
07/04/2023	20:11:00	4	5	21	32

Date	Time	Wind speed average	Wind Speed maximum	Temperature	Wind Direction
07/04/2023	20:12:00	4.1	5.1	21	32
07/04/2023	20:13:00	4.4	5.2	21	32
07/04/2023	20:14:00	3.6	5.2	21	32
07/04/2023	20:15:00	4.1	5.4	21	36
07/04/2023	20:16:00	4.6	5.8	21	36
07/04/2023	20:17:00	3.8	5.3	21	37
07/04/2023	20:18:00	4.3	5.5	21	38
07/04/2023	20:19:00	4.8	5.9	21	36
07/04/2023	20:20:00	4.1	5.6	21	35
07/04/2023	20:21:00	4.4	5.5	21	37
07/04/2023	20:22:00	3.7	5.4	21	37
07/04/2023	20:23:00	4.2	5.5	21	32
07/04/2023	20:24:00	3.4	4.7	21	28
07/04/2023	20:25:00	3.4	4.2	21	29
07/04/2023	20:26:00	3.5	4.5	21	32
07/04/2023	20:27:00	3.9	5	21	27
07/04/2023	20:28:00	3.7	4.6	21	29
07/04/2023	20:29:00	3.8	4.8	21	32
07/04/2023	20:30:00	3.7	5.1	21	33
07/04/2023	20:31:00	3.3	4.1	21	34
07/04/2023	20:32:00	3.8	4.6	21	33
07/04/2023	20:33:00	3.4	4.3	21	32
07/04/2023	20:34:00	3	4	21	36
07/04/2023	20:35:00	3.6	4.3	21	36
07/04/2023	20:36:00	3.5	4.8	21	40
07/04/2023	20:37:00	3.5	4.3	21	39
07/04/2023	20:38:00	3.7	4.5	21	42
07/04/2023	20:39:00	3	3.7	21	46
07/04/2023	20:40:00	3.2	4	21	42
07/04/2023	20:41:00	4.5	5.9	21	43
07/04/2023	20:42:00	4.4	5.1	21	44
07/04/2023	20:43:00	4.2	5.1	21	44
07/04/2023	20:44:00	4	4.9	21	49
07/04/2023	20:45:00	3.6	5.1	21	53
07/04/2023	20:46:00	3.7	5.6	21	61
07/04/2023	20:47:00	3.4	4.8	21	57
07/04/2023	20:48:00	4.1	5.6	21	56
07/04/2023	20:49:00	3.5	4.4	21	50
07/04/2023	20:50:00	3.6	6	21	50
07/04/2023	20:51:00	4.4	5.3	21	50
07/04/2023	20:52:00	4.5	6.1	21	46
07/04/2023	20:53:00	4	4.9	21	42
07/04/2023	20:54:00	3.9	5.1	21	42
07/04/2023	20:55:00	3.8	4.4	21	44
07/04/2023	20:56:00	4	5.2	21	45
07/04/2023	20:57:00	3.5	4.9	21	46
07/04/2023	20:58:00	3.3	4.3	21	46
07/04/2023	20:59:00	4	5.2	21	49
07/04/2023	21:00:00	4.5	5.7	21	48
07/04/2023	21:01:00	4	5.7	21	50
07/04/2023	21:02:00	3.4	5.1	21	52
07/04/2023	21:03:00	4	5.6	21	50
07/04/2023	21:04:00	4.8	5.9	21	52
07/04/2023	21:05:00	4.1	6.1	21	51
07/04/2023	21:06:00	3.7	4.4	21	52
07/04/2023	21:07:00	4.4	5.7	21	48
07/04/2023	21:08:00	4.1	5.8	21	55
07/04/2023	21:09:00	4.1	5.4	21	50
07/04/2023	21:10:00	4.1	5.2	21	57
07/04/2023	21:11:00	4.2	5.4	21	56
07/04/2023	21:12:00	4.4	6	21	61
07/04/2023	21:13:00	3.9	5.4	21	60

Date	Time	Wind speed average	Wind Speed maximum	Temperature	Wind Direction
07/04/2023	21:14:00	3.7	4.6	21	64
07/04/2023	21:15:00	3.3	4.5	21	65
07/04/2023	21:16:00	3.4	4.6	21	63
07/04/2023	21:17:00	3.6	5.4	21	63
07/04/2023	21:18:00	3.3	4.1	21	61
07/04/2023	21:19:00	3.7	4.8	21	64
07/04/2023	21:20:00	4	4.9	21	63
07/04/2023	21:21:00	3.6	4.5	21	68
07/04/2023	21:22:00	3.8	5	21	70
07/04/2023	21:23:00	3.7	4.3	21	70
07/04/2023	21:24:00	3.6	4.7	21	70
07/04/2023	21:25:00	3.4	5.1	21	70
07/04/2023	21:26:00	3.8	5	21	63
07/04/2023	21:27:00	3.5	4.8	21	63
07/04/2023	21:28:00	2.6	4	21	64
07/04/2023	21:29:00	3.6	4.7	21	63
07/04/2023	21:30:00	3.6	4.5	21	61
07/04/2023	21:31:00	4	5.1	21	58
07/04/2023	21:32:00	3.2	4.2	21	54
07/04/2023	21:33:00	3.3	4.1	21	54
07/04/2023	21:34:00	3.2	4	21	57
07/04/2023	21:35:00	3.5	4.3	21	58
07/04/2023	21:36:00	3.6	4.5	21	54
07/04/2023	21:37:00	3.3	4	21	53
07/04/2023	21:38:00	3.1	3.6	21	50
07/04/2023	21:39:00	3.4	4.3	21	47
07/04/2023	21:40:00	3.4	4.5	21	47
07/04/2023	21:41:00	3.1	3.8	21	48
07/04/2023	21:42:00	3.2	4.2	21	56
07/04/2023	21:43:00	2.8	3.7	21	52
07/04/2023	21:44:00	2.9	3.4	21	53
07/04/2023	21:45:00	2.4	3.2	21	53
07/04/2023	21:46:00	2.8	4	21	57
07/04/2023	21:47:00	2	3	21	65
07/04/2023	21:48:00	2.2	3.2	21	66
07/04/2023	21:49:00	2.1	3.5	21	76
07/04/2023	21:50:00	2.1	3.3	21	83
07/04/2023	21:51:00	2.2	3	21	83
07/04/2023	21:52:00	1.8	2.7	21	83
07/04/2023	21:53:00	1.6	2.5	21	92
07/04/2023	21:54:00	2.2	3.8	21	81
07/04/2023	21:55:00	2.5	3.7	21	89
07/04/2023	21:56:00	2.7	4.1	21	85
07/04/2023	21:57:00	3.1	4	21	75
07/04/2023	21:58:00	3.4	4.8	21	68
07/04/2023	21:59:00	4.3	5.4	21	69
07/04/2023	22:00:00	3.5	4.3	21	74
07/04/2023	22:01:00	3.3	3.9	21	73
07/04/2023	22:02:00	3.2	4.5	21	74
07/04/2023	22:03:00	2.7	3.3	21	56
07/04/2023	22:04:00	2.8	3.2	21	55
07/04/2023	22:05:00	2.8	3.2	21	49
07/04/2023	22:06:00	3	3.5	21	46
07/04/2023	22:07:00	2.9	3.4	21	43
07/04/2023	22:08:00	3	3.7	21	43
07/04/2023	22:09:00	3.4	4.6	21	40
07/04/2023	22:10:00	3.5	4.5	21	35
07/04/2023	22:11:00	3.3	3.9	21	31
07/04/2023	22:12:00	3.3	4.2	21	31
07/04/2023	22:13:00	2.9	3.5	21	30
07/04/2023	22:14:00	3.5	4.7	21	34
07/04/2023	22:15:00	3.9	4.9	21	39

Date	Time	Wind speed average	Wind Speed maximum	Temperature	Wind Direction
07/04/2023	22:16:00	4.5	5.6	21	38
07/04/2023	22:17:00	4	5.3	21	41
07/04/2023	22:18:00	3.4	4.2	21	50
07/04/2023	22:19:00	3.3	4	21	47
07/04/2023	22:20:00	4.1	5.3	21	33
07/04/2023	22:21:00	4	4.9	21	24
07/04/2023	22:22:00	3.9	4.7	21	32
07/04/2023	22:23:00	3.9	5.5	21	37
07/04/2023	22:24:00	3.9	5	21	48
07/04/2023	22:25:00	3.6	4	20	52
07/04/2023	22:26:00	2.8	3.5	20	56
07/04/2023	22:27:00	2.9	4.1	20	69
07/04/2023	22:28:00	3.2	4.5	20	74
07/04/2023	22:29:00	4	5.2	20	72
07/04/2023	22:30:00	3.7	4.8	20	71
07/04/2023	22:31:00	3.7	4.7	20	72
07/04/2023	22:32:00	4.2	5.6	20	76
07/04/2023	22:33:00	3.5	4.6	20	86
07/04/2023	22:34:00	3.7	4.9	20	84
07/04/2023	22:35:00	4	4.9	20	86
07/04/2023	22:36:00	3.7	4.6	20	83
07/04/2023	22:37:00	3.5	4.6	20	93
07/04/2023	22:38:00	3.7	4.6	20	91
07/04/2023	22:39:00	3.3	4.6	20	90
07/04/2023	22:40:00	3.2	4.1	20	95
07/04/2023	22:41:00	3.9	5	20	102
07/04/2023	22:42:00	4	5.6	20	103
07/04/2023	22:43:00	3.9	4.7	20	103
07/04/2023	22:44:00	4	5.5	20	101
07/04/2023	22:45:00	4.1	5	20	99
07/04/2023	22:46:00	4.1	5.4	20	95
07/04/2023	22:47:00	4	5.5	20	92
07/04/2023	22:48:00	3.8	5.1	20	91
07/04/2023	22:49:00	3.5	5.7	20	94
07/04/2023	22:50:00	2.9	4.6	20	93
07/04/2023	22:51:00	3.5	4.8	20	110
07/04/2023	22:52:00	3.4	4.3	20	115
07/04/2023	22:53:00	4.1	5.1	20	110
07/04/2023	22:54:00	4	5.5	20	107
07/04/2023	22:55:00	3.6	4.8	20	106
07/04/2023	22:56:00	3.5	5.2	20	114
07/04/2023	22:57:00	3.5	4.5	20	121
07/04/2023	22:58:00	3	4.2	20	127
07/04/2023	22:59:00	2.6	3.4	20	125
07/04/2023	23:00:00	2.3	3.6	20	120
07/04/2023	23:01:00	2.9	3.7	20	117
07/04/2023	23:02:00	2.7	4	21	105
07/04/2023	23:03:00	3.1	4.8	21	118
07/04/2023	23:04:00	3.3	4.5	21	123
07/04/2023	23:05:00	3.1	3.6	21	109
07/04/2023	23:06:00	2.9	3.7	21	106
07/04/2023	23:07:00	3.1	5.3	21	91
07/04/2023	23:08:00	4.1	5.4	21	101
07/04/2023	23:09:00	3.4	4.6	21	96
07/04/2023	23:10:00	3.1	3.6	21	101
07/04/2023	23:11:00	3	4.1	21	84
07/04/2023	23:12:00	2.9	4	21	82
07/04/2023	23:13:00	2.6	3.8	21	86
07/04/2023	23:14:00	2.8	3.7	21	64
07/04/2023	23:15:00	2.9	3.7	21	46
07/04/2023	23:16:00	2.6	3.1	21	31
07/04/2023	23:17:00	2.1	3.4	21	16

Date	Time	Wind speed average	Wind Speed maximum	Temperature	Wind Direction
07/04/2023	23:18:00	1.8	2.6	21	7
07/04/2023	23:19:00	3.2	4.8	21	119
07/04/2023	23:20:00	3.3	4.2	21	106
07/04/2023	23:21:00	2.9	4.3	21	138
07/04/2023	23:22:00	1.8	2.5	21	135
07/04/2023	23:23:00	1	1.4	21	90
07/04/2023	23:24:00	0.4	0.8	21	184
07/04/2023	23:25:00	1.4	2.5	21	190
07/04/2023	23:26:00	1.4	2	21	253
07/04/2023	23:27:00	2.5	4.1	21	183
07/04/2023	23:28:00	3.4	4.6	21	187
07/04/2023	23:29:00	4.1	5.3	21	183
07/04/2023	23:30:00	4.5	5.8	21	182
07/04/2023	23:31:00	4.4	6.2	21	169
07/04/2023	23:32:00	5.7	8	21	173
07/04/2023	23:33:00	5.5	6.6	21	176
07/04/2023	23:34:00	6.9	9.1	22	167
07/04/2023	23:35:00	5.4	7.3	22	161
07/04/2023	23:36:00	4.8	6.3	22	160
07/04/2023	23:37:00	5.2	7	22	157
07/04/2023	23:38:00	4.4	5.9	22	153
07/04/2023	23:39:00	4.5	6	22	148
07/04/2023	23:40:00	5	6.9	22	146
07/04/2023	23:41:00	4.7	6.3	22	148
07/04/2023	23:42:00	4.5	6.4	22	153
07/04/2023	23:43:00	3.9	5.8	22	158
07/04/2023	23:44:00	4.2	5.9	22	158
07/04/2023	23:45:00	4.1	5.5	22	155
07/04/2023	23:46:00	4.1	5.5	22	155
07/04/2023	23:47:00	3.6	5.4	23	154
07/04/2023	23:48:00	3.9	5.8	23	156
07/04/2023	23:49:00	3.7	4.9	23	155
07/04/2023	23:50:00	3.7	5.2	23	153
07/04/2023	23:51:00	4.5	5.9	23	157
07/04/2023	23:52:00	3.6	5.4	23	159
07/04/2023	23:53:00	3.2	4.6	22	163
07/04/2023	23:54:00	3.3	5.1	22	160
07/04/2023	23:55:00	3.9	5.4	22	162
07/04/2023	23:56:00	4.1	6.1	22	155
07/04/2023	23:57:00	4.5	5.5	22	153
07/04/2023	23:58:00	3.9	6	22	151
07/04/2023	23:59:00	3.7	5.9	22	152
08/04/2023	00:00:00	4.1	5.4	22	153
08/04/2023	00:01:00	4	5.9	22	148
08/04/2023	00:02:00	4.7	5.9	22	148
08/04/2023	00:03:00	4.6	6.1	22	151
08/04/2023	00:04:00	6.1	7.6	22	151
08/04/2023	00:05:00	5.6	6.5	22	156
08/04/2023	00:06:00	4.7	5.9	22	153
08/04/2023	00:07:00	4.3	5.5	22	154
08/04/2023	00:08:00	4.4	5.8	22	155
08/04/2023	00:09:00	5.2	6.6	22	151
08/04/2023	00:10:00	4	5.5	22	152
08/04/2023	00:11:00	4.2	5.6	22	153
08/04/2023	00:12:00	4	5.1	22	154
08/04/2023	00:13:00	4	6.3	22	156
08/04/2023	00:14:00	4.3	6.2	22	154
08/04/2023	00:15:00	4.1	5	22	159
08/04/2023	00:16:00	3.8	4.9	22	156
08/04/2023	00:17:00	3.6	4.4	22	154
08/04/2023	00:18:00	3.8	5.4	22	154
08/04/2023	00:19:00	4	5.7	22	151

Date	Time	Wind speed average	Wind Speed maximum	Temperature	Wind Direction
08/04/2023	00:20:00	3.9	4.6	22	154
08/04/2023	00:21:00	4.4	5.5	22	156
08/04/2023	00:22:00	3.5	4.4	22	153
08/04/2023	00:23:00	3.4	4.7	22	158
08/04/2023	00:24:00	3.3	4.8	22	158
08/04/2023	00:25:00	2.8	3.9	22	157
08/04/2023	00:26:00	2.8	4	22	158
08/04/2023	00:27:00	2.7	3.7	22	157
08/04/2023	00:28:00	3.7	5.2	22	161
08/04/2023	00:29:00	3.4	4.6	22	163
08/04/2023	00:30:00	4.1	5.9	22	165
08/04/2023	00:31:00	4.3	5.8	22	163
08/04/2023	00:32:00	4.2	6.3	22	159
08/04/2023	00:33:00	4.8	6.1	22	170
08/04/2023	00:34:00	4.5	6.3	22	177
08/04/2023	00:35:00	4.4	5.1	22	172
08/04/2023	00:36:00	4.4	5.4	22	178
08/04/2023	00:37:00	4	5	22	181
08/04/2023	00:38:00	4.2	5.3	22	188
08/04/2023	00:39:00	3.4	4.5	22	195
08/04/2023	00:40:00	3.5	5	22	194
08/04/2023	00:41:00	3.7	4.5	22	197
08/04/2023	00:42:00	3.6	4.7	22	195
08/04/2023	00:43:00	4.9	6.2	22	201
08/04/2023	00:44:00	4.8	6.3	22	191
08/04/2023	00:45:00	4.8	6.4	22	183
08/04/2023	00:46:00	4.8	6.6	22	180
08/04/2023	00:47:00	5.3	7.1	22	176
08/04/2023	00:48:00	4.9	7.4	22	172
08/04/2023	00:49:00	5.2	7.5	22	169
08/04/2023	00:50:00	5.1	6.6	22	172
08/04/2023	00:51:00	4.9	6.9	22	169
08/04/2023	00:52:00	5	6.4	22	173
08/04/2023	00:53:00	5.7	8.1	23	175
08/04/2023	00:54:00	5.6	8.1	23	174
08/04/2023	00:55:00	5.7	8.1	23	177
08/04/2023	00:56:00	5	6.3	23	174
08/04/2023	00:57:00	5.4	7.4	23	175
08/04/2023	00:58:00	6.2	8.5	23	181
08/04/2023	00:59:00	6.3	8.9	23	180
08/04/2023	01:00:00	6.5	8.2	23	182
08/04/2023	01:01:00	5.7	7.2	23	186
08/04/2023	01:02:00	5.9	8.5	23	184
08/04/2023	01:03:00	5	7.1	23	183
08/04/2023	01:04:00	6	7.5	23	183
08/04/2023	01:05:00	5.6	8	23	191
08/04/2023	01:06:00	4.6	5.9	23	188
08/04/2023	01:07:00	5.7	7.1	23	189
08/04/2023	01:08:00	4.8	6.3	23	188
08/04/2023	01:09:00	5	6.3	23	187
08/04/2023	01:10:00	3.6	4.5	23	191
08/04/2023	01:11:00	4.1	5.5	23	184
08/04/2023	01:12:00	3.9	5.3	23	187
08/04/2023	01:13:00	3.6	4.7	23	189
08/04/2023	01:14:00	4.7	6.3	23	187
08/04/2023	01:15:00	4	6.2	23	186
08/04/2023	01:16:00	3.9	5	23	187
08/04/2023	01:17:00	4.6	7.3	23	189
08/04/2023	01:18:00	5.5	7.3	23	189
08/04/2023	01:19:00	4.9	6.6	23	191
08/04/2023	01:20:00	4.5	5.8	23	192
08/04/2023	01:21:00	5.7	7.5	23	187

Date	Time	Wind speed average	Wind Speed maximum	Temperature	Wind Direction
08/04/2023	01:22:00	4.5	5.9	23	188
08/04/2023	01:23:00	4.5	6	23	188
08/04/2023	01:24:00	4.8	6	23	184
08/04/2023	01:25:00	4.8	6.6	23	189
08/04/2023	01:26:00	5.6	7.4	23	182
08/04/2023	01:27:00	5.7	8.4	23	185
08/04/2023	01:28:00	5.6	7.2	23	185
08/04/2023	01:29:00	4.5	5.9	23	187
08/04/2023	01:30:00	4.1	5.3	23	187
08/04/2023	01:31:00	4.4	6.4	23	188
08/04/2023	01:32:00	4.4	6	23	189
08/04/2023	01:33:00	3.8	4.9	23	188
08/04/2023	01:34:00	4.3	5.6	23	192
08/04/2023	01:35:00	4.4	6.1	23	190
08/04/2023	01:36:00	3.8	5.2	23	191
08/04/2023	01:37:00	4.1	5.4	23	194
08/04/2023	01:38:00	3.9	4.8	23	198
08/04/2023	01:39:00	3.7	5.6	23	199
08/04/2023	01:40:00	4.5	6.5	23	203
08/04/2023	01:41:00	5.3	7.1	23	196
08/04/2023	01:42:00	5	6.7	23	200
08/04/2023	01:43:00	6	8.6	23	197
08/04/2023	01:44:00	6.1	7.8	23	193
08/04/2023	01:45:00	5.5	7.1	23	189
08/04/2023	01:46:00	6.3	9.1	24	192
08/04/2023	01:47:00	5.2	6.3	24	193
08/04/2023	01:48:00	5.5	7.1	24	187
08/04/2023	01:49:00	5.9	7.9	24	188
08/04/2023	01:50:00	6	7.5	24	194
08/04/2023	01:51:00	6.3	7.9	24	190
08/04/2023	01:52:00	6.2	8.3	24	191
08/04/2023	01:53:00	5.8	7.4	24	187
08/04/2023	01:54:00	6.2	7.6	24	192
08/04/2023	01:55:00	4.9	6.7	24	188
08/04/2023	01:56:00	4.8	5.9	24	189
08/04/2023	01:57:00	5.4	7.7	24	190
08/04/2023	01:58:00	6	8	24	186
08/04/2023	01:59:00	5.5	6.7	24	185
08/04/2023	02:00:00	7	9.2	24	185
08/04/2023	02:01:00	6.7	8.2	24	187
08/04/2023	02:02:00	4.9	6.5	24	187
08/04/2023	02:03:00	5.8	8	24	185
08/04/2023	02:04:00	5.1	6.7	24	181
08/04/2023	02:05:00	4.9	7.2	24	182
08/04/2023	02:06:00	5.7	7.3	24	181
08/04/2023	02:07:00	4.9	6.6	24	182
08/04/2023	02:08:00	6	8	24	179
08/04/2023	02:09:00	5.2	6.7	24	179
08/04/2023	02:10:00	5	6.6	24	182
08/04/2023	02:11:00	5.9	8.1	24	178
08/04/2023	02:12:00	5.8	7.1	24	175
08/04/2023	02:13:00	5.2	6.4	24	179
08/04/2023	02:14:00	5.4	6.8	24	179
08/04/2023	02:15:00	5.5	7.1	24	181
08/04/2023	02:16:00	5.8	7.8	24	183
08/04/2023	02:17:00	4.9	6.5	24	181
08/04/2023	02:18:00	5.2	7.6	24	182
08/04/2023	02:19:00	5.2	6.4	24	185
08/04/2023	02:20:00	5.7	6.9	24	181
08/04/2023	02:21:00	5.3	6.5	24	184
08/04/2023	02:22:00	5	6.6	24	182
08/04/2023	02:23:00	5.1	6.9	24	176

Date	Time	Wind speed average	Wind Speed maximum	Temperature	Wind Direction
08/04/2023	02:24:00	5.5	7.8	24	174
08/04/2023	02:25:00	4.9	6.1	24	177
08/04/2023	02:26:00	4.9	7	23	177
08/04/2023	02:27:00	5.2	7	23	174
08/04/2023	02:28:00	6.2	7.6	23	176
08/04/2023	02:29:00	5.4	6.9	23	175
08/04/2023	02:30:00	5.1	6.1	23	176
08/04/2023	02:31:00	4.4	5.9	23	176
08/04/2023	02:32:00	4.9	7.1	23	172
08/04/2023	02:33:00	4.8	7.2	23	172
08/04/2023	02:34:00	5.1	7	23	174
08/04/2023	02:35:00	5.3	6.8	23	174
08/04/2023	02:36:00	5	7	23	175
08/04/2023	02:37:00	5.5	7.6	23	177
08/04/2023	02:38:00	5.2	6.6	23	177
08/04/2023	02:39:00	5.3	7.1	23	172
08/04/2023	02:40:00	6.1	8.1	23	173
08/04/2023	02:41:00	5.3	6.8	23	175
08/04/2023	02:42:00	5.7	8.2	23	173
08/04/2023	02:43:00	5.4	7.9	23	170
08/04/2023	02:44:00	5	7.6	23	172
08/04/2023	02:45:00	5.1	6.8	23	166
08/04/2023	02:46:00	4.7	6.2	23	167
08/04/2023	02:47:00	4.7	6.2	23	165
08/04/2023	02:48:00	4.6	6	23	165
08/04/2023	02:49:00	4.9	7.1	23	162
08/04/2023	02:50:00	5.1	6.5	23	167
08/04/2023	02:51:00	5.1	6.9	23	163
08/04/2023	02:52:00	5.1	6.8	23	168
08/04/2023	02:53:00	5.3	6.9	23	167
08/04/2023	02:54:00	5.5	7.6	23	167
08/04/2023	02:55:00	4.7	6.4	23	168
08/04/2023	02:56:00	5.2	6.7	23	167
08/04/2023	02:57:00	4.2	6.1	23	168
08/04/2023	02:58:00	4.5	6.3	23	163
08/04/2023	02:59:00	4.2	5.9	23	165
08/04/2023	03:00:00	4	5.9	23	167
08/04/2023	03:01:00	4	5.9	23	166
08/04/2023	03:02:00	4.1	5.3	23	163
08/04/2023	03:03:00	4.2	5.9	23	162
08/04/2023	03:04:00	4.6	6.7	23	162
08/04/2023	03:05:00	5.2	6.8	23	163
08/04/2023	03:06:00	4.7	6.5	23	160
08/04/2023	03:07:00	4.3	5.6	23	160
08/04/2023	03:08:00	4.1	6.9	23	155
08/04/2023	03:09:00	3.8	4.8	23	162
08/04/2023	03:10:00	4	5.7	23	161
08/04/2023	03:11:00	4	5.4	23	161
08/04/2023	03:12:00	3.7	5.2	22	164
08/04/2023	03:13:00	3.5	4.8	22	160
08/04/2023	03:14:00	3.1	4	22	163
08/04/2023	03:15:00	3.5	5.2	22	162
08/04/2023	03:16:00	3.6	4.7	22	160
08/04/2023	03:17:00	3.9	5.9	22	160
08/04/2023	03:18:00	4	5.3	22	161
08/04/2023	03:19:00	4	5.1	22	161
08/04/2023	03:20:00	3.7	5	22	159
08/04/2023	03:21:00	3.6	4.9	22	160
08/04/2023	03:22:00	3.7	5.2	22	161
08/04/2023	03:23:00	3.3	4.4	22	160
08/04/2023	03:24:00	3.4	4.3	22	161
08/04/2023	03:25:00	3.7	5	22	163

Date	Time	Wind speed average	Wind Speed maximum	Temperature	Wind Direction
08/04/2023	03:26:00	3.6	4.8	22	166
08/04/2023	03:27:00	3.7	4.7	22	168
08/04/2023	03:28:00	3.6	4.9	22	167
08/04/2023	03:29:00	3.3	4.2	22	165
08/04/2023	03:30:00	3.9	5.4	22	164
08/04/2023	03:31:00	3.5	4.8	22	162
08/04/2023	03:32:00	3.3	4.2	22	162
08/04/2023	03:33:00	3.4	5.1	22	164
08/04/2023	03:34:00	3	4.5	22	167
08/04/2023	03:35:00	3.1	3.9	22	168
08/04/2023	03:36:00	3.2	4.5	22	171
08/04/2023	03:37:00	3.1	4	22	170
08/04/2023	03:38:00	3.4	4.6	22	176
08/04/2023	03:39:00	3.4	4.5	22	176
08/04/2023	03:40:00	2.6	3.7	22	175
08/04/2023	03:41:00	3.1	4	22	181
08/04/2023	03:42:00	3.6	4.6	22	180
08/04/2023	03:43:00	3.2	4.2	22	183
08/04/2023	03:44:00	3.1	3.9	22	183
08/04/2023	03:45:00	3.3	4.2	22	184
08/04/2023	03:46:00	3.1	3.8	22	186
08/04/2023	03:47:00	3.2	3.9	22	190
08/04/2023	03:48:00	3.1	4.2	22	190
08/04/2023	03:49:00	2.8	3.6	22	185
08/04/2023	03:50:00	3.1	4.4	22	189
08/04/2023	03:51:00	3.1	3.8	22	182
08/04/2023	03:52:00	3.7	5.6	22	183
08/04/2023	03:53:00	3.7	4.4	22	178
08/04/2023	03:54:00	3.7	4.7	22	183
08/04/2023	03:55:00	3.7	4.9	22	177
08/04/2023	03:56:00	3.6	4.9	22	179
08/04/2023	03:57:00	4	5.3	22	174
08/04/2023	03:58:00	3.5	4.7	22	174
08/04/2023	03:59:00	4.5	5.9	22	172
08/04/2023	04:00:00	5.1	6.4	22	172
08/04/2023	04:01:00	4.7	6.5	22	172
08/04/2023	04:02:00	4.8	5.8	22	172
08/04/2023	04:03:00	4.4	5.7	22	174
08/04/2023	04:04:00	3.6	4.5	22	172
08/04/2023	04:05:00	3.6	4.4	22	171
08/04/2023	04:06:00	3.4	4.2	22	171
08/04/2023	04:07:00	3.4	4.3	22	173
08/04/2023	04:08:00	3.5	4.4	22	174
08/04/2023	04:09:00	3.6	4.9	22	173
08/04/2023	04:10:00	3	3.9	22	174
08/04/2023	04:11:00	3	4.4	23	175
08/04/2023	04:12:00	2.8	3.6	23	176
08/04/2023	04:13:00	3.2	4.1	23	177
08/04/2023	04:14:00	2.7	3.5	23	175
08/04/2023	04:15:00	3.6	4.5	22	171
08/04/2023	04:16:00	2.9	4	22	174
08/04/2023	04:17:00	3	4.5	22	174
08/04/2023	04:18:00	3.4	4.4	22	174
08/04/2023	04:19:00	3.3	4.4	22	176
08/04/2023	04:20:00	3.3	4.3	22	177
08/04/2023	04:21:00	4.1	5.3	22	178
08/04/2023	04:22:00	3.5	4.6	22	177
08/04/2023	04:23:00	3.7	4.9	22	179
08/04/2023	04:24:00	4.3	5.1	22	175
08/04/2023	04:25:00	4.3	5.6	22	175
08/04/2023	04:26:00	4.3	5.2	22	177
08/04/2023	04:27:00	4.3	5.5	22	177

Date	Time	Wind speed average	Wind Speed maximum	Temperature	Wind Direction
08/04/2023	04:28:00	4.7	6	22	177
08/04/2023	04:29:00	4.7	5.6	22	178
08/04/2023	04:30:00	4.4	5.5	22	174
08/04/2023	04:31:00	4.5	5.6	22	173
08/04/2023	04:32:00	4.8	6.2	22	173
08/04/2023	04:33:00	4.1	5.5	22	173
08/04/2023	04:34:00	4.7	5.9	22	170
08/04/2023	04:35:00	4.2	5.7	22	171
08/04/2023	04:36:00	4.2	5.5	22	171
08/04/2023	04:37:00	4	5.8	22	168
08/04/2023	04:38:00	4.9	6.6	22	167
08/04/2023	04:39:00	4.8	6.1	22	176
08/04/2023	04:40:00	5	6.3	22	174
08/04/2023	04:41:00	4.4	5.8	22	178
08/04/2023	04:42:00	4.7	6.9	22	180
08/04/2023	04:43:00	3.9	5	22	180
08/04/2023	04:44:00	4.4	6.4	22	185
08/04/2023	04:45:00	4.9	6.9	22	184
08/04/2023	04:46:00	4.9	6.3	22	180
08/04/2023	04:47:00	5.9	6.9	22	179
08/04/2023	04:48:00	5.7	7	22	180
08/04/2023	04:49:00	4.9	6.2	22	178
08/04/2023	04:50:00	5.3	6.9	23	174
08/04/2023	04:51:00	5.2	7	23	172
08/04/2023	04:52:00	5.8	7.6	23	172
08/04/2023	04:53:00	4.8	7.1	23	174
08/04/2023	04:54:00	5.6	7.9	23	170
08/04/2023	04:55:00	5.2	6.6	23	174
08/04/2023	04:56:00	5	6	23	179
08/04/2023	04:57:00	4.5	6.1	23	177
08/04/2023	04:58:00	4.6	6.1	23	174
08/04/2023	04:59:00	5	6.5	23	175
08/04/2023	05:00:00	4.7	6.4	23	174
08/04/2023	05:01:00	4.5	5.7	23	168
08/04/2023	05:02:00	4.4	5.5	22	171
08/04/2023	05:03:00	4.6	6.2	22	169
08/04/2023	05:04:00	4.1	5.7	22	173
08/04/2023	05:05:00	4.3	5.3	22	172
08/04/2023	05:06:00	4.4	6	22	170
08/04/2023	05:07:00	3.9	5.1	22	170
08/04/2023	05:08:00	4.8	6.8	22	171
08/04/2023	05:09:00	4.3	5.5	22	165
08/04/2023	05:10:00	4.3	5.6	22	165
08/04/2023	05:11:00	3.4	4.8	22	168
08/04/2023	05:12:00	3.1	3.9	22	164
08/04/2023	05:13:00	3.5	4.9	22	163
08/04/2023	05:14:00	3.7	5.1	22	162
08/04/2023	05:15:00	4	4.9	22	164
08/04/2023	05:16:00	3.4	5	22	166
08/04/2023	05:17:00	4.7	5.8	22	173
08/04/2023	05:18:00	3.9	5.2	22	172
08/04/2023	05:19:00	4.1	5.6	22	171
08/04/2023	05:20:00	3.8	5	22	168
08/04/2023	05:21:00	3.5	5.1	22	169
08/04/2023	05:22:00	4.1	5	22	170
08/04/2023	05:23:00	3.7	5.1	22	168
08/04/2023	05:24:00	3.9	4.9	22	162
08/04/2023	05:25:00	3.3	4.5	21	163
08/04/2023	05:26:00	3	3.9	21	164
08/04/2023	05:27:00	3.3	4.5	21	171
08/04/2023	05:28:00	3	4.6	21	172
08/04/2023	05:29:00	3.4	4.5	21	168

Date	Time	Wind speed average	Wind Speed maximum	Temperature	Wind Direction
08/04/2023	05:30:00	3	4.4	21	167
08/04/2023	05:31:00	2.9	3.9	21	167
08/04/2023	05:32:00	3.1	4.3	21	164
08/04/2023	05:33:00	3.2	4.5	21	162
08/04/2023	05:34:00	2.9	4.4	21	158
08/04/2023	05:35:00	3.7	4.9	21	157
08/04/2023	05:36:00	2.9	3.9	21	156
08/04/2023	05:37:00	3	3.9	21	162
08/04/2023	05:38:00	2.6	3.8	21	156
08/04/2023	05:39:00	2.6	4.1	21	155
08/04/2023	05:40:00	2.7	3.6	21	160
08/04/2023	05:41:00	2.7	3.9	21	158
08/04/2023	05:42:00	2.4	3.6	21	158
08/04/2023	05:43:00	3.3	4.8	21	152
08/04/2023	05:44:00	3.1	4.2	21	152
08/04/2023	05:45:00	2.4	3.5	21	157
08/04/2023	05:46:00	2.7	3.9	21	159
08/04/2023	05:47:00	2.8	3.7	21	164
08/04/2023	05:48:00	2.4	3.3	21	167
08/04/2023	05:49:00	2.7	3.6	21	168
08/04/2023	05:50:00	2.2	3.7	21	167
08/04/2023	05:51:00	2.7	3.5	21	166
08/04/2023	05:52:00	3.1	4.4	21	165
08/04/2023	05:53:00	2.8	4.6	21	164
08/04/2023	05:54:00	3	4.4	21	164
08/04/2023	05:55:00	3.1	3.9	21	154
08/04/2023	05:56:00	2.7	3.9	21	156
08/04/2023	05:57:00	2.8	3.8	21	159
08/04/2023	05:58:00	3.1	4	21	156
08/04/2023	05:59:00	3.1	4.5	21	155
08/04/2023	06:00:00	2.8	3.8	21	151
08/04/2023	06:01:00	2.6	3.9	21	146
08/04/2023	06:02:00	3.1	4.4	21	146
08/04/2023	06:03:00	2.9	3.8	21	149
08/04/2023	06:04:00	3	4.1	21	146
08/04/2023	06:05:00	2.6	4	21	148
08/04/2023	06:06:00	3	3.9	21	151
08/04/2023	06:07:00	2.5	3.6	21	158
08/04/2023	06:08:00	2.2	3	21	175
08/04/2023	06:09:00	1.9	2.5	21	188
08/04/2023	06:10:00	1.4	1.9	21	230
08/04/2023	06:11:00	1.5	1.9	21	266
08/04/2023	06:12:00	1.9	2.4	21	313
08/04/2023	06:13:00	1.9	2.2	21	323
08/04/2023	06:14:00	1.8	2.2	21	321
08/04/2023	06:15:00	1.8	2	21	313
08/04/2023	06:16:00	1.7	2.1	20	306
08/04/2023	06:17:00	1.5	1.8	20	296
08/04/2023	06:18:00	1.4	2	20	304
08/04/2023	06:19:00	2.3	3.5	20	324
08/04/2023	06:20:00	3.2	3.8	20	291
08/04/2023	06:21:00	2.9	3.9	20	301
08/04/2023	06:22:00	3.7	4.2	20	312
08/04/2023	06:23:00	2.9	3.5	20	314
08/04/2023	06:24:00	4	6.1	20	294
08/04/2023	06:25:00	5.2	6.7	20	301
08/04/2023	06:26:00	5.9	9.3	20	290
08/04/2023	06:27:00	7.2	9.6	20	295
08/04/2023	06:28:00	6	7.9	20	286
08/04/2023	06:29:00	5.3	7.1	20	293
08/04/2023	06:30:00	6	8.6	20	307
08/04/2023	06:31:00	5	7.6	20	305

Date	Time	Wind speed average	Wind Speed maximum	Temperature	Wind Direction
08/04/2023	06:32:00	4.9	6	20	311
08/04/2023	06:33:00	3.7	5	20	320
08/04/2023	06:34:00	2.6	3.9	20	312
08/04/2023	06:35:00	1.9	2.9	20	290
08/04/2023	06:36:00	1.7	2.5	20	211
08/04/2023	06:37:00	1.3	1.6	20	223
08/04/2023	06:38:00	2	3	20	243
08/04/2023	06:39:00	2.7	3.8	20	245
08/04/2023	06:40:00	2.8	4.6	20	257
08/04/2023	06:41:00	3.6	4.6	21	290
08/04/2023	06:42:00	3.6	5.2	21	298
08/04/2023	06:43:00	2.8	3.6	21	299
08/04/2023	06:44:00	3.7	5.3	21	299
08/04/2023	06:45:00	2.6	3.5	21	288
08/04/2023	06:46:00	3.3	4.8	21	297
08/04/2023	06:47:00	3.5	4.6	21	295
08/04/2023	06:48:00	3.5	4.4	21	289
08/04/2023	06:49:00	3.2	4.2	21	281
08/04/2023	06:50:00	3	3.9	21	292
08/04/2023	06:51:00	3.5	5	21	294
08/04/2023	06:52:00	3.1	5.2	21	287
08/04/2023	06:53:00	2.8	4.3	21	274
08/04/2023	06:54:00	2.9	3.4	21	282
08/04/2023	06:55:00	2.4	3.2	21	267
08/04/2023	06:56:00	1.9	2.8	22	265
08/04/2023	06:57:00	1.9	2.4	22	250
08/04/2023	06:58:00	1.3	1.9	22	245
08/04/2023	06:59:00	1.4	1.7	22	281
08/04/2023	07:00:00	1	1.7	22	274
08/04/2023	07:01:00	1.1	1.6	22	293
08/04/2023	07:02:00	1.2	1.4	22	30
08/04/2023	07:03:00	1.3	2	22	39
08/04/2023	07:04:00	2.1	2.5	22	60
08/04/2023	07:05:00	1.9	2.4	22	56
08/04/2023	07:06:00	1.6	1.9	22	47
08/04/2023	07:07:00	2	2.9	22	55
08/04/2023	07:08:00	2.6	3	22	56
08/04/2023	07:09:00	2.7	3.7	22	50
08/04/2023	07:10:00	3.8	4.5	22	48
08/04/2023	07:11:00	3.6	4.2	22	55
08/04/2023	07:12:00	3	4	21	61
08/04/2023	07:13:00	2.7	3.2	21	81
08/04/2023	07:14:00	1.9	2.5	21	103
08/04/2023	07:15:00	1.2	1.5	21	125
08/04/2023	07:16:00	1.4	2	21	114
08/04/2023	07:17:00	1.6	1.9	21	98
08/04/2023	07:18:00	1.1	1.5	21	99
08/04/2023	07:19:00	1.4	1.9	21	99
08/04/2023	07:20:00	1.5	1.9	21	107
08/04/2023	07:21:00	1.6	1.9	21	103
08/04/2023	07:22:00	1.7	2	21	103
08/04/2023	07:23:00	1.5	2	21	107
08/04/2023	07:24:00	1.5	2	21	120
08/04/2023	07:25:00	1.4	1.9	21	138
08/04/2023	07:26:00	1.6	1.9	21	153
08/04/2023	07:27:00	1.8	2.1	21	149
08/04/2023	07:28:00	1.8	2.8	21	150
08/04/2023	07:29:00	2.2	2.8	21	144
08/04/2023	07:30:00	2.3	3	21	141
08/04/2023	07:31:00	2.2	2.7	21	141
08/04/2023	07:32:00	2.6	3.3	21	131
08/04/2023	07:33:00	2.3	3.2	21	127

Date	Time	Wind speed average	Wind Speed maximum	Temperature	Wind Direction
08/04/2023	07:34:00	2.6	3.3	21	120
08/04/2023	07:35:00	3.2	4	21	112
08/04/2023	07:36:00	3.6	5	21	109
08/04/2023	07:37:00	3.9	4.9	21	107
08/04/2023	07:38:00	4.3	5	21	106
08/04/2023	07:39:00	4.1	5	21	104
08/04/2023	07:40:00	3.7	4.4	21	102
08/04/2023	07:41:00	3.4	4.7	21	104
08/04/2023	07:42:00	3.6	4.4	21	110
08/04/2023	07:43:00	3.8	4.8	21	121
08/04/2023	07:44:00	3.1	4.1	21	128
08/04/2023	07:45:00	2.8	3.7	21	131
08/04/2023	07:46:00	2.4	3.5	21	142
08/04/2023	07:47:00	2.3	3.5	21	145
08/04/2023	07:48:00	2.5	3.3	21	141
08/04/2023	07:49:00	2.5	3.3	21	142
08/04/2023	07:50:00	2.8	3.8	21	144
08/04/2023	07:51:00	2.4	3.4	21	142
08/04/2023	07:52:00	2.9	3.6	21	138
08/04/2023	07:53:00	2.8	3.6	21	124
08/04/2023	07:54:00	2.7	3.4	21	119
08/04/2023	07:55:00	2.8	3.8	21	125
08/04/2023	07:56:00	3	4	21	127
08/04/2023	07:57:00	2.8	3.8	21	128
08/04/2023	07:58:00	2.5	3.5	21	126
08/04/2023	07:59:00	2.6	3.2	21	134
08/04/2023	08:00:00	2.4	2.9	21	141
08/04/2023	08:01:00	2.5	3.2	21	145
08/04/2023	08:02:00	2.7	3.8	21	150
08/04/2023	08:03:00	2.7	3.6	21	148
08/04/2023	08:04:00	2.6	3.4	21	150
08/04/2023	08:05:00	2.8	3.5	21	150
08/04/2023	08:06:00	2.6	3.7	21	160
08/04/2023	08:07:00	2.6	3.5	22	165
08/04/2023	08:08:00	2.5	3.1	22	158
08/04/2023	08:09:00	2.9	3.7	22	150
08/04/2023	08:10:00	3.5	4.7	22	147
08/04/2023	08:11:00	3.4	4.5	22	151
08/04/2023	08:12:00	3.6	4.5	22	145
08/04/2023	08:13:00	3.5	4.7	22	143
08/04/2023	08:14:00	3.1	3.9	22	137
08/04/2023	08:15:00	3.2	3.8	22	131
08/04/2023	08:16:00	3.2	4	22	125
08/04/2023	08:17:00	3.2	4.3	22	121
08/04/2023	08:18:00	2.7	3.4	22	122
08/04/2023	08:19:00	2.8	3.8	22	124
08/04/2023	08:20:00	2.6	3.5	22	126
08/04/2023	08:21:00	2.5	3	22	128
08/04/2023	08:22:00	2.7	3.7	23	119
08/04/2023	08:23:00	2.9	3.7	23	121
08/04/2023	08:24:00	2.8	3.4	23	123
08/04/2023	08:25:00	2.7	3.5	23	126
08/04/2023	08:26:00	2.3	3	23	126
08/04/2023	08:27:00	2.4	3.4	23	119
08/04/2023	08:28:00	2.9	3.4	23	122
08/04/2023	08:29:00	2.9	3.6	23	127
08/04/2023	08:30:00	2.3	3.4	23	134
08/04/2023	08:31:00	2.6	3.3	23	142
08/04/2023	08:32:00	2.5	3	23	136
08/04/2023	08:33:00	2.4	3.1	24	144
08/04/2023	08:34:00	2.1	2.7	24	147
08/04/2023	08:35:00	2.4	3.3	24	133

Date	Time	Wind speed average	Wind Speed maximum	Temperature	Wind Direction
08/04/2023	08:36:00	2.5	3.3	24	133
08/04/2023	08:37:00	1.9	2.5	24	140
08/04/2023	08:38:00	2.3	2.9	24	146
08/04/2023	08:39:00	2.2	2.7	24	154
08/04/2023	08:40:00	1.9	2.7	24	164
08/04/2023	08:41:00	2	2.6	24	172
08/04/2023	08:42:00	2.5	2.9	24	171
08/04/2023	08:43:00	2.1	2.4	24	179
08/04/2023	08:44:00	2	2.7	25	183
08/04/2023	08:45:00	1.7	2	25	198
08/04/2023	08:46:00	1.7	2	25	219
08/04/2023	08:47:00	1.6	2.1	25	227
08/04/2023	08:48:00	1.8	2.5	25	229
08/04/2023	08:49:00	2	2.4	25	233
08/04/2023	08:50:00	1.9	2.5	25	248
08/04/2023	08:51:00	2.1	3	25	256
08/04/2023	08:52:00	2.5	3.2	25	267
08/04/2023	08:53:00	3.1	4.1	25	271
08/04/2023	08:54:00	3.1	3.7	25	277
08/04/2023	08:55:00	3.5	5.9	25	279
08/04/2023	08:56:00	5	6.2	25	283
08/04/2023	08:57:00	5.3	6.8	25	287
08/04/2023	08:58:00	3.8	5.7	24	292
08/04/2023	08:59:00	3.8	5.1	24	304
08/04/2023	09:00:00	4	4.7	24	300
08/04/2023	09:01:00	3.7	5.3	24	280
08/04/2023	09:02:00	5.5	7.3	24	287
08/04/2023	09:03:00	5.9	7.4	24	300
08/04/2023	09:04:00	5.7	7.1	24	288
08/04/2023	09:05:00	5.2	6.8	24	289
08/04/2023	09:06:00	4.6	6.6	24	281
08/04/2023	09:07:00	3.9	5.1	24	292
08/04/2023	09:08:00	4.3	5.8	24	303
08/04/2023	09:09:00	4.3	5.3	23	302
08/04/2023	09:10:00	3.5	4.9	23	299
08/04/2023	09:11:00	3.8	5.1	23	304
08/04/2023	09:12:00	4	5.3	23	294
08/04/2023	09:13:00	4.1	5.2	23	298
08/04/2023	09:14:00	4.5	5.9	23	307
08/04/2023	09:15:00	4	5.5	23	302
08/04/2023	09:16:00	4.1	5.5	23	300
08/04/2023	09:17:00	3.6	4.8	23	311
08/04/2023	09:18:00	3.4	4.6	23	307
08/04/2023	09:19:00	3.5	4.1	23	305
08/04/2023	09:20:00	3.8	4.5	23	311
08/04/2023	09:21:00	3.8	5	23	312
08/04/2023	09:22:00	3.2	4.2	23	308
08/04/2023	09:23:00	3.1	4.2	23	305
08/04/2023	09:24:00	3.9	5.1	23	307
08/04/2023	09:25:00	3.1	4	23	301
08/04/2023	09:26:00	3.1	3.8	23	316
08/04/2023	09:27:00	3.7	4.6	23	321
08/04/2023	09:28:00	3.7	4.8	23	330
08/04/2023	09:29:00	3.2	3.9	23	329
08/04/2023	09:30:00	3.4	4.6	23	335
08/04/2023	09:31:00	3.5	4.2	23	331
08/04/2023	09:32:00	3.2	4.4	23	321
08/04/2023	09:33:00	2.9	4	23	312
08/04/2023	09:34:00	2.8	3.6	23	330
08/04/2023	09:35:00	2	2.5	23	319
08/04/2023	09:36:00	3.1	3.9	23	327
08/04/2023	09:37:00	2.7	3.6	23	329

Date	Time	Wind speed average	Wind Speed maximum	Temperature	Wind Direction
08/04/2023	09:38:00	2.8	3.4	23	333
08/04/2023	09:39:00	2.2	2.8	24	345
08/04/2023	09:40:00	2.2	2.9	24	343
08/04/2023	09:41:00	2.9	4.6	24	8
08/04/2023	09:42:00	3.5	4.3	24	9
08/04/2023	09:43:00	2.8	4	24	8
08/04/2023	09:44:00	2.8	4.1	24	14
08/04/2023	09:45:00	3.1	3.7	24	2
08/04/2023	09:46:00	3	3.8	24	351
08/04/2023	09:47:00	2.5	3.3	24	0
08/04/2023	09:48:00	2	2.6	25	359
08/04/2023	09:49:00	2.4	3.1	25	354
08/04/2023	09:50:00	1.8	2.4	25	348
08/04/2023	09:51:00	2.3	2.8	25	353
08/04/2023	09:52:00	2.1	2.8	25	346
08/04/2023	09:53:00	2.8	3.4	25	350
08/04/2023	09:54:00	2.4	3	25	358
08/04/2023	09:55:00	2.9	3.9	25	2
08/04/2023	09:56:00	3.3	4	25	353
08/04/2023	09:57:00	2.7	3.1	25	360
08/04/2023	09:58:00	2.6	3	25	350
08/04/2023	09:59:00	2.7	3.1	25	350
08/04/2023	10:00:00	2.8	3.7	26	324
08/04/2023	10:01:00	2.3	3.4	26	336
08/04/2023	10:02:00	3.1	4	26	350
08/04/2023	10:03:00	3.1	3.9	26	334
08/04/2023	10:04:00	3	4.6	26	325
08/04/2023	10:05:00	3.1	3.9	26	326
08/04/2023	10:06:00	2.7	3.3	26	332
08/04/2023	10:07:00	2.6	3.3	26	342
08/04/2023	10:08:00	2.9	3.5	26	351
08/04/2023	10:09:00	2.9	3.7	26	3
08/04/2023	10:10:00	3.5	4	26	359
08/04/2023	10:11:00	2.8	3.6	26	3
08/04/2023	10:12:00	2.3	2.9	26	353
08/04/2023	10:13:00	2.6	3.1	26	323
08/04/2023	10:14:00	2.2	2.7	26	6
08/04/2023	10:15:00	2.4	3.1	26	358
08/04/2023	10:16:00	2.7	3.6	26	329
08/04/2023	10:17:00	2.8	3.7	26	347
08/04/2023	10:18:00	2.5	3.2	26	359
08/04/2023	10:19:00	3	3.8	26	5
08/04/2023	10:20:00	2.8	3.8	26	10
08/04/2023	10:21:00	2.7	3.6	26	340
08/04/2023	10:22:00	2.4	3.2	26	338
08/04/2023	10:23:00	3.3	4.2	26	355
08/04/2023	10:24:00	2.6	3.6	26	1
08/04/2023	10:25:00	2.1	2.5	26	344
08/04/2023	10:26:00	3	4	27	334
08/04/2023	10:27:00	2.9	3.7	27	335
08/04/2023	10:28:00	3.1	3.9	27	352
08/04/2023	10:29:00	3.2	3.9	27	336
08/04/2023	10:30:00	2.8	4.6	27	332
08/04/2023	10:31:00	3	4.4	27	333
08/04/2023	10:32:00	2.7	3.9	27	321
08/04/2023	10:33:00	3	4	27	303
08/04/2023	10:34:00	2.7	4	27	312
08/04/2023	10:35:00	2.3	3.1	27	338
08/04/2023	10:36:00	3.3	4.8	27	334
08/04/2023	10:37:00	2.3	2.8	27	339
08/04/2023	10:38:00	2.8	3.7	27	341
08/04/2023	10:39:00	3.8	5.8	27	339

Date	Time	Wind speed average	Wind Speed maximum	Temperature	Wind Direction
08/04/2023	10:40:00	4.1	5.1	27	328
08/04/2023	10:41:00	3.5	6.3	27	325
08/04/2023	10:42:00	2.5	3.6	27	3
08/04/2023	10:43:00	3.6	4.4	27	8
08/04/2023	10:44:00	3.3	4.6	27	9
08/04/2023	10:45:00	3.3	3.9	27	11
08/04/2023	10:46:00	3.7	5	27	350
08/04/2023	10:47:00	3.6	4.4	27	340
08/04/2023	10:48:00	2.5	3.4	27	332
08/04/2023	10:49:00	2.9	3.8	27	346
08/04/2023	10:50:00	2.6	3.9	27	344
08/04/2023	10:51:00	3.5	4.7	27	343
08/04/2023	10:52:00	3.8	5.3	28	21
08/04/2023	10:53:00	4	5.5	28	21
08/04/2023	10:54:00	3.6	5.2	28	10
08/04/2023	10:55:00	4.2	5	28	12
08/04/2023	10:56:00	4	5.1	28	17
08/04/2023	10:57:00	3.4	4.6	28	11
08/04/2023	10:58:00	3	4.7	28	3
08/04/2023	10:59:00	4	5.4	28	0
08/04/2023	11:00:00	2.8	3.7	28	357
08/04/2023	11:01:00	3	4.1	28	11
08/04/2023	11:02:00	3.3	4.8	28	22
08/04/2023	11:03:00	2.9	3.9	28	39
08/04/2023	11:04:00	3.2	4.2	28	31
08/04/2023	11:05:00	3.4	4.1	28	35
08/04/2023	11:06:00	3.6	5.1	28	39
08/04/2023	11:07:00	2.3	3	28	34
08/04/2023	11:08:00	2.8	4.3	28	15
08/04/2023	11:09:00	3.9	5	28	9
08/04/2023	11:10:00	3.2	4.1	28	349
08/04/2023	11:11:00	1.8	3.6	28	11
08/04/2023	11:12:00	1.1	2.2	28	321
08/04/2023	11:13:00	1.1	2.3	28	294
08/04/2023	11:14:00	1.9	2.8	28	345
08/04/2023	11:15:00	2.6	3.3	28	2
08/04/2023	11:16:00	1.8	2.6	28	12
08/04/2023	11:17:00	3	4.3	28	345
08/04/2023	11:18:00	2.6	3.2	28	334
08/04/2023	11:19:00	1.7	2.3	28	309
08/04/2023	11:20:00	1.2	1.9	28	345
08/04/2023	11:21:00	3	4.7	28	341
08/04/2023	11:22:00	3.4	4.5	28	344
08/04/2023	11:23:00	2.9	3.6	28	356
08/04/2023	11:24:00	3	3.9	28	357
08/04/2023	11:25:00	3	3.5	28	17
08/04/2023	11:26:00	2.4	3.7	28	6
08/04/2023	11:27:00	2.7	4	28	24
08/04/2023	11:28:00	1.7	3	28	5
08/04/2023	11:29:00	1.2	1.9	28	330
08/04/2023	11:30:00	1.5	2	28	26
08/04/2023	11:31:00	0.8	1.5	28	232
08/04/2023	11:32:00	1	1.7	28	298
08/04/2023	11:33:00	1.9	2.9	28	84
08/04/2023	11:34:00	3	3.8	28	76
08/04/2023	11:35:00	2.7	3.5	28	98
08/04/2023	11:36:00	3	4	28	88
08/04/2023	11:37:00	2	3	28	104
08/04/2023	11:38:00	1.8	2.3	28	115
08/04/2023	11:39:00	3.4	5	29	78
08/04/2023	11:40:00	3.4	4	29	79
08/04/2023	11:41:00	2.4	3.3	29	69

Date	Time	Wind speed average	Wind Speed maximum	Temperature	Wind Direction
08/04/2023	11:42:00	2.2	2.6	29	58
08/04/2023	11:43:00	1.6	2	29	71
08/04/2023	11:44:00	1	1.4	29	109
08/04/2023	11:45:00	0.7	1.7	29	77
08/04/2023	11:46:00	3.2	6.3	29	50
08/04/2023	11:47:00	3.6	4.4	29	119
08/04/2023	11:48:00	3.3	3.9	29	121
08/04/2023	11:49:00	3.8	4.8	29	99
08/04/2023	11:50:00	3.2	4.8	29	112
08/04/2023	11:51:00	3.1	3.7	29	113
08/04/2023	11:52:00	2.9	4.7	29	109
08/04/2023	11:53:00	2.3	3.3	29	73
08/04/2023	11:54:00	2.7	3.8	29	99
08/04/2023	11:55:00	3	4	29	130
08/04/2023	11:56:00	2.9	3.4	29	115
08/04/2023	11:57:00	3.7	5.4	29	133
08/04/2023	11:58:00	3.4	4.9	29	135
08/04/2023	11:59:00	3.4	4.4	29	143
08/04/2023	12:00:00	3.1	4.3	29	132
08/04/2023	12:01:00	2.6	4.2	29	116
08/04/2023	12:02:00	2.4	3.5	29	159
08/04/2023	12:03:00	2.8	3.6	29	182
08/04/2023	12:04:00	2.7	3.3	29	168
08/04/2023	12:05:00	2.6	3.2	29	148
08/04/2023	12:06:00	2.9	3.8	29	177
08/04/2023	12:07:00	1.8	2.6	29	186
08/04/2023	12:08:00	3	3.9	29	131
08/04/2023	12:09:00	2.2	3.3	29	136
08/04/2023	12:10:00	1.3	2.4	29	64
08/04/2023	12:11:00	2.8	3.4	29	30
08/04/2023	12:12:00	2.3	2.9	29	30
08/04/2023	12:13:00	1.9	2.7	29	139
08/04/2023	12:14:00	2.3	3.2	29	187
08/04/2023	12:15:00	2.4	3	29	175
08/04/2023	12:16:00	1.7	2.2	29	234
08/04/2023	12:17:00	1.3	2.3	29	176
08/04/2023	12:18:00	1.4	2.3	29	131
08/04/2023	12:19:00	0.8	1.6	29	50
08/04/2023	12:20:00	1.5	2.4	29	106
08/04/2023	12:21:00	1.3	1.9	29	114
08/04/2023	12:22:00	0.8	1.6	29	147
08/04/2023	12:23:00	2.3	4.2	29	45
08/04/2023	12:24:00	1.4	2.8	29	48
08/04/2023	12:25:00	3.2	3.8	29	31
08/04/2023	12:26:00	2.8	3.7	29	20
08/04/2023	12:27:00	2.6	3.7	29	352
08/04/2023	12:28:00	2.1	2.9	29	341
08/04/2023	12:29:00	1.6	2.7	29	354
08/04/2023	12:30:00	1.3	2.1	29	140
08/04/2023	12:31:00	1.5	2.3	29	91
08/04/2023	12:32:00	1.2	2	29	140
08/04/2023	12:33:00	1.8	2.3	29	181
08/04/2023	12:34:00	0.7	0.9	29	178
08/04/2023	12:35:00	1.1	2.4	29	68
08/04/2023	12:36:00	2.3	3.3	29	110
08/04/2023	12:37:00	2.2	3.1	29	114
08/04/2023	12:38:00	2.2	3.5	29	101
08/04/2023	12:39:00	2.8	4.1	29	137
08/04/2023	12:40:00	3.9	4.7	29	146
08/04/2023	12:41:00	3.6	4.7	29	133
08/04/2023	12:42:00	3.4	4.8	29	132
08/04/2023	12:43:00	2	2.9	29	117

Date	Time	Wind speed average	Wind Speed maximum	Temperature	Wind Direction
08/04/2023	12:44:00	3.1	4	29	168
08/04/2023	12:45:00	3	4.1	29	142
08/04/2023	12:46:00	3.4	4.7	29	142
08/04/2023	12:47:00	2.9	3.9	29	146
08/04/2023	12:48:00	3.4	3.9	29	128
08/04/2023	12:49:00	2	2.8	29	124
08/04/2023	12:50:00	2.3	3.5	29	151
08/04/2023	12:51:00	2.8	3.5	29	179
08/04/2023	12:52:00	2.6	3.6	30	182
08/04/2023	12:53:00	2.5	3.1	30	189
08/04/2023	12:54:00	3.1	5.2	30	170
08/04/2023	12:55:00	3.2	4.8	30	186
08/04/2023	12:56:00	3.9	5.1	30	173
08/04/2023	12:57:00	3.8	4.9	30	180
08/04/2023	12:58:00	2.8	3.9	29	165
08/04/2023	12:59:00	1.5	2.9	29	165
08/04/2023	13:00:00	2.3	3.1	29	157

Noise data log

Table 10: Noise data for AN 1

Date	Time	Leq	Lmax	Lmin	LN 10	LN 90
08/04/2023	15:37:18	47.6	63.8	35.6	51.6	38.7
08/04/2023	15:47:18	55.2	67.8	34.9	59.2	42.4
08/04/2023	15:57:18	48	63	37.3	51.4	41.9
08/04/2023	16:07:18	48.1	63.2	38	51.2	41.7
08/04/2023	16:17:18	45.1	58.5	38.4	47.5	41.6
08/04/2023	16:27:18	49.2	67.4	37.2	50.5	40.6
08/04/2023	16:37:18	46.9	67.2	32.4	50.3	37.2
08/04/2023	16:47:18	48.9	70.4	40	50.2	42.9
08/04/2023	16:57:18	49.9	68.2	41.6	52.3	44.7
08/04/2023	17:07:18	58.4	72.1	42.9	61.8	45.7
08/04/2023	17:17:18	68.3	75.6	58	71.3	63
08/04/2023	17:27:18	67.1	79.5	58.7	70.1	62.2
08/04/2023	17:37:18	65.1	73.6	53.1	69.5	58.2
08/04/2023	17:47:18	68.1	75.3	58.2	71	63.3
08/04/2023	17:57:18	66.6	76.2	55.7	70.1	60.4
08/04/2023	18:07:18	54.7	68.1	38.3	57.8	42.9
08/04/2023	18:17:18	53.4	68.9	39.9	58	42.5
08/04/2023	18:27:18	50.4	63.1	38.1	55.3	42.5
08/04/2023	18:37:18	50.8	69.8	37.5	55.2	41.1
08/04/2023	18:47:18	58.9	72.7	38.6	61.4	50.9
08/04/2023	18:57:18	56.7	69.7	33.1	60.4	39.4
08/04/2023	19:07:18	44.9	64.8	33.4	47.9	37
08/04/2023	19:17:18	46.5	69.3	33.1	45.4	35
08/04/2023	19:27:18	36.5	59.8	31.6	37.2	33.6
08/04/2023	19:37:18	46.8	68.7	32.1	44.4	33.9
08/04/2023	19:47:18	44.5	72.2	32.2	41.6	34.8
08/04/2023	19:57:18	48.1	71.9	32.5	43.2	34.2
08/04/2023	20:07:18	45.1	68.2	32.9	44.3	34.4
08/04/2023	20:17:18	44.7	66.6	31.2	45	33.1
08/04/2023	20:27:18	46.6	68.9	30.7	50	33.2
08/04/2023	20:37:18	43.2	62.8	29.2	45.9	31.4
08/04/2023	20:47:18	45.1	67.8	30.3	48.9	32.9
08/04/2023	20:57:18	36.4	54	31.8	38.2	33.1
08/04/2023	21:07:18	39.2	64.3	32.2	38.5	34.4
08/04/2023	21:17:18	38.4	53.5	32.4	40.2	34.7
08/04/2023	21:27:18	44.3	62.9	33.6	47.8	35.6

Date	Time	Leq	Lmax	Lmin	LN 10	LN 90
08/04/2023	21:37:18	40.6	68.6	31	38.4	33.2
08/04/2023	21:47:18	34.9	58.3	30.8	36.5	32.7
08/04/2023	21:57:18	35.3	50.1	31.2	37	33.1
08/04/2023	22:07:18	37.9	61.1	31	36.8	32.6
08/04/2023	22:17:18	35.2	50.4	31.4	36.8	32.9
08/04/2023	22:27:18	54.9	77.5	31.7	45.3	33.1
08/04/2023	22:37:18	60	85.7	32.5	43.5	34.6
08/04/2023	22:47:18	36.8	53.6	32.1	38.1	33.8
08/04/2023	22:57:18	39.5	62.1	31.6	40.6	33.9
08/04/2023	23:07:18	34.1	49.9	31.7	35	32.8
08/04/2023	23:17:18	50.4	72.6	32.6	49.5	34.4
08/04/2023	23:27:18	38.3	46.3	32.7	40.8	35.2
08/04/2023	23:37:18	38.6	47.6	33.5	41.2	35.6
08/04/2023	23:47:18	37.3	45.5	32.8	39.7	34.6
08/04/2023	23:57:18	37.4	51.6	32.5	39.3	34.5
09/04/2023	00:07:18	36.3	47.2	32.9	37.7	34.3
09/04/2023	00:17:18	36.1	48.1	32.7	37.6	34.1
09/04/2023	00:27:18	35.6	44.7	32.3	37.1	33.9
09/04/2023	00:37:18	34.7	44.3	32.6	35.7	33.6
09/04/2023	00:47:18	37.4	52.1	32.4	37.5	33.9
09/04/2023	00:57:18	35.1	41.3	33.1	35.9	34.1
09/04/2023	01:07:18	34.8	43	32.9	35.5	33.9
09/04/2023	01:17:18	34.1	43.1	32.1	34.8	33.3
09/04/2023	01:27:18	43.4	68.8	31.8	46.9	33.5
09/04/2023	01:37:18	35.5	53.5	31.7	34.7	33
09/04/2023	01:47:18	34.7	50.1	32.2	35.4	33.6
09/04/2023	01:57:18	35	42.7	32.9	35.9	34.1
09/04/2023	02:07:18	34.7	38.7	31.2	36	32.8
09/04/2023	02:17:18	33.3	57.7	29.8	32.9	30.9
09/04/2023	02:27:18	31.7	54.5	24.9	33	27
09/04/2023	02:37:18	27.7	39.7	24.8	28.8	26.2
09/04/2023	02:47:18	36.9	48.5	28.6	38.8	32.9
09/04/2023	02:57:18	37.8	53.9	28.8	40.4	30.6
09/04/2023	03:07:18	40.4	59.5	28.7	43.9	31.2
09/04/2023	03:17:18	46	58.6	36	49.8	39.6
09/04/2023	03:27:18	36.4	48.8	28.5	39	30.7
09/04/2023	03:37:18	33.8	50.7	27	33.8	29.3
09/04/2023	03:47:18	31.8	43.6	26.2	34.8	28.8
09/04/2023	03:57:18	32.1	43.7	24.7	35.7	26.9
09/04/2023	04:07:18	34.5	42.9	27.6	37.3	30.4
09/04/2023	04:17:18	29.6	37.9	26.6	30.7	28.1
09/04/2023	04:27:18	34.7	52.8	28.7	34.1	30.6
09/04/2023	04:37:18	31.9	41.7	27.8	33.4	29.7
09/04/2023	04:47:18	33	50.3	29.4	34.8	30.7
09/04/2023	04:57:18	33.9	48.8	28.6	36.8	30.1
09/04/2023	05:07:18	39	49	31.3	41.8	34.8
09/04/2023	05:17:18	40.5	52.6	32.8	43.5	35.6
09/04/2023	05:27:18	42.5	54.7	34.2	45.5	37.3
09/04/2023	05:37:18	45.8	67.8	33.5	46	37.5
09/04/2023	05:47:18	47.4	63.2	37.9	49.8	41.2
09/04/2023	05:57:18	52.5	78.6	35.3	48.4	37.5
09/04/2023	06:07:18	46.3	70.6	31.9	48.5	35.9
09/04/2023	06:17:18	44.5	62.1	30.2	48.6	34.7
09/04/2023	06:27:18	45.3	60.7	31.8	48.9	36.6
09/04/2023	06:37:18	47.8	61.7	31.3	51.7	38
09/04/2023	06:47:18	47.9	61.1	34.3	51.4	40.9
09/04/2023	06:57:18	47.8	57.9	34.7	50.3	40.8
09/04/2023	07:07:18	49.3	65.8	40.3	51.8	43.3
09/04/2023	07:17:18	46.9	61.6	34.9	49.5	39.8
09/04/2023	07:27:18	47	62.5	29.3	50.6	36
09/04/2023	07:37:18	45.4	60.7	30.1	49.1	36.4
09/04/2023	07:47:18	49.6	60.8	30.7	53.1	37.1
09/04/2023	07:57:18	47.1	63.7	35.1	50.5	40.6

Date	Time	Leq	Lmax	Lmin	LN 10	LN 90
09/04/2023	08:07:18	51.8	83	32.7	51.9	41.5
09/04/2023	08:17:18	50.1	67.1	34.9	54.4	40.6
09/04/2023	08:27:18	46.6	65.3	32.6	50.1	37.6
09/04/2023	08:37:18	44.7	59.2	31.4	48.9	36.4
09/04/2023	08:47:18	47.8	59.9	35.4	52.2	39.4
09/04/2023	08:57:18	51.6	64.3	38.9	55.1	43.4
09/04/2023	09:07:18	51.4	65.5	35.2	55.2	41.6
09/04/2023	09:17:18	53	63.8	34	56.8	41
09/04/2023	09:27:18	51	73.6	32.4	54.3	36.9
09/04/2023	09:37:18	53.5	68.8	31.5	56.5	38.5
09/04/2023	09:47:18	43.4	66.6	30.6	45.1	34.4
09/04/2023	09:57:18	43.4	62	30.4	46.2	34.8
09/04/2023	10:07:18	43.3	56.3	33.6	46.3	37.4
09/04/2023	10:17:18	49.8	70	32.8	54.8	36.9
09/04/2023	10:27:18	53.1	59.2	35.5	56.4	43
09/04/2023	10:37:18	53.5	61.5	38.3	56.9	42.5
09/04/2023	10:47:18	54.2	66.4	38.6	58.7	43.2
09/04/2023	10:57:18	50.6	69.9	40.3	51.8	43.6
09/04/2023	11:07:18	46.6	67.1	37.4	48.5	42.7
09/04/2023	11:17:18	49	71.1	39.4	48.9	42.5
09/04/2023	11:27:18	48.9	75.6	38.9	50	43
09/04/2023	11:37:18	52.6	78.4	40.8	53.4	44.4
09/04/2023	11:47:18	47.3	65.5	39.9	49.9	43.2
09/04/2023	11:57:18	48.6	61.9	39.8	51	45
09/04/2023	12:07:18	50.2	65.3	42.7	52.5	45.8
09/04/2023	12:17:18	59.2	84.4	39.9	55.9	45.3
09/04/2023	12:27:18	51.6	68.7	39.6	54.6	43.8
09/04/2023	12:37:18	49.3	69.9	39.2	52.1	43.2
09/04/2023	12:47:18	53.2	74.8	40.7	53	45.3
09/04/2023	12:57:18	54	79.8	38.9	54.2	42.6
09/04/2023	13:07:18	49	68.8	39.1	51.5	42.7
09/04/2023	13:17:18	50.1	66.9	43	52.2	45.8
09/04/2023	13:27:18	50.1	65.7	41	52.4	46.2
09/04/2023	13:37:18	50.5	72.4	42.2	52.5	45.4
09/04/2023	13:47:18	51.4	66.3	40.9	53	44.3
09/04/2023	13:57:18	50.9	67.6	42.8	53.6	46.2
09/04/2023	14:07:18	49.2	75.1	39.9	51.2	43.2
09/04/2023	14:17:18	50	69.4	40	53.1	43.1
09/04/2023	14:27:18	47.4	61.3	35.9	50.6	40.5
09/04/2023	14:37:18	47.5	64.8	37.5	49.6	42
09/04/2023	14:47:18	48	71.2	38.5	49.5	42.6
09/04/2023	14:57:18	48.3	67.9	36.1	49.5	40.6
09/04/2023	15:07:18	44.9	56.5	35.4	47.5	39.9
09/04/2023	15:17:18	47.9	73	33.3	49	39.3
09/04/2023	15:27:18	52.9	78	32.8	52.9	41.6
09/04/2023	15:37:18	50.8	77.3	38.1	50.8	42.9

Table 11: Noise data for AN 2

Date	Time	Leq	Lmax	Lmin	LN 10	LN 90
07/04/2023 00:00	13:33:49	40.2	46.3	38.3	40.9	39.5
07/04/2023 00:00	13:43:49	39.6	53	38	40	38.9
07/04/2023 00:00	13:53:49	39.3	47.9	37.7	39.9	38.6
07/04/2023 00:00	14:03:49	39.7	48.6	37.9	40	38.8
07/04/2023 00:00	14:13:49	39.6	51	37.9	40.1	38.7
07/04/2023 00:00	14:23:49	44.1	62.2	37.8	42.5	38.8
07/04/2023 00:00	14:33:49	46.1	65.6	38.2	46.2	39.1
07/04/2023 00:00	14:43:49	42.6	60.9	38.6	43.3	39.5
07/04/2023 00:00	14:53:49	41.7	56.8	39	42.9	39.8
07/04/2023 00:00	15:03:49	45.5	67.2	39	43.9	39.9
07/04/2023 00:00	15:13:49	47.7	62.1	39.6	51.6	40.4
07/04/2023 00:00	15:23:49	43	58	39.8	44.9	40.4

Date	Time	Leq	Lmax	Lmin	LN 10	LN 90
07/04/2023 00:00	15:33:49	43.1	56.3	39.6	44.6	40.1
07/04/2023 00:00	15:43:49	42.1	60.2	39.5	41	40.1
07/04/2023 00:00	15:53:49	40.7	52.7	39.5	41.1	40.1
07/04/2023 00:00	16:03:49	40.9	51.7	39.6	41.2	40.3
07/04/2023 00:00	16:13:49	42.1	58.3	39.7	42.2	40.4
07/04/2023 00:00	16:23:49	41.1	54	39.8	41.3	40.4
07/04/2023 00:00	16:33:49	41.2	60.5	39.5	41.2	40.3
07/04/2023 00:00	16:43:49	43.9	62.2	33.1	44	35.2
07/04/2023 00:00	16:53:49	41.2	63.5	23.9	42.1	27.1
07/04/2023 00:00	17:03:49	48.4	66.6	23.6	44.3	26.9
07/04/2023 00:00	17:13:49	39	64.3	22.7	40.2	25.6
07/04/2023 00:00	17:23:49	36.8	62.1	22.9	38.8	27.1
07/04/2023 00:00	17:33:49	42.8	60	23.4	44.5	27.7
07/04/2023 00:00	17:43:49	34.9	46.1	24.5	38.7	28
07/04/2023 00:00	17:53:49	35.4	47.4	24.1	39.3	26.4
07/04/2023 00:00	18:03:49	36.9	52	24.3	40.3	28.5
07/04/2023 00:00	18:13:49	42.3	60.9	27.4	45.2	32.2
07/04/2023 00:00	18:23:49	44.2	61.2	26.1	47.2	30.8
07/04/2023 00:00	18:33:49	43.9	63.6	25.8	46.2	30.3
07/04/2023 00:00	18:43:49	42.2	61.8	27	44.8	31.3
07/04/2023 00:00	18:53:49	43.4	61.4	26.8	45.9	31
07/04/2023 00:00	19:03:49	46.8	61.2	26.5	50.6	31.2
07/04/2023 00:00	19:13:49	43.1	62.9	27.4	45.6	32.3
07/04/2023 00:00	19:23:49	43.6	66.4	27.9	45.8	32.1
07/04/2023 00:00	19:33:49	45	64.8	27.1	48.3	32.1
07/04/2023 00:00	19:43:49	40.9	57.7	27.4	43.8	32.8
07/04/2023 00:00	19:53:49	36.9	54.4	25.2	40	28.7
07/04/2023 00:00	20:03:49	38.6	66.2	25.5	37.5	28.2
07/04/2023 00:00	20:13:49	39.2	58.6	25.5	42.4	29.4
07/04/2023 00:00	20:23:49	35.9	59.6	24.3	35.4	26.6
07/04/2023 00:00	20:33:49	30.5	42.8	24.3	33.2	26.9
07/04/2023 00:00	20:43:49	32.8	53.8	24.5	35.8	27.5
07/04/2023 00:00	20:53:49	35.6	51	23.4	39.3	27.2
07/04/2023 00:00	21:03:49	37.6	57	24.3	40.9	29.1
07/04/2023 00:00	21:13:49	40.5	54.8	24.3	43.7	32.4
07/04/2023 00:00	21:23:49	40.6	56.6	34	43.3	35
07/04/2023 00:00	21:33:49	39.5	51.6	33.9	42.5	35.3
07/04/2023 00:00	21:43:49	37.3	50.7	33.8	39.3	35
07/04/2023 00:00	21:53:49	37.4	57	33.6	38.9	34.9
07/04/2023 00:00	22:03:49	38.1	48.5	33.9	40.5	35.1
07/04/2023 00:00	22:13:49	38.3	48.7	34.3	40.5	35.7
07/04/2023 00:00	22:23:49	39.7	59.8	34.2	40.7	35.3
07/04/2023 00:00	22:33:49	38	50.7	34.3	39.8	35.9
07/04/2023 00:00	22:43:49	38.8	52.2	34.4	41.5	36
07/04/2023 00:00	22:53:49	37.8	46.8	33.9	39.8	35.6
07/04/2023 00:00	23:03:49	37.3	47.4	34.3	39.3	35.4
07/04/2023 00:00	23:13:49	38.1	53.5	34.4	39.7	35.6
07/04/2023 00:00	23:23:49	39.2	52.5	34.1	41.6	35.7
07/04/2023 00:00	23:33:49	42	56	35.5	44.6	37.4
07/04/2023 00:00	23:43:49	39.2	50	35	41.4	36.5
07/04/2023 00:00	23:53:49	39.4	50.9	34.6	41.9	36.2
08/04/2023 00:00	00:03:49	40.7	53.1	35.1	42.9	37.3
08/04/2023 00:00	00:13:49	38.8	52.3	34.8	40.7	36.5
08/04/2023 00:00	00:23:49	38.5	50.3	34.5	40.8	35.9
08/04/2023 00:00	00:33:49	39.1	54.8	34.2	41.2	36.4
08/04/2023 00:00	00:43:49	40.7	51.6	35.1	43.5	37.2
08/04/2023 00:00	00:53:49	43.4	56.3	36.3	46.3	38.3
08/04/2023 00:00	01:03:49	40.3	54.2	34.8	42.9	36.4
08/04/2023 00:00	01:13:49	39.6	49	34.6	41.9	36.7
08/04/2023 00:00	01:23:49	40.3	53.3	34.6	43	36.4
08/04/2023 00:00	01:33:49	39.7	52.8	34.5	42.3	36
08/04/2023 00:00	01:43:49	43.3	56.6	35.7	46.7	37.6
08/04/2023 00:00	01:53:49	42.5	54	35.7	45.7	37.5

Date	Time	Leq	Lmax	Lmin	LN 10	LN 90
08/04/2023 00:00	02:03:49	42.8	65.9	35.4	45.4	37.2
08/04/2023 00:00	02:13:49	40.9	52.7	35.7	43.4	37.4
08/04/2023 00:00	02:23:49	41.5	51.5	35.4	44.2	37.5
08/04/2023 00:00	02:33:49	41.7	51.4	35.5	44.6	37.3
08/04/2023 00:00	02:43:49	40.8	50.4	35.5	43.6	37.2
08/04/2023 00:00	02:53:49	39.9	48.6	34.8	42.5	36.7
08/04/2023 00:00	03:03:49	38.9	47.8	34.1	41	36.1
08/04/2023 00:00	03:13:49	38.5	54	34	41.4	35.3
08/04/2023 00:00	03:23:49	36.9	46	34.1	38.3	35.4
08/04/2023 00:00	03:33:49	37.6	46.3	34.2	39.8	35.3
08/04/2023 00:00	03:43:49	37.6	48	34.1	39.7	35.2
08/04/2023 00:00	03:53:49	38.2	49.6	33.9	40.3	35.5
08/04/2023 00:00	04:03:49	40.4	52.2	34.2	44.5	35.7
08/04/2023 00:00	04:13:49	38.3	51.1	33.8	40.8	35.4
08/04/2023 00:00	04:23:49	37.9	48.8	34.3	39.8	35.8
08/04/2023 00:00	04:33:49	38.2	49.8	34.8	40.3	35.9
08/04/2023 00:00	04:43:49	40.2	50.7	34.7	43	36.5
08/04/2023 00:00	04:53:49	39.1	50.5	34.6	41.7	36
08/04/2023 00:00	05:03:49	38.1	48.9	34.5	40	35.8
08/04/2023 00:00	05:13:49	37.7	49.4	34.1	39.4	35.7
08/04/2023 00:00	05:23:49	36.6	46.9	33.9	38.2	35
08/04/2023 00:00	05:33:49	40	57.8	34	42.2	35.3
08/04/2023 00:00	05:43:49	37.6	57.3	34.1	38.7	35.3
08/04/2023 00:00	05:53:49	38.6	51.9	34.4	41	35.7
08/04/2023 00:00	06:03:49	47	65.5	34.6	50.2	36.1
08/04/2023 00:00	06:13:49	36.8	48.7	34.1	38.3	35
08/04/2023 00:00	06:23:49	42	57.3	34.2	45.3	35.8
08/04/2023 00:00	06:33:49	35.8	49.9	33.7	36.8	34.6
08/04/2023 00:00	06:43:49	35.7	47.5	33.8	36.6	34.6
08/04/2023 00:00	06:53:49	36.1	52.9	33.5	36.9	34.7
08/04/2023 00:00	07:03:49	35.8	49.5	33.5	36.8	34.5
08/04/2023 00:00	07:13:49	36	45.1	33.6	37.9	34.5
08/04/2023 00:00	07:23:49	35.3	47.9	33.4	36	34.4
08/04/2023 00:00	07:33:49	36.7	50.1	33.7	38.2	34.9
08/04/2023 00:00	07:43:49	36.2	52.3	33.8	37.4	34.8
08/04/2023 00:00	07:53:49	36.8	60	33.7	37.9	34.8
08/04/2023 00:00	08:03:49	37	52.7	33.9	38.5	35
08/04/2023 00:00	08:13:49	37.9	54.2	33.8	39.6	35
08/04/2023 00:00	08:23:49	37.3	50.3	34	38.9	35.3
08/04/2023 00:00	08:33:49	37.5	56.6	34.1	39.2	35.2
08/04/2023 00:00	08:43:49	37.6	54	34.1	39.7	35.2
08/04/2023 00:00	08:53:49	38.7	60.5	33.8	40.7	35.1
08/04/2023 00:00	09:03:49	39.5	63.8	33.8	40.7	35.1
08/04/2023 00:00	09:13:49	37.1	59.9	34	37.6	34.8
08/04/2023 00:00	09:23:49	37.2	52.2	33.8	39.6	34.7
08/04/2023 00:00	09:33:49	36.2	51.1	33.7	36.7	34.7
08/04/2023 00:00	09:43:49	35.5	47.9	33.9	36	34.7
08/04/2023 00:00	09:53:49	39.9	62.8	33.8	37.2	34.8
08/04/2023 00:00	10:03:49	40.9	58.1	34.4	43.7	35.2
08/04/2023 00:00	10:13:49	36.2	54.1	33.9	36.3	34.9
08/04/2023 00:00	10:23:49	36.3	62.2	34.1	36.4	34.9
08/04/2023 00:00	10:33:49	36.4	49.3	34.2	37.5	35.1
08/04/2023 00:00	10:43:49	37.1	54.7	34.4	37.6	35.2
08/04/2023 00:00	10:53:49	39.2	62.3	34.6	41.5	35.5
08/04/2023 00:00	11:03:49	37.9	50.3	34.2	40	35.2
08/04/2023 00:00	11:13:49	45	65.3	34.1	40.1	34.9
08/04/2023 00:00	11:23:49	35.9	53.2	34	36.3	34.9
08/04/2023 00:00	11:33:49	41.7	71.5	21	38.3	24.4
08/04/2023 00:00	11:43:49	29	48	21.2	31.4	23
08/04/2023 00:00	11:53:49	27.4	44.5	21.4	29.7	23
08/04/2023 00:00	12:03:49	25.2	38.1	21.1	26.9	22.2
08/04/2023 00:00	12:13:49	26	47	20.8	26.2	21.7
08/04/2023 00:00	12:23:49	28.7	48.7	20.6	30.4	22

Date	Time	Leq	Lmax	Lmin	LN 10	LN 90
08/04/2023 00:00	12:33:49	30.3	47.6	21	33.4	22.8
08/04/2023 00:00	12:43:49	27.6	45.1	21.3	28.8	23
08/04/2023 00:00	12:53:49	27.7	52.2	21	29.6	23.1
08/04/2023 00:00	13:03:49	25.5	49.2	20.7	26.6	22.3
08/04/2023 00:00	13:13:49	26.5	49	21.2	28.3	22.8
08/04/2023 00:00	13:23:49	25.7	41.9	20.8	27.7	21.9
08/04/2023 00:00	13:33:49	26.7	49.4	20.8	27.5	21.8

Air data log

Table 12: Air data for AN 1

Date	Time	CO	CO2	NO	NO2	SO2	PM2.5	PM10
08/Apr/2023	18:00:00	0	702.88	0	37.67	0	5.67	24.39
08/Apr/2023	18:15:00	0	691.84	0	34.4	0	5.47	23.75
08/Apr/2023	18:30:00	0	693.68	0	36.31	0	17.05	58.99
08/Apr/2023	18:45:00	0	693.68	0	32.81	0	4.95	17.51
08/Apr/2023	19:00:00	0	688.16	0	30.77	0	5.14	17.13
08/Apr/2023	19:15:00	0	695.52	0	27.37	0	5.11	16.28
08/Apr/2023	19:30:00	0	691.84	0	29.93	0	5.13	15.89
08/Apr/2023	19:45:00	0	693.68	0	24.22	0	5.26	16.79
08/Apr/2023	20:00:00	0	697.36	0	26.89	0	5.18	14.97
08/Apr/2023	20:15:00	0	706.56	0	25.56	0	5.21	16.02
08/Apr/2023	20:30:00	0	706.56	0	20.19	0	5.61	18.59
08/Apr/2023	20:45:00	0	708.4	0	17.17	0	5.65	17.29
08/Apr/2023	21:00:00	0	710.24	0	19.14	0	5.76	18.75
08/Apr/2023	21:15:00	0	710.24	0	18.11	0	5.35	16.55
08/Apr/2023	21:30:00	0	712.08	0	16.2	0	5.24	17.22
08/Apr/2023	21:45:00	0	713.92	0	15.41	0	5.24	15.27
08/Apr/2023	22:00:00	0	715.76	0	15.32	0	5.07	15.83
08/Apr/2023	22:15:00	0	712.08	0	15.45	0	4.9	15.46
08/Apr/2023	22:30:00	0	715.76	0	14.65	0	4.7	13.43
08/Apr/2023	22:45:00	0	719.44	0	13.9	0	4.32	10.88
08/Apr/2023	23:00:00	0	713.92	0	12.53	0	3.65	11.31
08/Apr/2023	23:15:00	0	712.08	0	12.93	0	3.52	10.34
08/Apr/2023	23:30:00	0	715.76	0	12.36	0	3.89	10.88
08/Apr/2023	23:45:00	0	717.6	0	13.1	0	3.88	10.31
09/Apr/2023	00:00:00	0	717.6	0	13.27	0	3.83	11.39
09/Apr/2023	00:15:00	0	719.44	0	11.38	0	4.1	11.87
09/Apr/2023	00:30:00	0	721.28	0	10.85	0	4.07	11.74
09/Apr/2023	00:45:00	0	724.96	0	10.45	0	4.5	14.61
09/Apr/2023	01:00:00	0	723.12	0	10.18	0	4.88	15.19
09/Apr/2023	01:15:00	0	723.12	0	11.63	0	4.89	14.63
09/Apr/2023	01:30:00	0	724.96	0	10.22	0	5.02	14.47
09/Apr/2023	01:45:00	0	730.48	0	12.72	0	5.38	16.03
09/Apr/2023	02:00:00	0	728.64	0	10.6	0	5.1	15.11
09/Apr/2023	02:15:00	0	728.64	0	9.55	0	5.08	14.91
09/Apr/2023	02:30:00	0	730.48	0	10.18	0	5.25	14.57
09/Apr/2023	02:45:00	0	728.64	0	9.97	0	5.39	14.71
09/Apr/2023	03:00:00	0	721.28	0	10.2	0	4.87	13.59
09/Apr/2023	03:15:00	0	713.92	0	11.42	0	3.83	13.55
09/Apr/2023	03:30:00	0	717.6	0	13.69	0	4.41	11.54
09/Apr/2023	03:45:00	0	715.76	0	14.29	0	4.37	11.65
09/Apr/2023	04:00:00	0	717.6	0	14.48	0	4.53	13.28
09/Apr/2023	04:15:00	0	712.08	0	12.47	0	4.32	12.06
09/Apr/2023	04:30:00	0	717.6	0	13.39	0	4.42	13.56
09/Apr/2023	04:45:00	0	715.76	0	13.06	0	4.36	12.47
09/Apr/2023	05:00:00	0	719.44	0	12.45	0	4.2	11.82
09/Apr/2023	05:15:00	0	721.28	0	13.87	0	4.02	13.04
09/Apr/2023	05:30:00	0	717.6	0	13.92	0	3.79	10.94
09/Apr/2023	05:45:00	0	713.92	0	13.83	0	3.65	11.16
09/Apr/2023	06:00:00	0	721.28	0	13.24	0	3.66	10.55

Date	Time	CO	CO2	NO	NO2	SO2	PM2.5	PM10
09/Apr/2023	06:15:00	0	721.28	0	12.32	0	3.81	11.94
09/Apr/2023	06:30:00	0	723.12	0	13.58	0	3.84	11.08
09/Apr/2023	06:45:00	0	717.6	0	13.79	0	4.07	13.61
09/Apr/2023	07:00:00	0	719.44	0	21.43	0	3.93	12.05
09/Apr/2023	07:15:00	0	717.6	0	13.47	0	3.69	10.3
09/Apr/2023	07:30:00	0	715.76	0	9.7	0	3.55	9.28
09/Apr/2023	07:45:00	0	710.24	0	9.45	0	3.47	12.22
09/Apr/2023	08:00:00	0	712.08	0	10.7	0	3.29	8.53
09/Apr/2023	08:15:00	0	710.24	0	11.06	0	3.22	9.56
09/Apr/2023	08:30:00	0	712.08	0	12.3	0	3.3	9.13
09/Apr/2023	08:45:00	0	708.4	0	20.02	0	3.17	8.12
09/Apr/2023	09:00:00	0	704.72	0	13.73	0	3.52	9.61
09/Apr/2023	09:15:00	0	706.56	0	19.25	0	4.29	9.91
09/Apr/2023	09:30:00	0	710.24	0	16.23	0	4.8	11.55
09/Apr/2023	09:45:00	0	702.88	0	22.21	0	4.41	13.01
09/Apr/2023	10:00:00	0	701.04	0	24.33	0	4.99	13.11
09/Apr/2023	10:15:00	0	701.04	0	25.25	0	5.59	18.16
09/Apr/2023	10:30:00	0	697.36	0	23.95	0	5.34	17
09/Apr/2023	10:45:00	0	702.88	0	20.63	0	5.08	18.32
09/Apr/2023	11:00:00	0	706.56	0	34.53	0	5.74	20.86
09/Apr/2023	11:15:00	0	704.72	0	32.81	0	6.19	18.75
09/Apr/2023	11:30:00	0	701.04	0.63	27.94	0	5.96	18.78
09/Apr/2023	11:45:00	0	706.56	0.89	28.34	0	7.07	24.42
09/Apr/2023	12:00:00	0	702.88	3.74	24.28	0	6.3	20.39
09/Apr/2023	12:15:00	0	697.36	1.27	27.64	0	5.91	20.68
09/Apr/2023	12:30:00	0	699.2	2.34	24.89	0	5.96	19.76
09/Apr/2023	12:45:00	0	704.72	4.42	27.29	0	6.32	24.9
09/Apr/2023	13:00:00	0	702.88	9.28	23.76	0	6.85	27.39
09/Apr/2023	13:15:00	0	697.36	6.31	24.89	0	7.02	29.46
09/Apr/2023	13:30:00	0	691.84	6.95	26.13	0	6.7	25.81
09/Apr/2023	13:45:00	0	695.52	9	26.43	0	6.61	27.71
09/Apr/2023	14:00:00	0	701.04	4.56	26.89	0	7.73	36.37
09/Apr/2023	14:15:00	0	691.84	3.63	31.59	0	7.44	32.85
09/Apr/2023	14:30:00	0	697.36	0	27.29	0	7.45	31.61
09/Apr/2023	14:45:00	0	701.04	0	27.03	0	7.11	30.9
09/Apr/2023	15:00:00	0	693.68	0	32.51	0	7.02	33
09/Apr/2023	15:15:00	0	695.52	0	33	0	6.78	26.58
09/Apr/2023	15:30:00	0	691.84	0	33.02	0	6.75	23.57
09/Apr/2023	15:45:00	0	695.52	0	33.02	0	6.6	23.82
09/Apr/2023	16:00:00	0	693.68	0	33.35	0	6.75	23.42
09/Apr/2023	16:15:00	0	693.68	0	31.74	0	6.7	24.79
09/Apr/2023	16:30:00	0	690	0	30.25	0	6.28	21.83
09/Apr/2023	16:45:00	0	699.2	0	35.07	0	6.32	19.95
09/Apr/2023	17:00:00	0	695.52	0	35.76	0	6.56	23.19
09/Apr/2023	17:15:00	0	690	0	37.24	0	6.26	21.05
09/Apr/2023	17:30:00	0	684.48	0	37.51	0	6.46	24.91
09/Apr/2023	17:45:00	0	688.16	0	37.65	0	6.8	24.46
09/Apr/2023	18:00:00	0	695.52	0	36.6	0	6.2	20.04

Table 13: Weather data for Air monitoring (AN 1)

Date	Time	Wind speed average	Wind Speed maximum	Temperature	Wind Direction
08/04/2023	18:00:00	2.3	4.8	26	298
08/04/2023	18:01:00	2.6	5.2	26	295
08/04/2023	18:02:00	2.5	3.8	26	282
08/04/2023	18:03:00	2.5	3.5	26	304
08/04/2023	18:04:00	2.9	4.6	26	293
08/04/2023	18:05:00	2	3.5	26	299
08/04/2023	18:06:00	2.4	3.9	26	287

Date	Time	Wind speed average	Wind Speed maximum	Temperature	Wind Direction
08/04/2023	18:07:00	2.6	5.1	26	285
08/04/2023	18:08:00	2.6	4.7	26	295
08/04/2023	18:09:00	3.4	5.9	26	281
08/04/2023	18:10:00	2.8	4.2	26	283
08/04/2023	18:11:00	2.4	3.5	26	304
08/04/2023	18:12:00	2.9	4.8	26	309
08/04/2023	18:13:00	2.8	4.1	26	311
08/04/2023	18:14:00	3.4	4.5	26	315
08/04/2023	18:15:00	2.9	4.7	26	310
08/04/2023	18:16:00	3.2	4.6	26	314
08/04/2023	18:17:00	2.8	4.1	26	318
08/04/2023	18:18:00	3	6.3	26	303
08/04/2023	18:19:00	2.5	4.7	26	312
08/04/2023	18:20:00	2	3.2	26	319
08/04/2023	18:21:00	2.2	3.6	26	316
08/04/2023	18:22:00	2.6	3.6	26	317
08/04/2023	18:23:00	2.4	3.7	26	303
08/04/2023	18:24:00	2.4	3.5	26	309
08/04/2023	18:25:00	2.6	3.8	26	317
08/04/2023	18:26:00	3	4.5	26	315
08/04/2023	18:27:00	2.9	3.9	26	326
08/04/2023	18:28:00	3.1	4.6	25	319
08/04/2023	18:29:00	2.7	5	25	312
08/04/2023	18:30:00	2.7	3.9	25	317
08/04/2023	18:31:00	2.5	4.3	25	322
08/04/2023	18:32:00	2.8	3.9	25	321
08/04/2023	18:33:00	2.6	3.9	25	318
08/04/2023	18:34:00	2.7	3.3	25	323
08/04/2023	18:35:00	2.5	3.4	25	315
08/04/2023	18:36:00	2.6	3.6	25	304
08/04/2023	18:37:00	2.7	4.3	25	315
08/04/2023	18:38:00	2.8	4.4	25	317
08/04/2023	18:39:00	2.1	3.1	24	318
08/04/2023	18:40:00	1.9	2.9	24	315
08/04/2023	18:41:00	2.8	4.3	24	317
08/04/2023	18:42:00	2.6	4.3	24	315
08/04/2023	18:43:00	2.7	4.8	24	315
08/04/2023	18:44:00	2.6	3.7	24	318
08/04/2023	18:45:00	2.8	4.3	24	317
08/04/2023	18:46:00	2.3	4.1	24	319
08/04/2023	18:47:00	1.8	2.9	24	310
08/04/2023	18:48:00	2	3.3	24	302
08/04/2023	18:49:00	2.1	3.5	24	322
08/04/2023	18:50:00	2.3	3.3	24	310
08/04/2023	18:51:00	2.2	3.5	24	313
08/04/2023	18:52:00	2.3	3.3	24	313
08/04/2023	18:53:00	2.1	3.3	24	314
08/04/2023	18:54:00	2.5	3.8	24	314
08/04/2023	18:55:00	2.5	3.3	24	320
08/04/2023	18:56:00	2.4	4.8	24	309
08/04/2023	18:57:00	1.9	3	24	316
08/04/2023	18:58:00	2.3	3.4	24	319
08/04/2023	18:59:00	2.1	3.1	24	318
08/04/2023	19:00:00	1.5	2	24	306
08/04/2023	19:01:00	1.9	3.7	24	306
08/04/2023	19:02:00	1.9	3.3	23	300
08/04/2023	19:03:00	2.2	3.1	23	311
08/04/2023	19:04:00	1.6	2.7	23	294
08/04/2023	19:05:00	2	3.3	23	317
08/04/2023	19:06:00	1.7	3	23	321
08/04/2023	19:07:00	1.6	2.1	23	310
08/04/2023	19:08:00	1.4	1.9	23	306

Date	Time	Wind speed average	Wind Speed maximum	Temperature	Wind Direction
08/04/2023	19:09:00	1.6	2.6	23	318
08/04/2023	19:10:00	2	3.5	23	313
08/04/2023	19:11:00	1.9	2.5	23	313
08/04/2023	19:12:00	2.1	2.7	23	319
08/04/2023	19:13:00	1.7	2.5	23	317
08/04/2023	19:14:00	1.7	2.4	23	325
08/04/2023	19:15:00	1.6	2.2	23	325
08/04/2023	19:16:00	1.7	2.4	23	328
08/04/2023	19:17:00	1.4	2.3	23	327
08/04/2023	19:18:00	1.3	1.9	23	324
08/04/2023	19:19:00	1.5	1.8	23	324
08/04/2023	19:20:00	1.6	2.1	23	324
08/04/2023	19:21:00	1.5	2	23	322
08/04/2023	19:22:00	1.3	2.1	23	329
08/04/2023	19:23:00	1.3	1.8	23	323
08/04/2023	19:24:00	1.5	2.2	22	323
08/04/2023	19:25:00	1.5	2.1	22	321
08/04/2023	19:26:00	1.5	2.1	22	329
08/04/2023	19:27:00	1.5	2.1	22	324
08/04/2023	19:28:00	1.4	1.7	22	315
08/04/2023	19:29:00	1.5	2.1	22	323
08/04/2023	19:30:00	1.4	2	22	328
08/04/2023	19:31:00	1.3	1.8	22	318
08/04/2023	19:32:00	1.4	2.1	22	321
08/04/2023	19:33:00	1.4	2.2	22	327
08/04/2023	19:34:00	1.1	1.4	22	322
08/04/2023	19:35:00	1.3	1.9	22	318
08/04/2023	19:36:00	1.4	2	22	319
08/04/2023	19:37:00	1.4	1.8	22	323
08/04/2023	19:38:00	1.3	1.6	22	324
08/04/2023	19:39:00	1.3	1.9	22	328
08/04/2023	19:40:00	1.2	1.9	22	324
08/04/2023	19:41:00	1.3	1.9	22	331
08/04/2023	19:42:00	1.3	1.7	22	323
08/04/2023	19:43:00	1.2	1.6	22	313
08/04/2023	19:44:00	1.4	1.7	22	322
08/04/2023	19:45:00	1.3	1.7	22	326
08/04/2023	19:46:00	1.2	1.8	22	329
08/04/2023	19:47:00	1.3	1.8	22	328
08/04/2023	19:48:00	1.4	1.8	22	323
08/04/2023	19:49:00	1.2	1.4	21	324
08/04/2023	19:50:00	1.2	1.6	21	331
08/04/2023	19:51:00	1.2	1.8	21	327
08/04/2023	19:52:00	1.3	1.5	21	326
08/04/2023	19:53:00	1.1	1.6	21	334
08/04/2023	19:54:00	1.2	1.7	21	322
08/04/2023	19:55:00	1.1	1.6	21	320
08/04/2023	19:56:00	1.1	1.6	21	332
08/04/2023	19:57:00	1.1	1.5	21	332
08/04/2023	19:58:00	1	1.3	21	340
08/04/2023	19:59:00	1.3	1.6	21	325
08/04/2023	20:00:00	1	1.4	21	336
08/04/2023	20:01:00	0.9	1.4	21	336
08/04/2023	20:02:00	0.9	1.3	21	341
08/04/2023	20:03:00	0.9	1.2	21	328
08/04/2023	20:04:00	0.8	1	21	332
08/04/2023	20:05:00	0.9	1.2	21	333
08/04/2023	20:06:00	1	1.2	21	329
08/04/2023	20:07:00	0.8	1	21	333
08/04/2023	20:08:00	0.8	1.1	21	324
08/04/2023	20:09:00	0.9	1.5	21	338
08/04/2023	20:10:00	0.8	1.1	21	333

Date	Time	Wind speed average	Wind Speed maximum	Temperature	Wind Direction
08/04/2023	20:11:00	0.8	1.1	21	327
08/04/2023	20:12:00	0.7	0.9	21	324
08/04/2023	20:13:00	0.2	0.8	20	323
08/04/2023	20:14:00	0	0	20	nW
08/04/2023	20:15:00	0	0	20	nW
08/04/2023	20:16:00	0	0	20	nW
08/04/2023	20:17:00	0.1	0.6	20	334
08/04/2023	20:18:00	0.4	0.9	20	39
08/04/2023	20:19:00	0.8	1	20	24
08/04/2023	20:20:00	0.8	1.1	19	32
08/04/2023	20:21:00	0.5	0.7	19	33
08/04/2023	20:22:00	0.6	0.9	19	44
08/04/2023	20:23:00	0.7	1.1	19	33
08/04/2023	20:24:00	0.6	0.9	19	29
08/04/2023	20:25:00	0.7	0.9	19	34
08/04/2023	20:26:00	0.3	0.9	19	34
08/04/2023	20:27:00	0.8	1	19	34
08/04/2023	20:28:00	0.9	1.2	19	33
08/04/2023	20:29:00	0.5	1	19	38
08/04/2023	20:30:00	0.5	0.9	19	81
08/04/2023	20:31:00	0	0	19	nW
08/04/2023	20:32:00	0.5	1	19	76
08/04/2023	20:33:00	0.8	1.1	19	28
08/04/2023	20:34:00	0.8	1	18	40
08/04/2023	20:35:00	1	1.3	18	35
08/04/2023	20:36:00	1	1.6	18	31
08/04/2023	20:37:00	1.4	1.7	18	25
08/04/2023	20:38:00	1.2	1.6	18	21
08/04/2023	20:39:00	1.1	1.5	18	25
08/04/2023	20:40:00	1	1.5	18	18
08/04/2023	20:41:00	1.1	1.6	18	27
08/04/2023	20:42:00	1.2	1.6	18	21
08/04/2023	20:43:00	1.4	1.7	18	16
08/04/2023	20:44:00	1.4	1.8	18	14
08/04/2023	20:45:00	0.9	1.4	18	13
08/04/2023	20:46:00	0.9	1.4	18	22
08/04/2023	20:47:00	1.2	1.6	18	13
08/04/2023	20:48:00	1.2	1.6	18	20
08/04/2023	20:49:00	1.2	1.5	18	7
08/04/2023	20:50:00	1.3	2	19	357
08/04/2023	20:51:00	0.9	1.3	19	6
08/04/2023	20:52:00	0.8	1.3	19	4
08/04/2023	20:53:00	0.8	1.1	19	354
08/04/2023	20:54:00	0.9	1.6	19	350
08/04/2023	20:55:00	0.9	1.2	19	352
08/04/2023	20:56:00	0.8	1.1	19	346
08/04/2023	20:57:00	0.6	0.8	19	345
08/04/2023	20:58:00	0.7	0.8	19	7
08/04/2023	20:59:00	0.7	1.1	19	12
08/04/2023	21:00:00	0.8	1	19	4
08/04/2023	21:01:00	0.7	1	19	5
08/04/2023	21:02:00	0.9	1.3	19	18
08/04/2023	21:03:00	1.1	1.7	19	2
08/04/2023	21:04:00	1	1.4	19	6
08/04/2023	21:05:00	1	1.2	18	5
08/04/2023	21:06:00	1	1.6	18	17
08/04/2023	21:07:00	1.1	1.5	18	11
08/04/2023	21:08:00	1	1.7	18	12
08/04/2023	21:09:00	0.8	1.1	18	12
08/04/2023	21:10:00	1.1	1.7	18	8
08/04/2023	21:11:00	0.8	1.1	18	13
08/04/2023	21:12:00	1	1.4	18	10

Date	Time	Wind speed average	Wind Speed maximum	Temperature	Wind Direction
08/04/2023	21:13:00	0.7	1.1	18	358
08/04/2023	21:14:00	0.9	1.3	18	339
08/04/2023	21:15:00	0.7	1	18	347
08/04/2023	21:16:00	0.7	1.1	18	335
08/04/2023	21:17:00	0.8	1.2	18	10
08/04/2023	21:18:00	1	1.3	18	10
08/04/2023	21:19:00	0.9	1.5	18	345
08/04/2023	21:20:00	0.9	1.2	18	343
08/04/2023	21:21:00	1.1	2.1	18	336
08/04/2023	21:22:00	0.8	1.3	18	343
08/04/2023	21:23:00	0.8	1.2	18	338
08/04/2023	21:24:00	0.4	0.8	18	351
08/04/2023	21:25:00	0.7	1.5	18	15
08/04/2023	21:26:00	0.9	1.2	18	19
08/04/2023	21:27:00	0.9	1.3	18	15
08/04/2023	21:28:00	1	1.5	18	14
08/04/2023	21:29:00	1.3	1.8	18	25
08/04/2023	21:30:00	0.9	1.1	18	23
08/04/2023	21:31:00	1.1	1.5	18	8
08/04/2023	21:32:00	1	1.4	18	22
08/04/2023	21:33:00	1	1.4	18	7
08/04/2023	21:34:00	0.9	1.3	18	22
08/04/2023	21:35:00	1	1.7	18	29
08/04/2023	21:36:00	0.9	1.2	18	17
08/04/2023	21:37:00	1	1.4	18	15
08/04/2023	21:38:00	0.9	1.1	18	25
08/04/2023	21:39:00	0.8	1.1	18	49
08/04/2023	21:40:00	0.7	0.9	18	37
08/04/2023	21:41:00	0.9	1.1	18	37
08/04/2023	21:42:00	0.9	1.2	18	39
08/04/2023	21:43:00	0.9	1.2	18	27
08/04/2023	21:44:00	1.1	1.5	18	34
08/04/2023	21:45:00	1	1.4	18	27
08/04/2023	21:46:00	1.3	1.8	18	19
08/04/2023	21:47:00	1.3	1.7	18	28
08/04/2023	21:48:00	1.1	1.5	18	29
08/04/2023	21:49:00	1.5	2	18	26
08/04/2023	21:50:00	1.3	1.6	18	21
08/04/2023	21:51:00	1.1	1.5	18	22
08/04/2023	21:52:00	1.2	2.1	18	20
08/04/2023	21:53:00	1.2	1.6	18	21
08/04/2023	21:54:00	1.2	1.5	18	33
08/04/2023	21:55:00	1	1.3	18	26
08/04/2023	21:56:00	1.1	1.3	18	26
08/04/2023	21:57:00	1.1	1.4	18	34
08/04/2023	21:58:00	1	1.3	18	23
08/04/2023	21:59:00	0.9	1.2	18	38
08/04/2023	22:00:00	0.8	1	18	38
08/04/2023	22:01:00	0.8	1.1	18	36
08/04/2023	22:02:00	0.8	1.1	18	47
08/04/2023	22:03:00	0.7	1	18	51
08/04/2023	22:04:00	0.9	1.1	18	46
08/04/2023	22:05:00	0.8	1	18	42
08/04/2023	22:06:00	0.9	1.5	18	39
08/04/2023	22:07:00	0.9	1.3	18	27
08/04/2023	22:08:00	1.1	1.6	18	36
08/04/2023	22:09:00	1.1	1.4	18	37
08/04/2023	22:10:00	1.2	1.7	17	31
08/04/2023	22:11:00	1.2	1.5	17	27
08/04/2023	22:12:00	1.1	1.3	17	29
08/04/2023	22:13:00	1	1.1	17	26
08/04/2023	22:14:00	1	1.3	17	21

Date	Time	Wind speed average	Wind Speed maximum	Temperature	Wind Direction
08/04/2023	22:15:00	0.8	1.1	17	27
08/04/2023	22:16:00	0.8	1.1	17	29
08/04/2023	22:17:00	0.9	1.2	17	35
08/04/2023	22:18:00	0.9	1.1	17	32
08/04/2023	22:19:00	0.9	1.2	17	38
08/04/2023	22:20:00	1	1.3	17	30
08/04/2023	22:21:00	1.1	1.3	17	21
08/04/2023	22:22:00	1	1.4	17	34
08/04/2023	22:23:00	1.1	1.4	17	28
08/04/2023	22:24:00	1	1.3	17	30
08/04/2023	22:25:00	0.9	1.1	17	37
08/04/2023	22:26:00	0.9	1.2	17	31
08/04/2023	22:27:00	0.8	1.1	17	39
08/04/2023	22:28:00	0.9	1.1	17	39
08/04/2023	22:29:00	0.9	1.2	17	38
08/04/2023	22:30:00	0.7	1.2	17	30
08/04/2023	22:31:00	0.6	0.8	17	42
08/04/2023	22:32:00	0.4	0.7	17	67
08/04/2023	22:33:00	0.6	0.9	17	56
08/04/2023	22:34:00	0.4	0.8	17	29
08/04/2023	22:35:00	0	0	17	nW
08/04/2023	22:36:00	0	0	17	nW
08/04/2023	22:37:00	0	0	17	nW
08/04/2023	22:38:00	0	0.6	17	nW
08/04/2023	22:39:00	0.1	0.7	17	57
08/04/2023	22:40:00	0	0.6	17	nW
08/04/2023	22:41:00	0.2	0.7	17	104
08/04/2023	22:42:00	0.2	0.7	16	121
08/04/2023	22:43:00	0	0.6	16	nW
08/04/2023	22:44:00	0	0	16	nW
08/04/2023	22:45:00	0	0	16	nW
08/04/2023	22:46:00	0	0	16	nW
08/04/2023	22:47:00	0	0	16	nW
08/04/2023	22:48:00	0	0	16	nW
08/04/2023	22:49:00	0.2	0.8	16	62
08/04/2023	22:50:00	0.1	0.7	16	52
08/04/2023	22:51:00	0.5	1.3	16	46
08/04/2023	22:52:00	1	1.2	15	34
08/04/2023	22:53:00	1	1.3	15	39
08/04/2023	22:54:00	0.9	1.2	15	42
08/04/2023	22:55:00	1.1	1.3	15	39
08/04/2023	22:56:00	1	1.4	15	33
08/04/2023	22:57:00	0.9	1.1	15	27
08/04/2023	22:58:00	1	1.3	15	28
08/04/2023	22:59:00	1	1.3	15	37
08/04/2023	23:00:00	1.1	1.7	15	28
08/04/2023	23:01:00	1.1	1.4	15	24
08/04/2023	23:02:00	1.2	1.6	15	22
08/04/2023	23:03:00	1	1.2	15	25
08/04/2023	23:04:00	1	1.4	15	23
08/04/2023	23:05:00	1.2	1.9	16	19
08/04/2023	23:06:00	1.3	1.8	16	26
08/04/2023	23:07:00	1.3	1.6	16	24
08/04/2023	23:08:00	1.9	3	16	27
08/04/2023	23:09:00	1.3	2	16	16
08/04/2023	23:10:00	1.3	2	16	16
08/04/2023	23:11:00	1.4	2.6	16	16
08/04/2023	23:12:00	1.6	2.2	16	14
08/04/2023	23:13:00	1.6	2.4	16	21
08/04/2023	23:14:00	1.3	1.7	16	11
08/04/2023	23:15:00	1.2	1.8	17	18
08/04/2023	23:16:00	1.3	2.2	17	18

Date	Time	Wind speed average	Wind Speed maximum	Temperature	Wind Direction
08/04/2023	23:17:00	1.2	1.9	17	21
08/04/2023	23:18:00	1.5	2	17	24
08/04/2023	23:19:00	1.6	2.4	17	21
08/04/2023	23:20:00	1.5	1.8	17	18
08/04/2023	23:21:00	1.4	2	17	14
08/04/2023	23:22:00	1.4	1.9	17	19
08/04/2023	23:23:00	1.3	1.8	17	25
08/04/2023	23:24:00	1.5	2.1	17	26
08/04/2023	23:25:00	1.4	2	17	33
08/04/2023	23:26:00	1.3	2.2	17	24
08/04/2023	23:27:00	1.6	2.4	17	30
08/04/2023	23:28:00	1.6	2.2	17	35
08/04/2023	23:29:00	1.9	2.9	17	27
08/04/2023	23:30:00	1.9	2.7	17	28
08/04/2023	23:31:00	1.6	2.2	17	30
08/04/2023	23:32:00	1.4	2	17	51
08/04/2023	23:33:00	1.2	2.3	17	37
08/04/2023	23:34:00	1	1.7	17	48
08/04/2023	23:35:00	0.9	1.4	17	61
08/04/2023	23:36:00	1.1	1.7	17	39
08/04/2023	23:37:00	1.4	2.4	17	41
08/04/2023	23:38:00	1.5	2.4	17	38
08/04/2023	23:39:00	1.7	2.8	17	35
08/04/2023	23:40:00	1.6	2.4	17	44
08/04/2023	23:41:00	1.4	2.3	17	43
08/04/2023	23:42:00	1.5	2.3	17	50
08/04/2023	23:43:00	1.3	2.1	17	55
08/04/2023	23:44:00	1	1.5	17	47
08/04/2023	23:45:00	1.2	2.1	17	44
08/04/2023	23:46:00	1	1.7	17	32
08/04/2023	23:47:00	1	1.4	17	48
08/04/2023	23:48:00	1	1.8	17	44
08/04/2023	23:49:00	1	1.8	17	51
08/04/2023	23:50:00	1	1.8	17	50
08/04/2023	23:51:00	0.9	1.5	17	79
08/04/2023	23:52:00	1.1	1.7	17	52
08/04/2023	23:53:00	0.8	1.2	17	27
08/04/2023	23:54:00	0.7	1.3	17	70
08/04/2023	23:55:00	0.5	0.8	17	61
08/04/2023	23:56:00	0.2	0.7	17	70
08/04/2023	23:57:00	0.8	1.3	17	64
08/04/2023	23:58:00	0.9	1.4	17	60
08/04/2023	23:59:00	1.1	1.9	17	65
09/04/2023	00:00:00	0.8	1.4	17	69
09/04/2023	00:01:00	0.9	1.4	16	53
09/04/2023	00:02:00	0.9	1.5	16	51
09/04/2023	00:03:00	0.7	1.1	16	61
09/04/2023	00:04:00	0.7	0.8	16	56
09/04/2023	00:05:00	0.3	0.8	16	78
09/04/2023	00:06:00	0	0	16	nW
09/04/2023	00:07:00	0	0	16	nW
09/04/2023	00:08:00	0	0	16	nW
09/04/2023	00:09:00	0	0	16	nW
09/04/2023	00:10:00	0	0	16	nW
09/04/2023	00:11:00	0	0	16	nW
09/04/2023	00:12:00	0	0	16	nW
09/04/2023	00:13:00	0	0.8	16	nW
09/04/2023	00:14:00	0.1	0.7	16	77
09/04/2023	00:15:00	0	0	16	nW
09/04/2023	00:16:00	0.1	0.8	15	71
09/04/2023	00:17:00	0	0	15	nW
09/04/2023	00:18:00	0.1	0.9	15	66

Date	Time	Wind speed average	Wind Speed maximum	Temperature	Wind Direction
09/04/2023	00:19:00	0.8	1.1	15	48
09/04/2023	00:20:00	0.7	1.7	15	54
09/04/2023	00:21:00	1.3	1.8	14	33
09/04/2023	00:22:00	1.1	1.7	14	43
09/04/2023	00:23:00	1	1.4	14	47
09/04/2023	00:24:00	1.1	2.2	14	48
09/04/2023	00:25:00	1	1.7	14	57
09/04/2023	00:26:00	1	1.4	14	49
09/04/2023	00:27:00	1.3	2	14	41
09/04/2023	00:28:00	1.3	2.3	14	47
09/04/2023	00:29:00	1.1	1.6	14	35
09/04/2023	00:30:00	1.1	2	14	40
09/04/2023	00:31:00	1.2	2.1	14	45
09/04/2023	00:32:00	1.3	2.1	14	41
09/04/2023	00:33:00	1	2	15	57
09/04/2023	00:34:00	1.3	2	15	37
09/04/2023	00:35:00	1.1	1.9	15	77
09/04/2023	00:36:00	1.1	1.9	15	64
09/04/2023	00:37:00	1	2	15	64
09/04/2023	00:38:00	0.9	1.6	16	64
09/04/2023	00:39:00	0.7	1.4	16	50
09/04/2023	00:40:00	0.8	1.3	16	91
09/04/2023	00:41:00	0.8	1.1	16	78
09/04/2023	00:42:00	0.6	1.4	16	91
09/04/2023	00:43:00	0.5	1	16	88
09/04/2023	00:44:00	0.4	0.8	16	72
09/04/2023	00:45:00	0.3	0.8	16	111
09/04/2023	00:46:00	0	0	16	nW
09/04/2023	00:47:00	0	0	16	nW
09/04/2023	00:48:00	0.4	1	16	65
09/04/2023	00:49:00	0.7	1.7	16	55
09/04/2023	00:50:00	0.7	1.5	16	65
09/04/2023	00:51:00	0.7	0.9	16	69
09/04/2023	00:52:00	0.9	1.4	16	50
09/04/2023	00:53:00	0.9	1.5	16	61
09/04/2023	00:54:00	1	1.9	16	52
09/04/2023	00:55:00	1	2.1	16	44
09/04/2023	00:56:00	1.1	2.2	16	57
09/04/2023	00:57:00	1.1	2	16	65
09/04/2023	00:58:00	1.5	2	16	49
09/04/2023	00:59:00	1	1.5	16	60
09/04/2023	01:00:00	1.2	1.9	16	20
09/04/2023	01:01:00	1.4	2	16	46
09/04/2023	01:02:00	1.5	2.5	16	35
09/04/2023	01:03:00	1.3	2	16	21
09/04/2023	01:04:00	1.3	2	16	37
09/04/2023	01:05:00	1.5	2.6	16	21
09/04/2023	01:06:00	1.3	2.4	16	51
09/04/2023	01:07:00	1.2	2	16	60
09/04/2023	01:08:00	1.2	1.9	16	51
09/04/2023	01:09:00	1.3	2.4	16	36
09/04/2023	01:10:00	1.2	2	16	63
09/04/2023	01:11:00	1.4	2.2	16	48
09/04/2023	01:12:00	1.5	2.6	16	50
09/04/2023	01:13:00	1.1	1.7	16	43
09/04/2023	01:14:00	0.9	1.5	16	47
09/04/2023	01:15:00	1.1	1.9	16	42
09/04/2023	01:16:00	1.2	1.8	16	61
09/04/2023	01:17:00	1	1.8	16	67
09/04/2023	01:18:00	0.7	1.7	16	84
09/04/2023	01:19:00	0.7	1.2	16	127
09/04/2023	01:20:00	0.9	1.6	16	90

Date	Time	Wind speed average	Wind Speed maximum	Temperature	Wind Direction
09/04/2023	01:21:00	0.6	1.3	16	57
09/04/2023	01:22:00	0.6	1.1	16	42
09/04/2023	01:23:00	0.4	0.9	16	102
09/04/2023	01:24:00	0.7	1.6	16	80
09/04/2023	01:25:00	0.2	0.8	16	101
09/04/2023	01:26:00	0.6	1	16	54
09/04/2023	01:27:00	0.6	1	16	72
09/04/2023	01:28:00	0.8	1.1	16	80
09/04/2023	01:29:00	0.4	1.5	16	67
09/04/2023	01:30:00	0.8	1.3	16	67
09/04/2023	01:31:00	0.7	1.5	16	79
09/04/2023	01:32:00	0.4	0.8	16	109
09/04/2023	01:33:00	0.5	1.2	16	99
09/04/2023	01:34:00	0.6	1.2	16	68
09/04/2023	01:35:00	0.3	0.9	16	97
09/04/2023	01:36:00	0.4	1.4	16	89
09/04/2023	01:37:00	0.3	0.9	16	68
09/04/2023	01:38:00	0	0	16	nW
09/04/2023	01:39:00	0.1	0.8	16	77
09/04/2023	01:40:00	0	0	16	nW
09/04/2023	01:41:00	0	0	16	nW
09/04/2023	01:42:00	0.1	0.7	16	86
09/04/2023	01:43:00	0	0	16	nW
09/04/2023	01:44:00	0	0	16	nW
09/04/2023	01:45:00	0.3	1.3	16	116
09/04/2023	01:46:00	0.6	0.8	16	118
09/04/2023	01:47:00	0.4	0.9	16	140
09/04/2023	01:48:00	0.7	1	15	125
09/04/2023	01:49:00	0.7	1	15	115
09/04/2023	01:50:00	0.6	0.8	15	106
09/04/2023	01:51:00	0.2	0.9	15	84
09/04/2023	01:52:00	0.3	0.8	15	111
09/04/2023	01:53:00	0.5	1	15	112
09/04/2023	01:54:00	0.8	1.4	15	115
09/04/2023	01:55:00	1	1.5	15	128
09/04/2023	01:56:00	0.7	1.1	15	118
09/04/2023	01:57:00	0.6	0.9	15	129
09/04/2023	01:58:00	0.7	0.9	15	127
09/04/2023	01:59:00	0.6	0.8	15	132
09/04/2023	02:00:00	0.7	0.8	15	125
09/04/2023	02:01:00	0.5	0.8	15	133
09/04/2023	02:02:00	0.4	0.7	15	123
09/04/2023	02:03:00	0.4	0.7	15	122
09/04/2023	02:04:00	0.7	1	15	133
09/04/2023	02:05:00	0.8	1.3	15	137
09/04/2023	02:06:00	0.9	1.4	15	130
09/04/2023	02:07:00	0.7	0.9	15	115
09/04/2023	02:08:00	0.8	1.5	15	122
09/04/2023	02:09:00	0.7	0.9	15	117
09/04/2023	02:10:00	0.7	0.9	15	124
09/04/2023	02:11:00	0.7	0.9	15	126
09/04/2023	02:12:00	0.7	1	15	123
09/04/2023	02:13:00	0.5	0.9	15	133
09/04/2023	02:14:00	0.8	1.5	15	126
09/04/2023	02:15:00	0.8	1.6	15	124
09/04/2023	02:16:00	0.8	1	15	120
09/04/2023	02:17:00	0.4	0.8	15	110
09/04/2023	02:18:00	0.3	0.7	15	108
09/04/2023	02:19:00	0.6	0.7	15	108
09/04/2023	02:20:00	0.4	0.7	15	104
09/04/2023	02:21:00	0	0.6	15	nW
09/04/2023	02:22:00	0	0	15	nW

Date	Time	Wind speed average	Wind Speed maximum	Temperature	Wind Direction
09/04/2023	02:23:00	0	0.6	15	nW
09/04/2023	02:24:00	0.1	0.9	15	101
09/04/2023	02:25:00	0.6	1	15	158
09/04/2023	02:26:00	0.6	1	15	124
09/04/2023	02:27:00	0.6	0.9	15	126
09/04/2023	02:28:00	0.7	0.9	15	131
09/04/2023	02:29:00	0.8	1.3	15	125
09/04/2023	02:30:00	0.8	1.2	15	129
09/04/2023	02:31:00	0.8	1.2	15	129
09/04/2023	02:32:00	0.7	0.9	15	111
09/04/2023	02:33:00	0.2	0.8	15	154
09/04/2023	02:34:00	0.3	0.8	15	160
09/04/2023	02:35:00	0.5	0.8	15	120
09/04/2023	02:36:00	0.4	0.8	15	170
09/04/2023	02:37:00	0.2	0.7	15	94
09/04/2023	02:38:00	0	0	15	nW
09/04/2023	02:39:00	0.1	0.7	15	90
09/04/2023	02:40:00	0.1	0.6	15	76
09/04/2023	02:41:00	0.5	0.8	15	184
09/04/2023	02:42:00	0.4	1	15	129
09/04/2023	02:43:00	0.3	0.9	16	105
09/04/2023	02:44:00	0	0	16	nW
09/04/2023	02:45:00	0.7	2.1	16	39
09/04/2023	02:46:00	1.6	2.2	16	26
09/04/2023	02:47:00	2.4	3.2	16	28
09/04/2023	02:48:00	2.5	3.5	16	28
09/04/2023	02:49:00	3.1	4	16	23
09/04/2023	02:50:00	1.6	2.4	16	59
09/04/2023	02:51:00	0.9	1.4	16	80
09/04/2023	02:52:00	1.1	2.4	16	66
09/04/2023	02:53:00	1	1.5	16	286
09/04/2023	02:54:00	1.1	1.7	16	144
09/04/2023	02:55:00	1.3	2.1	16	137
09/04/2023	02:56:00	1.1	1.8	16	256
09/04/2023	02:57:00	1.4	2.3	16	64
09/04/2023	02:58:00	0.9	1.4	16	79
09/04/2023	02:59:00	1	1.6	16	44
09/04/2023	03:00:00	1.3	1.8	16	12
09/04/2023	03:01:00	1.8	2.5	17	18
09/04/2023	03:02:00	1.9	2.6	17	42
09/04/2023	03:03:00	1	1.7	17	117
09/04/2023	03:04:00	1	1.3	17	183
09/04/2023	03:05:00	1.7	2.1	17	168
09/04/2023	03:06:00	2	2.8	17	166
09/04/2023	03:07:00	2	3.1	17	143
09/04/2023	03:08:00	1	1.5	17	128
09/04/2023	03:09:00	0.5	1	17	87
09/04/2023	03:10:00	0.7	0.9	17	313
09/04/2023	03:11:00	0.9	2.6	17	84
09/04/2023	03:12:00	1.9	3.1	17	46
09/04/2023	03:13:00	3.9	4.9	17	16
09/04/2023	03:14:00	3.9	4.8	17	25
09/04/2023	03:15:00	3.8	5.3	17	10
09/04/2023	03:16:00	3.7	5.6	17	358
09/04/2023	03:17:00	3.1	5.1	17	359
09/04/2023	03:18:00	3.8	6.4	17	3
09/04/2023	03:19:00	4.7	6.6	18	360
09/04/2023	03:20:00	4.5	6.8	18	10
09/04/2023	03:21:00	2.7	4.5	18	27
09/04/2023	03:22:00	2.4	4	18	32
09/04/2023	03:23:00	2.2	4.9	18	50
09/04/2023	03:24:00	2.1	4	18	74

Date	Time	Wind speed average	Wind Speed maximum	Temperature	Wind Direction
09/04/2023	03:25:00	1.8	3.6	18	110
09/04/2023	03:26:00	1	1.4	18	191
09/04/2023	03:27:00	1.1	1.4	18	132
09/04/2023	03:28:00	1.1	1.6	19	125
09/04/2023	03:29:00	1	1.3	19	204
09/04/2023	03:30:00	0.8	1.1	19	151
09/04/2023	03:31:00	1.2	2.4	19	128
09/04/2023	03:32:00	1	1.7	19	123
09/04/2023	03:33:00	0.8	1.4	19	93
09/04/2023	03:34:00	1.1	1.6	19	314
09/04/2023	03:35:00	1.1	1.9	19	69
09/04/2023	03:36:00	1.7	3.6	19	35
09/04/2023	03:37:00	1.3	2.1	19	57
09/04/2023	03:38:00	2.2	3.5	19	36
09/04/2023	03:39:00	1.3	2.3	19	52
09/04/2023	03:40:00	0.7	1.1	19	136
09/04/2023	03:41:00	0.9	1.3	19	118
09/04/2023	03:42:00	0.1	0.7	19	119
09/04/2023	03:43:00	0.2	0.8	19	113
09/04/2023	03:44:00	0	0	19	nW
09/04/2023	03:45:00	0.1	0.7	19	80
09/04/2023	03:46:00	0.6	2	19	70
09/04/2023	03:47:00	1	2.3	19	203
09/04/2023	03:48:00	1.5	2.6	19	47
09/04/2023	03:49:00	0.9	1.7	19	129
09/04/2023	03:50:00	1.2	1.9	19	226
09/04/2023	03:51:00	0.9	1.5	19	141
09/04/2023	03:52:00	0.7	1.2	19	155
09/04/2023	03:53:00	0.3	0.9	19	110
09/04/2023	03:54:00	0.2	0.7	19	127
09/04/2023	03:55:00	0.4	1	19	46
09/04/2023	03:56:00	0.7	1.1	19	148
09/04/2023	03:57:00	1.2	1.5	19	149
09/04/2023	03:58:00	0.7	1.6	19	100
09/04/2023	03:59:00	0.6	1.1	19	334
09/04/2023	04:00:00	1.1	1.4	19	315
09/04/2023	04:01:00	1.4	1.6	19	321
09/04/2023	04:02:00	1.4	1.8	19	318
09/04/2023	04:03:00	1.4	2.7	19	208
09/04/2023	04:04:00	1.5	2.4	19	187
09/04/2023	04:05:00	1.5	2.8	19	205
09/04/2023	04:06:00	1.7	2.9	19	172
09/04/2023	04:07:00	1.5	2.8	19	169
09/04/2023	04:08:00	2.3	4.3	19	167
09/04/2023	04:09:00	1.9	3.4	19	180
09/04/2023	04:10:00	1.7	3.1	19	258
09/04/2023	04:11:00	2.2	3.1	19	265
09/04/2023	04:12:00	1.4	2.4	19	250
09/04/2023	04:13:00	0.4	0.9	19	160
09/04/2023	04:14:00	0	0.6	19	nW
09/04/2023	04:15:00	0.7	1.2	19	178
09/04/2023	04:16:00	0.4	0.9	19	174
09/04/2023	04:17:00	0.4	1	19	175
09/04/2023	04:18:00	0.6	0.9	19	46
09/04/2023	04:19:00	0.2	0.9	19	41
09/04/2023	04:20:00	0.1	0.8	19	36
09/04/2023	04:21:00	0.4	1.3	19	73
09/04/2023	04:22:00	0.8	2	19	133
09/04/2023	04:23:00	0.9	1.6	19	41
09/04/2023	04:24:00	1	1.7	19	72
09/04/2023	04:25:00	0.3	0.9	19	77
09/04/2023	04:26:00	0.5	1.2	19	23

Date	Time	Wind speed average	Wind Speed maximum	Temperature	Wind Direction
09/04/2023	04:27:00	1.3	1.9	19	41
09/04/2023	04:28:00	1	1.7	19	77
09/04/2023	04:29:00	1	1.7	19	47
09/04/2023	04:30:00	1.2	1.9	19	31
09/04/2023	04:31:00	1.7	2.5	19	30
09/04/2023	04:32:00	1.5	2.7	19	26
09/04/2023	04:33:00	1.7	2.9	19	30
09/04/2023	04:34:00	1.3	1.9	19	2
09/04/2023	04:35:00	1.3	1.7	19	42
09/04/2023	04:36:00	0.4	1.2	19	36
09/04/2023	04:37:00	0.5	1.2	19	54
09/04/2023	04:38:00	0.8	1.6	19	192
09/04/2023	04:39:00	0.6	1	19	128
09/04/2023	04:40:00	0.8	1.3	19	110
09/04/2023	04:41:00	0.7	1.1	18	337
09/04/2023	04:42:00	0.6	1.1	18	130
09/04/2023	04:43:00	0.9	1.2	18	24
09/04/2023	04:44:00	0.7	1.5	18	295
09/04/2023	04:45:00	1	1.6	18	68
09/04/2023	04:46:00	1.1	2.1	18	64
09/04/2023	04:47:00	0.9	1.8	18	167
09/04/2023	04:48:00	0.9	1.4	18	144
09/04/2023	04:49:00	0.9	1.3	18	95
09/04/2023	04:50:00	0.9	1.5	18	170
09/04/2023	04:51:00	1.3	2.8	18	4
09/04/2023	04:52:00	0.9	1.3	18	35
09/04/2023	04:53:00	0.6	1	18	196
09/04/2023	04:54:00	0.8	1.6	18	101
09/04/2023	04:55:00	0.9	1.6	18	71
09/04/2023	04:56:00	0.2	0.8	18	90
09/04/2023	04:57:00	0.8	2.1	18	107
09/04/2023	04:58:00	0.7	1.1	18	106
09/04/2023	04:59:00	0.9	1.5	18	56
09/04/2023	05:00:00	0.7	1.5	18	29
09/04/2023	05:01:00	0.9	1.6	18	84
09/04/2023	05:02:00	0.6	1.6	18	51
09/04/2023	05:03:00	0.9	1.7	18	58
09/04/2023	05:04:00	1.3	1.8	18	46
09/04/2023	05:05:00	1.1	1.7	18	48
09/04/2023	05:06:00	1.2	2	18	40
09/04/2023	05:07:00	1.4	2.7	18	48
09/04/2023	05:08:00	1.6	2.5	18	42
09/04/2023	05:09:00	1.2	2.1	18	58
09/04/2023	05:10:00	1.1	1.8	18	22
09/04/2023	05:11:00	1	1.5	18	34
09/04/2023	05:12:00	1	2	18	77
09/04/2023	05:13:00	1.1	1.7	18	50
09/04/2023	05:14:00	1.4	2.4	18	63
09/04/2023	05:15:00	1.6	2.4	18	32
09/04/2023	05:16:00	1.8	2.5	18	21
09/04/2023	05:17:00	1.9	2.6	18	25
09/04/2023	05:18:00	1.8	2.6	18	31
09/04/2023	05:19:00	2.1	3.4	18	13
09/04/2023	05:20:00	2.4	3.2	18	3
09/04/2023	05:21:00	1.6	2.6	18	0
09/04/2023	05:22:00	1.1	1.6	18	352
09/04/2023	05:23:00	1.2	1.7	19	344
09/04/2023	05:24:00	1.3	1.6	19	322
09/04/2023	05:25:00	1.2	1.5	19	311
09/04/2023	05:26:00	1.1	1.5	19	294
09/04/2023	05:27:00	1.3	1.9	18	298
09/04/2023	05:28:00	1.4	1.8	18	313

Date	Time	Wind speed average	Wind Speed maximum	Temperature	Wind Direction
09/04/2023	05:29:00	1.6	2.1	18	318
09/04/2023	05:30:00	1.6	2.3	18	314
09/04/2023	05:31:00	1.7	2.1	18	318
09/04/2023	05:32:00	1.5	2.1	18	325
09/04/2023	05:33:00	1.6	2.3	18	331
09/04/2023	05:34:00	1.4	1.8	18	318
09/04/2023	05:35:00	1.5	2	18	318
09/04/2023	05:36:00	1.1	1.7	18	308
09/04/2023	05:37:00	1.4	3	18	305
09/04/2023	05:38:00	1.2	1.9	18	306
09/04/2023	05:39:00	1.3	1.9	18	291
09/04/2023	05:40:00	1.6	2.3	18	291
09/04/2023	05:41:00	1.5	2.6	18	291
09/04/2023	05:42:00	2.5	3.8	18	283
09/04/2023	05:43:00	2.4	4.2	18	285
09/04/2023	05:44:00	1.7	3.2	18	296
09/04/2023	05:45:00	2.1	2.9	18	283
09/04/2023	05:46:00	2.1	3.6	18	277
09/04/2023	05:47:00	2.1	3.7	18	321
09/04/2023	05:48:00	3.5	5.9	18	287
09/04/2023	05:49:00	2.5	3.7	18	280
09/04/2023	05:50:00	3.5	5.1	18	284
09/04/2023	05:51:00	3	4.9	18	292
09/04/2023	05:52:00	2.6	4.2	18	301
09/04/2023	05:53:00	2.1	3.4	18	304
09/04/2023	05:54:00	2.2	3.3	18	316
09/04/2023	05:55:00	1.5	2.8	18	289
09/04/2023	05:56:00	1.4	2.3	18	306
09/04/2023	05:57:00	1.1	2	19	309
09/04/2023	05:58:00	1.2	1.9	19	290
09/04/2023	05:59:00	1.1	1.9	19	265
09/04/2023	06:00:00	1.1	1.8	19	296
09/04/2023	06:01:00	1.2	1.8	19	272
09/04/2023	06:02:00	0.9	1.4	19	290
09/04/2023	06:03:00	0.5	0.9	19	263
09/04/2023	06:04:00	0	0.6	19	nW
09/04/2023	06:05:00	0.4	0.7	19	75
09/04/2023	06:06:00	0.6	0.9	19	69
09/04/2023	06:07:00	0.7	1.4	19	98
09/04/2023	06:08:00	0.7	1.1	19	225
09/04/2023	06:09:00	0.6	1.4	19	159
09/04/2023	06:10:00	0.8	1.8	19	191
09/04/2023	06:11:00	0.9	1.3	18	210
09/04/2023	06:12:00	1	1.8	18	201
09/04/2023	06:13:00	0.9	1.3	18	227
09/04/2023	06:14:00	0.8	1.4	18	185
09/04/2023	06:15:00	0.8	1.5	18	165
09/04/2023	06:16:00	0.9	1.2	18	219
09/04/2023	06:17:00	1	1.6	18	14
09/04/2023	06:18:00	1.4	2.1	18	23
09/04/2023	06:19:00	1.4	2	18	31
09/04/2023	06:20:00	0.9	1.3	18	16
09/04/2023	06:21:00	0.6	0.8	18	338
09/04/2023	06:22:00	0.7	1	18	247
09/04/2023	06:23:00	0.1	0.7	18	242
09/04/2023	06:24:00	0.3	0.8	18	272
09/04/2023	06:25:00	0.9	1.4	18	17
09/04/2023	06:26:00	1.5	1.7	18	20
09/04/2023	06:27:00	1.2	1.6	18	352
09/04/2023	06:28:00	0.9	1.4	18	299
09/04/2023	06:29:00	1.1	1.4	18	181
09/04/2023	06:30:00	1	1.4	18	219

Date	Time	Wind speed average	Wind Speed maximum	Temperature	Wind Direction
09/04/2023	06:31:00	0.9	1.2	18	291
09/04/2023	06:32:00	0.7	1	18	11
09/04/2023	06:33:00	0.7	0.9	18	85
09/04/2023	06:34:00	0.4	0.8	18	106
09/04/2023	06:35:00	0.6	1.4	18	106
09/04/2023	06:36:00	1.1	2	18	211
09/04/2023	06:37:00	0.5	1.2	18	167
09/04/2023	06:38:00	0.3	0.8	18	277
09/04/2023	06:39:00	1.1	2	18	174
09/04/2023	06:40:00	2.7	4.1	18	155
09/04/2023	06:41:00	2.1	3	18	156
09/04/2023	06:42:00	2.1	3.3	18	154
09/04/2023	06:43:00	2	3	18	172
09/04/2023	06:44:00	1.1	1.5	18	181
09/04/2023	06:45:00	1.3	2.2	18	176
09/04/2023	06:46:00	0.7	1.1	18	206
09/04/2023	06:47:00	0.5	1	18	219
09/04/2023	06:48:00	0.5	0.9	18	194
09/04/2023	06:49:00	1.2	2.1	18	228
09/04/2023	06:50:00	0.4	1.3	18	197
09/04/2023	06:51:00	1	1.2	18	224
09/04/2023	06:52:00	0.8	1.2	18	192
09/04/2023	06:53:00	1.3	2	18	302
09/04/2023	06:54:00	1.6	2.5	18	308
09/04/2023	06:55:00	1.9	2.9	18	288
09/04/2023	06:56:00	2.8	4.4	18	266
09/04/2023	06:57:00	2.8	3.9	18	258
09/04/2023	06:58:00	2.2	3.3	18	268
09/04/2023	06:59:00	1.6	3	18	285
09/04/2023	07:00:00	1.5	2.1	18	272
09/04/2023	07:01:00	1.7	2.7	18	267
09/04/2023	07:02:00	1.1	1.6	18	304
09/04/2023	07:03:00	1.1	1.5	18	350
09/04/2023	07:04:00	1.1	1.5	18	311
09/04/2023	07:05:00	1.5	2.4	18	275
09/04/2023	07:06:00	1.1	1.6	18	179
09/04/2023	07:07:00	0.8	1.4	18	123
09/04/2023	07:08:00	1.1	1.6	18	182
09/04/2023	07:09:00	1.2	1.9	17	256
09/04/2023	07:10:00	1.7	2.9	17	306
09/04/2023	07:11:00	1.4	1.9	17	349
09/04/2023	07:12:00	1	1.9	17	6
09/04/2023	07:13:00	1.4	2.1	17	43
09/04/2023	07:14:00	1.7	3.3	17	47
09/04/2023	07:15:00	1.9	3.3	17	18
09/04/2023	07:16:00	1	1.4	17	19
09/04/2023	07:17:00	0.9	1.4	17	163
09/04/2023	07:18:00	1.7	2.5	17	157
09/04/2023	07:19:00	1.7	2.3	17	168
09/04/2023	07:20:00	1.5	2.5	17	155
09/04/2023	07:21:00	1	1.7	16	79
09/04/2023	07:22:00	0.7	1.1	16	99
09/04/2023	07:23:00	1.1	1.9	16	174
09/04/2023	07:24:00	1.7	3.4	16	129
09/04/2023	07:25:00	0.9	1.3	16	147
09/04/2023	07:26:00	1	1.5	16	179
09/04/2023	07:27:00	1.1	1.5	16	138
09/04/2023	07:28:00	1.1	1.9	16	128
09/04/2023	07:29:00	0.8	1.1	16	50
09/04/2023	07:30:00	1	1.5	16	60
09/04/2023	07:31:00	0.9	2.4	16	345
09/04/2023	07:32:00	0.9	1.6	16	190

Date	Time	Wind speed average	Wind Speed maximum	Temperature	Wind Direction
09/04/2023	07:33:00	0.9	1.3	16	32
09/04/2023	07:34:00	0.7	1.1	16	10
09/04/2023	07:35:00	0.6	1.2	16	350
09/04/2023	07:36:00	1	1.5	16	38
09/04/2023	07:37:00	0.3	1.3	16	6
09/04/2023	07:38:00	0.9	1.8	16	65
09/04/2023	07:39:00	0.6	1.1	16	133
09/04/2023	07:40:00	0	0	16	nW
09/04/2023	07:41:00	0.1	0.7	16	96
09/04/2023	07:42:00	0.3	0.9	16	111
09/04/2023	07:43:00	0.9	1.4	16	128
09/04/2023	07:44:00	1.1	1.5	16	128
09/04/2023	07:45:00	1.2	1.7	16	129
09/04/2023	07:46:00	1.6	2.4	16	138
09/04/2023	07:47:00	2	3.3	16	148
09/04/2023	07:48:00	1.5	2.8	16	141
09/04/2023	07:49:00	1.8	2.6	16	140
09/04/2023	07:50:00	2	3.2	16	139
09/04/2023	07:51:00	1.9	2.7	16	135
09/04/2023	07:52:00	2.2	2.9	16	149
09/04/2023	07:53:00	2.1	3.3	16	148
09/04/2023	07:54:00	1.9	3.3	16	152
09/04/2023	07:55:00	2.2	3.6	17	142
09/04/2023	07:56:00	0.9	1.8	17	95
09/04/2023	07:57:00	1.1	1.7	17	113
09/04/2023	07:58:00	1.3	2.8	17	125
09/04/2023	07:59:00	1.2	2.9	17	157
09/04/2023	08:00:00	1.1	1.8	17	170
09/04/2023	08:01:00	0.6	0.9	17	127
09/04/2023	08:02:00	0.6	1.2	17	102
09/04/2023	08:03:00	0.8	1.8	17	49
09/04/2023	08:04:00	1	2.1	17	71
09/04/2023	08:05:00	0.9	1.5	17	130
09/04/2023	08:06:00	1	1.8	17	150
09/04/2023	08:07:00	1.1	1.9	17	121
09/04/2023	08:08:00	1.3	3.1	17	60
09/04/2023	08:09:00	0.9	3.1	17	132
09/04/2023	08:10:00	1.1	3.9	17	76
09/04/2023	08:11:00	0.7	0.9	17	118
09/04/2023	08:12:00	0.4	0.9	17	124
09/04/2023	08:13:00	0.8	2.2	17	164
09/04/2023	08:14:00	1	2.1	17	162
09/04/2023	08:15:00	1	2.4	17	242
09/04/2023	08:16:00	0.9	1.8	17	122
09/04/2023	08:17:00	0.8	1.5	17	202
09/04/2023	08:18:00	0.7	1.2	17	157
09/04/2023	08:19:00	0.8	1.5	17	224
09/04/2023	08:20:00	0.9	1.5	17	200
09/04/2023	08:21:00	0.8	1.1	17	271
09/04/2023	08:22:00	0.7	1.1	17	228
09/04/2023	08:23:00	0.6	0.9	17	144
09/04/2023	08:24:00	1	1.9	17	121
09/04/2023	08:25:00	1.2	2	17	82
09/04/2023	08:26:00	1.2	2.5	17	120
09/04/2023	08:27:00	1	1.9	17	154
09/04/2023	08:28:00	1	2	17	74
09/04/2023	08:29:00	1	1.5	17	182
09/04/2023	08:30:00	0.8	1.3	17	135
09/04/2023	08:31:00	1.1	2.2	17	98
09/04/2023	08:32:00	1	1.6	17	38
09/04/2023	08:33:00	1.1	2	17	79
09/04/2023	08:34:00	0.9	1.3	17	153

Date	Time	Wind speed average	Wind Speed maximum	Temperature	Wind Direction
09/04/2023	08:35:00	0.7	1	17	102
09/04/2023	08:36:00	0.6	1	17	144
09/04/2023	08:37:00	0.7	1.1	17	190
09/04/2023	08:38:00	0.8	1.1	17	119
09/04/2023	08:39:00	0.6	1.4	17	109
09/04/2023	08:40:00	1.1	1.9	17	158
09/04/2023	08:41:00	0.9	2	17	174
09/04/2023	08:42:00	0.8	1.3	17	167
09/04/2023	08:43:00	0.7	1.1	17	165
09/04/2023	08:44:00	0.8	1.2	17	141
09/04/2023	08:45:00	0.7	1.3	17	100
09/04/2023	08:46:00	0.8	1.1	17	184
09/04/2023	08:47:00	0.8	1.2	17	82
09/04/2023	08:48:00	0.9	1.3	17	191
09/04/2023	08:49:00	0.9	1.5	17	176
09/04/2023	08:50:00	0.9	1.3	17	197
09/04/2023	08:51:00	1.2	1.9	17	169
09/04/2023	08:52:00	1.1	2	17	207
09/04/2023	08:53:00	1.1	2.4	17	129
09/04/2023	08:54:00	1	1.6	17	102
09/04/2023	08:55:00	1	1.4	18	269
09/04/2023	08:56:00	0.9	1.2	18	330
09/04/2023	08:57:00	1	1.6	18	184
09/04/2023	08:58:00	1	1.5	18	196
09/04/2023	08:59:00	0.8	1.1	18	155
09/04/2023	09:00:00	0.9	1.2	18	128
09/04/2023	09:01:00	1.1	2.9	18	165
09/04/2023	09:02:00	0.9	1.4	18	234
09/04/2023	09:03:00	0.9	1.3	18	128
09/04/2023	09:04:00	0.8	1.2	18	156
09/04/2023	09:05:00	1	1.8	18	133
09/04/2023	09:06:00	1	1.5	19	169
09/04/2023	09:07:00	1	1.5	19	7
09/04/2023	09:08:00	1	2.2	19	62
09/04/2023	09:09:00	1	2.2	19	125
09/04/2023	09:10:00	1.3	3.1	19	85
09/04/2023	09:11:00	1.1	2.3	19	36
09/04/2023	09:12:00	1.2	3	19	111
09/04/2023	09:13:00	1.2	1.8	19	84
09/04/2023	09:14:00	0.9	1.9	19	84
09/04/2023	09:15:00	1.1	1.9	19	319
09/04/2023	09:16:00	1.3	2.4	19	105
09/04/2023	09:17:00	1	2.1	19	329
09/04/2023	09:18:00	1.2	1.7	19	91
09/04/2023	09:19:00	1.7	2.9	19	50
09/04/2023	09:20:00	1	1.8	19	78
09/04/2023	09:21:00	1.2	2.2	19	46
09/04/2023	09:22:00	1.1	2	19	60
09/04/2023	09:23:00	1.4	2.1	19	66
09/04/2023	09:24:00	1.8	4	19	11
09/04/2023	09:25:00	1.2	2.3	19	90
09/04/2023	09:26:00	0.9	1.5	19	358
09/04/2023	09:27:00	1	1.7	20	111
09/04/2023	09:28:00	1.4	2.6	20	30
09/04/2023	09:29:00	1.4	2.5	20	350
09/04/2023	09:30:00	1.5	4	20	28
09/04/2023	09:31:00	1.5	2.5	20	90
09/04/2023	09:32:00	1.1	2	20	146
09/04/2023	09:33:00	1.4	2.3	20	245
09/04/2023	09:34:00	1.8	3.5	20	50
09/04/2023	09:35:00	1.5	2.6	20	87
09/04/2023	09:36:00	1	2	20	45

Date	Time	Wind speed average	Wind Speed maximum	Temperature	Wind Direction
09/04/2023	09:37:00	1.4	3.1	20	66
09/04/2023	09:38:00	1.4	2.7	20	72
09/04/2023	09:39:00	1	2	20	95
09/04/2023	09:40:00	1.1	1.5	20	36
09/04/2023	09:41:00	1	1.8	20	83
09/04/2023	09:42:00	1.2	1.8	20	160
09/04/2023	09:43:00	1	1.8	20	225
09/04/2023	09:44:00	1.4	2.6	21	29
09/04/2023	09:45:00	1.5	2.8	21	100
09/04/2023	09:46:00	1	1.7	21	135
09/04/2023	09:47:00	1.1	1.8	21	86
09/04/2023	09:48:00	1.1	1.7	21	214
09/04/2023	09:49:00	0.8	1.7	21	104
09/04/2023	09:50:00	1	1.6	21	167
09/04/2023	09:51:00	1.1	1.5	21	167
09/04/2023	09:52:00	1.1	1.4	21	143
09/04/2023	09:53:00	1	1.9	21	122
09/04/2023	09:54:00	1.1	1.8	21	149
09/04/2023	09:55:00	1.1	2.2	21	213
09/04/2023	09:56:00	1	1.9	21	69
09/04/2023	09:57:00	1.3	1.9	21	66
09/04/2023	09:58:00	1	1.7	21	164
09/04/2023	09:59:00	1	1.8	21	240
09/04/2023	10:00:00	1.1	1.4	21	72
09/04/2023	10:01:00	0.9	1.3	21	117
09/04/2023	10:02:00	0.9	1.3	21	268
09/04/2023	10:03:00	1.1	1.6	21	133
09/04/2023	10:04:00	1.2	1.9	21	209
09/04/2023	10:05:00	1.2	2.1	22	109
09/04/2023	10:06:00	1.3	2.4	22	72
09/04/2023	10:07:00	1	1.9	22	179
09/04/2023	10:08:00	1.1	1.5	22	171
09/04/2023	10:09:00	1.2	2.1	22	232
09/04/2023	10:10:00	1.3	2.6	22	139
09/04/2023	10:11:00	1.4	2.8	22	191
09/04/2023	10:12:00	1.3	1.9	22	188
09/04/2023	10:13:00	1.1	2.2	22	170
09/04/2023	10:14:00	1.2	2	23	183
09/04/2023	10:15:00	1.2	1.8	23	157
09/04/2023	10:16:00	1.2	2	23	164
09/04/2023	10:17:00	1.1	2.3	23	145
09/04/2023	10:18:00	1	1.8	23	117
09/04/2023	10:19:00	0.8	1.2	23	182
09/04/2023	10:20:00	1.1	1.7	23	175
09/04/2023	10:21:00	1	1.5	23	190
09/04/2023	10:22:00	1.1	2.6	23	198
09/04/2023	10:23:00	1.2	1.7	23	205
09/04/2023	10:24:00	1.1	1.7	23	167
09/04/2023	10:25:00	1.1	1.4	24	166
09/04/2023	10:26:00	1.2	1.9	24	141
09/04/2023	10:27:00	1.2	2.1	24	144
09/04/2023	10:28:00	1.3	2.4	24	157
09/04/2023	10:29:00	1.2	2.4	24	136
09/04/2023	10:30:00	1.3	2	24	176
09/04/2023	10:31:00	1.6	2.6	24	161
09/04/2023	10:32:00	1.2	1.8	24	179
09/04/2023	10:33:00	1.2	2.1	24	128
09/04/2023	10:34:00	1.4	2.1	24	155
09/04/2023	10:35:00	1.1	2	24	127
09/04/2023	10:36:00	1	2.4	24	143
09/04/2023	10:37:00	1.5	2.9	24	162
09/04/2023	10:38:00	1.4	2.6	24	177

Date	Time	Wind speed average	Wind Speed maximum	Temperature	Wind Direction
09/04/2023	10:39:00	1.3	2.2	24	202
09/04/2023	10:40:00	1	1.4	24	145
09/04/2023	10:41:00	1.2	2	24	236
09/04/2023	10:42:00	1.3	1.7	24	149
09/04/2023	10:43:00	1.3	2.6	24	151
09/04/2023	10:44:00	1.2	2.2	24	165
09/04/2023	10:45:00	1.1	1.7	24	190
09/04/2023	10:46:00	1.8	3.3	24	145
09/04/2023	10:47:00	1.6	3.2	24	150
09/04/2023	10:48:00	1.4	2.1	24	163
09/04/2023	10:49:00	1.2	2.1	24	182
09/04/2023	10:50:00	1.3	2	25	132
09/04/2023	10:51:00	1.4	2.2	25	163
09/04/2023	10:52:00	1.5	2.2	25	180
09/04/2023	10:53:00	1.4	2	25	147
09/04/2023	10:54:00	1.3	3.4	25	167
09/04/2023	10:55:00	1.4	2.3	25	172
09/04/2023	10:56:00	2	3.8	25	149
09/04/2023	10:57:00	1.7	3	25	182
09/04/2023	10:58:00	1.8	4.8	25	154
09/04/2023	10:59:00	1.5	2.4	25	189
09/04/2023	11:00:00	1.7	3.4	25	202
09/04/2023	11:01:00	1.4	2.2	25	143
09/04/2023	11:02:00	1.5	2.9	25	159
09/04/2023	11:03:00	2.1	4	25	169
09/04/2023	11:04:00	1.5	4	25	202
09/04/2023	11:05:00	1.9	3.3	25	151
09/04/2023	11:06:00	1.7	3	25	161
09/04/2023	11:07:00	1.5	2.6	25	163
09/04/2023	11:08:00	1.7	2.8	25	146
09/04/2023	11:09:00	1.8	4.1	25	164
09/04/2023	11:10:00	1.8	3.8	25	143
09/04/2023	11:11:00	1.5	3.3	25	180
09/04/2023	11:12:00	1.5	2.9	25	166
09/04/2023	11:13:00	1.6	3.9	25	151
09/04/2023	11:14:00	1.8	3.6	25	140
09/04/2023	11:15:00	1.5	2.1	26	129
09/04/2023	11:16:00	1.4	3.4	26	196
09/04/2023	11:17:00	1.4	3.7	26	146
09/04/2023	11:18:00	1.7	3.8	26	186
09/04/2023	11:19:00	1.5	3.5	26	160
09/04/2023	11:20:00	1.4	2.6	26	174
09/04/2023	11:21:00	1.6	2.4	26	168
09/04/2023	11:22:00	1.5	2.9	26	177
09/04/2023	11:23:00	1.6	3	26	160
09/04/2023	11:24:00	1.3	1.8	26	135
09/04/2023	11:25:00	1.3	1.8	26	203
09/04/2023	11:26:00	1.3	2.8	26	189
09/04/2023	11:27:00	1.4	2.1	26	165
09/04/2023	11:28:00	1.4	2	26	198
09/04/2023	11:29:00	1.4	2.4	26	180
09/04/2023	11:30:00	1.4	2.5	26	188
09/04/2023	11:31:00	1.3	2	26	200
09/04/2023	11:32:00	1.7	3.6	26	161
09/04/2023	11:33:00	1.8	3.4	26	176
09/04/2023	11:34:00	1.8	3	26	146
09/04/2023	11:35:00	1.8	3.1	26	171
09/04/2023	11:36:00	1.4	3.8	26	150
09/04/2023	11:37:00	1.9	3.4	26	161
09/04/2023	11:38:00	1.5	2.3	26	154
09/04/2023	11:39:00	1.5	3	26	194
09/04/2023	11:40:00	1.4	3.1	26	93

Date	Time	Wind speed average	Wind Speed maximum	Temperature	Wind Direction
09/04/2023	11:41:00	1.6	3.1	26	193
09/04/2023	11:42:00	1.8	4.1	26	168
09/04/2023	11:43:00	2	3.9	26	166
09/04/2023	11:44:00	1.9	4.2	26	152
09/04/2023	11:45:00	1.4	2.1	26	162
09/04/2023	11:46:00	1.5	2.5	26	157
09/04/2023	11:47:00	1.4	2.3	26	155
09/04/2023	11:48:00	1.9	3	26	135
09/04/2023	11:49:00	1.4	2.4	26	157
09/04/2023	11:50:00	1.4	2.6	26	194
09/04/2023	11:51:00	1.7	2.8	26	165
09/04/2023	11:52:00	1.5	2.2	26	175
09/04/2023	11:53:00	1.8	3.1	26	157
09/04/2023	11:54:00	2	3.1	26	138
09/04/2023	11:55:00	1.4	2	26	172
09/04/2023	11:56:00	1.9	3.5	26	154
09/04/2023	11:57:00	2.2	3.8	26	151
09/04/2023	11:58:00	1.8	3.1	26	164
09/04/2023	11:59:00	1.7	2.4	26	223
09/04/2023	12:00:00	1.2	2.3	26	171
09/04/2023	12:01:00	1.5	2.6	26	214
09/04/2023	12:02:00	2	3.4	26	164
09/04/2023	12:03:00	1.3	2.7	26	178
09/04/2023	12:04:00	1.4	2.3	26	217
09/04/2023	12:05:00	1.5	3.3	26	182
09/04/2023	12:06:00	1.3	2.5	26	205
09/04/2023	12:07:00	1.5	2.4	26	246
09/04/2023	12:08:00	1.4	2.9	26	225
09/04/2023	12:09:00	1.6	2.6	26	189
09/04/2023	12:10:00	1.5	3.6	26	186
09/04/2023	12:11:00	1.7	2.8	26	166
09/04/2023	12:12:00	1.5	3.3	26	184
09/04/2023	12:13:00	1.6	3.3	26	166
09/04/2023	12:14:00	2.2	4.5	26	170
09/04/2023	12:15:00	1.7	4.1	26	175
09/04/2023	12:16:00	1.4	3.3	26	170
09/04/2023	12:17:00	1.4	2.6	26	160
09/04/2023	12:18:00	1.9	3	26	145
09/04/2023	12:19:00	1.7	2.9	26	148
09/04/2023	12:20:00	2	4	26	168
09/04/2023	12:21:00	1.3	2.8	26	193
09/04/2023	12:22:00	1.6	2.6	26	160
09/04/2023	12:23:00	2	3.8	26	156
09/04/2023	12:24:00	1.8	2.7	26	141
09/04/2023	12:25:00	1.9	3.3	26	122
09/04/2023	12:26:00	1.6	3	26	187
09/04/2023	12:27:00	1.4	2.4	26	196
09/04/2023	12:28:00	1.8	2.4	26	151
09/04/2023	12:29:00	1.2	1.7	26	160
09/04/2023	12:30:00	1.7	3.3	26	150
09/04/2023	12:31:00	1.3	2.5	26	181
09/04/2023	12:32:00	1.6	3.5	26	170
09/04/2023	12:33:00	1.6	2.7	26	181
09/04/2023	12:34:00	1.4	2.7	26	151
09/04/2023	12:35:00	1.6	2.9	26	174
09/04/2023	12:36:00	1.9	4.5	27	146
09/04/2023	12:37:00	1.4	2.2	27	182
09/04/2023	12:38:00	1.3	2.2	27	163
09/04/2023	12:39:00	1.7	2.7	27	192
09/04/2023	12:40:00	1.6	2.7	27	174
09/04/2023	12:41:00	1.8	3.2	27	161
09/04/2023	12:42:00	1.6	3	27	193

Date	Time	Wind speed average	Wind Speed maximum	Temperature	Wind Direction
09/04/2023	12:43:00	1.7	3.1	27	161
09/04/2023	12:44:00	1.7	2.3	27	147
09/04/2023	12:45:00	2.1	5.1	27	141
09/04/2023	12:46:00	1.7	3.3	27	198
09/04/2023	12:47:00	1.4	2.6	27	174
09/04/2023	12:48:00	1.6	3.9	27	145
09/04/2023	12:49:00	2	3.5	27	172
09/04/2023	12:50:00	1.7	3.2	27	200
09/04/2023	12:51:00	1.7	3.4	27	205
09/04/2023	12:52:00	1.7	2.6	27	191
09/04/2023	12:53:00	1.4	2.2	27	195
09/04/2023	12:54:00	1.7	3.4	27	141
09/04/2023	12:55:00	1.9	3.2	27	135
09/04/2023	12:56:00	1.7	3.1	27	148
09/04/2023	12:57:00	1.5	2.1	27	181
09/04/2023	12:58:00	1.8	3.8	27	162
09/04/2023	12:59:00	2.3	4.3	27	167
09/04/2023	13:00:00	1.9	2.7	27	158
09/04/2023	13:01:00	2.2	4.2	27	155
09/04/2023	13:02:00	1.3	2.3	27	147
09/04/2023	13:03:00	1.3	2.3	27	184
09/04/2023	13:04:00	2	3.6	27	166
09/04/2023	13:05:00	2.5	4.6	27	138
09/04/2023	13:06:00	1.6	2.4	27	148
09/04/2023	13:07:00	2.1	3.1	27	146
09/04/2023	13:08:00	2	3.8	27	154
09/04/2023	13:09:00	1.5	2.4	27	139
09/04/2023	13:10:00	1.9	3.5	27	147
09/04/2023	13:11:00	2.3	4.5	27	139
09/04/2023	13:12:00	2.1	4	27	156
09/04/2023	13:13:00	1.6	2.8	27	172
09/04/2023	13:14:00	1.6	3.1	27	132
09/04/2023	13:15:00	1.6	3.3	27	197
09/04/2023	13:16:00	1.8	3.4	27	154
09/04/2023	13:17:00	2	3.5	27	144
09/04/2023	13:18:00	2.2	4.6	27	140
09/04/2023	13:19:00	2.2	3.6	27	135
09/04/2023	13:20:00	1.7	3.2	27	189
09/04/2023	13:21:00	1.6	3.1	27	174
09/04/2023	13:22:00	1.5	3	27	177
09/04/2023	13:23:00	1.6	2.9	27	161
09/04/2023	13:24:00	2.5	5.7	27	147
09/04/2023	13:25:00	1.6	2.6	27	178
09/04/2023	13:26:00	1.7	3.1	27	175
09/04/2023	13:27:00	2	3.5	28	168
09/04/2023	13:28:00	1.8	2.8	28	167
09/04/2023	13:29:00	1.5	2.7	28	158
09/04/2023	13:30:00	1.5	2.2	28	162
09/04/2023	13:31:00	1.6	3.1	28	170
09/04/2023	13:32:00	1.7	2.8	28	156
09/04/2023	13:33:00	1.4	2.3	28	223
09/04/2023	13:34:00	1.9	3.3	28	151
09/04/2023	13:35:00	2	4	28	161
09/04/2023	13:36:00	1.7	3.1	28	166
09/04/2023	13:37:00	1.8	4.1	28	169
09/04/2023	13:38:00	1.5	2.8	28	174
09/04/2023	13:39:00	1.8	3.6	28	175
09/04/2023	13:40:00	1.7	2.9	28	152
09/04/2023	13:41:00	1.4	3.2	28	163
09/04/2023	13:42:00	1.7	3.8	28	211
09/04/2023	13:43:00	2.1	3.2	28	246
09/04/2023	13:44:00	1.7	3.8	28	129

Date	Time	Wind speed average	Wind Speed maximum	Temperature	Wind Direction
09/04/2023	13:45:00	2.4	4.2	28	145
09/04/2023	13:46:00	2.6	4.6	28	140
09/04/2023	13:47:00	1.5	2.4	28	189
09/04/2023	13:48:00	1.3	2.3	28	197
09/04/2023	13:49:00	1.4	2.6	28	144
09/04/2023	13:50:00	1.6	3.9	28	186
09/04/2023	13:51:00	1.7	3	28	163
09/04/2023	13:52:00	1.4	1.9	28	171
09/04/2023	13:53:00	1.5	2.3	28	161
09/04/2023	13:54:00	2.4	5.8	28	144
09/04/2023	13:55:00	1.6	3	28	168
09/04/2023	13:56:00	1.8	3.8	28	143
09/04/2023	13:57:00	2.4	3.8	28	140
09/04/2023	13:58:00	2.4	4.1	28	143
09/04/2023	13:59:00	1.9	4.2	28	164
09/04/2023	14:00:00	1.4	2.1	28	141
09/04/2023	14:01:00	2.4	4.3	28	148
09/04/2023	14:02:00	1.5	2.1	28	148
09/04/2023	14:03:00	1.9	3.9	28	158
09/04/2023	14:04:00	2	3.3	28	150
09/04/2023	14:05:00	1.9	4.1	28	150
09/04/2023	14:06:00	2	3.3	28	158
09/04/2023	14:07:00	1.5	2.5	28	179
09/04/2023	14:08:00	2.1	3.4	28	159
09/04/2023	14:09:00	1.8	3.6	28	171
09/04/2023	14:10:00	1.9	4.2	28	147
09/04/2023	14:11:00	1.6	3	28	175
09/04/2023	14:12:00	1.6	2.4	28	212
09/04/2023	14:13:00	1.5	3	28	219
09/04/2023	14:14:00	1.5	3.3	28	196
09/04/2023	14:15:00	1.5	3.3	28	155
09/04/2023	14:16:00	2	4.6	28	181
09/04/2023	14:17:00	1.7	3.2	28	160
09/04/2023	14:18:00	1.4	2.8	28	175
09/04/2023	14:19:00	1.4	2.9	28	197
09/04/2023	14:20:00	1.9	4	28	186
09/04/2023	14:21:00	2.5	3.9	28	148
09/04/2023	14:22:00	2.1	3	28	165
09/04/2023	14:23:00	1.7	2.8	28	159
09/04/2023	14:24:00	1.3	2.3	28	164
09/04/2023	14:25:00	1.4	2.3	28	210
09/04/2023	14:26:00	1.5	2.3	28	169
09/04/2023	14:27:00	1.2	2.3	28	188
09/04/2023	14:28:00	1.3	2.4	28	186
09/04/2023	14:29:00	1.4	2.6	28	208
09/04/2023	14:30:00	1.7	3.4	28	170
09/04/2023	14:31:00	1.6	2.3	28	168
09/04/2023	14:32:00	1.5	2.7	28	162
09/04/2023	14:33:00	1.2	1.9	28	167
09/04/2023	14:34:00	1.5	3	28	180
09/04/2023	14:35:00	1.2	2.2	28	188
09/04/2023	14:36:00	1.9	4.4	28	144
09/04/2023	14:37:00	1.3	1.8	28	165
09/04/2023	14:38:00	1.2	1.8	28	200
09/04/2023	14:39:00	1.2	2.8	28	139
09/04/2023	14:40:00	1.6	3.3	28	156
09/04/2023	14:41:00	1.6	3.4	28	204
09/04/2023	14:42:00	1.5	2.2	28	159
09/04/2023	14:43:00	1.2	1.8	28	202
09/04/2023	14:44:00	1.7	2.4	28	167
09/04/2023	14:45:00	1.5	2.9	28	220
09/04/2023	14:46:00	1.7	3.2	28	147

Date	Time	Wind speed average	Wind Speed maximum	Temperature	Wind Direction
09/04/2023	14:47:00	1.5	2.8	28	153
09/04/2023	14:48:00	1.6	2.5	28	152
09/04/2023	14:49:00	1.7	3.2	28	184
09/04/2023	14:50:00	1.5	2.7	28	184
09/04/2023	14:51:00	2	3	28	144
09/04/2023	14:52:00	1.8	4.7	28	135
09/04/2023	14:53:00	1.7	3.9	28	148
09/04/2023	14:54:00	1.5	2.8	28	163
09/04/2023	14:55:00	1.6	3	28	155
09/04/2023	14:56:00	1.7	3.1	28	139
09/04/2023	14:57:00	1.3	1.9	28	148
09/04/2023	14:58:00	1.3	1.7	28	213
09/04/2023	14:59:00	1.3	2.7	27	163
09/04/2023	15:00:00	1.7	2.5	27	178
09/04/2023	15:01:00	1.4	2.4	27	180
09/04/2023	15:02:00	1.7	2.5	27	164
09/04/2023	15:03:00	1.3	2	27	143
09/04/2023	15:04:00	1.4	2.5	27	159
09/04/2023	15:05:00	1.4	3.2	27	177
09/04/2023	15:06:00	1.9	3.4	27	151
09/04/2023	15:07:00	1.5	3.7	27	186
09/04/2023	15:08:00	1.3	2.7	27	193
09/04/2023	15:09:00	0.9	1.3	27	228
09/04/2023	15:10:00	1.3	2.6	27	194
09/04/2023	15:11:00	1.5	2.8	27	121
09/04/2023	15:12:00	1.4	2.4	27	184
09/04/2023	15:13:00	2.1	3.3	27	143
09/04/2023	15:14:00	1.5	2.7	27	159
09/04/2023	15:15:00	1.2	2	27	144
09/04/2023	15:16:00	1.1	1.9	27	159
09/04/2023	15:17:00	1.4	2.5	27	161
09/04/2023	15:18:00	1.3	2.7	27	159
09/04/2023	15:19:00	1.4	2.3	27	154
09/04/2023	15:20:00	1.2	1.8	27	182
09/04/2023	15:21:00	1.3	2	27	151
09/04/2023	15:22:00	1.3	2.1	27	215
09/04/2023	15:23:00	1	1.4	27	167
09/04/2023	15:24:00	1.1	1.8	27	190
09/04/2023	15:25:00	1.7	3.1	27	71
09/04/2023	15:26:00	1.3	2.5	27	230
09/04/2023	15:27:00	1.3	2.5	27	127
09/04/2023	15:28:00	1.2	2.3	27	173
09/04/2023	15:29:00	1.1	1.5	27	187
09/04/2023	15:30:00	1.2	3	27	149
09/04/2023	15:31:00	1	1.9	27	140
09/04/2023	15:32:00	1	1.8	27	152
09/04/2023	15:33:00	1.1	2.6	27	201
09/04/2023	15:34:00	1.3	2.1	27	109
09/04/2023	15:35:00	1.3	3.1	27	356
09/04/2023	15:36:00	1.3	2.4	27	193
09/04/2023	15:37:00	1.6	2.5	28	92
09/04/2023	15:38:00	1.2	1.9	28	96
09/04/2023	15:39:00	1	1.5	28	180
09/04/2023	15:40:00	1.4	2.6	28	194
09/04/2023	15:41:00	1.5	2.7	28	178
09/04/2023	15:42:00	1.8	3.9	28	101
09/04/2023	15:43:00	2.5	4.9	28	11
09/04/2023	15:44:00	1.3	3	28	98
09/04/2023	15:45:00	1.3	2.1	27	216
09/04/2023	15:46:00	1.4	3.2	27	175
09/04/2023	15:47:00	1.2	2.2	27	224
09/04/2023	15:48:00	1.2	1.9	27	216

Date	Time	Wind speed average	Wind Speed maximum	Temperature	Wind Direction
09/04/2023	15:49:00	1.2	2.4	27	266
09/04/2023	15:50:00	1.2	2.2	27	249
09/04/2023	15:51:00	0.8	1.2	27	159
09/04/2023	15:52:00	1.1	1.9	27	230
09/04/2023	15:53:00	1	1.7	27	234
09/04/2023	15:54:00	0.9	1.6	27	156
09/04/2023	15:55:00	1	1.4	27	97
09/04/2023	15:56:00	1.1	1.8	27	139
09/04/2023	15:57:00	0.8	1	27	61
09/04/2023	15:58:00	0.7	1.1	27	163
09/04/2023	15:59:00	0.9	1.3	27	203
09/04/2023	16:00:00	1.3	2	27	154
09/04/2023	16:01:00	1.1	1.9	27	147
09/04/2023	16:02:00	1.4	3.2	27	134
09/04/2023	16:03:00	1	1.7	27	187
09/04/2023	16:04:00	1.1	2.2	27	121
09/04/2023	16:05:00	1.1	2	27	57
09/04/2023	16:06:00	1.4	3.5	27	290
09/04/2023	16:07:00	2	3.4	27	70
09/04/2023	16:08:00	1	1.8	27	229
09/04/2023	16:09:00	1	1.8	27	118
09/04/2023	16:10:00	1.1	2	27	213
09/04/2023	16:11:00	1.1	1.8	27	107
09/04/2023	16:12:00	1	1.9	27	151
09/04/2023	16:13:00	1	1.8	27	182
09/04/2023	16:14:00	1.2	1.5	27	166
09/04/2023	16:15:00	0.8	1.5	27	246
09/04/2023	16:16:00	0.7	1.4	27	301
09/04/2023	16:17:00	1.3	2.8	27	216
09/04/2023	16:18:00	1.3	3.6	27	180
09/04/2023	16:19:00	1.2	2.4	27	192
09/04/2023	16:20:00	1	2	27	175
09/04/2023	16:21:00	1.2	2.2	27	45
09/04/2023	16:22:00	1.3	2	27	193
09/04/2023	16:23:00	1.5	2.5	27	42
09/04/2023	16:24:00	1.2	1.7	27	201
09/04/2023	16:25:00	1.2	1.7	27	181
09/04/2023	16:26:00	1.6	3.2	27	98
09/04/2023	16:27:00	1.3	2.2	27	211
09/04/2023	16:28:00	1.7	3.6	27	257
09/04/2023	16:29:00	1.6	2.8	28	23
09/04/2023	16:30:00	1.8	3.3	28	111
09/04/2023	16:31:00	1	1.5	28	117
09/04/2023	16:32:00	1.3	2	28	231
09/04/2023	16:33:00	1.2	2.5	28	186
09/04/2023	16:34:00	1.3	2.5	28	201
09/04/2023	16:35:00	0.9	1.5	28	237
09/04/2023	16:36:00	1.1	1.9	28	209
09/04/2023	16:37:00	1.2	2.4	28	145
09/04/2023	16:38:00	1.4	2.4	28	127
09/04/2023	16:39:00	1.2	2.2	28	194
09/04/2023	16:40:00	1.4	2.2	28	188
09/04/2023	16:41:00	1.5	2.8	28	79
09/04/2023	16:42:00	1.1	1.9	28	194
09/04/2023	16:43:00	1.3	2	28	178
09/04/2023	16:44:00	1.5	2.6	28	127
09/04/2023	16:45:00	1.5	4.2	28	130
09/04/2023	16:46:00	1.2	2.8	28	8
09/04/2023	16:47:00	1.3	2.1	28	182
09/04/2023	16:48:00	1.6	3.6	27	91
09/04/2023	16:49:00	1.3	2	27	62
09/04/2023	16:50:00	1	1.7	27	170

Date	Time	Wind speed average	Wind Speed maximum	Temperature	Wind Direction
09/04/2023	16:51:00	1.1	1.6	27	256
09/04/2023	16:52:00	1.6	4.2	27	52
09/04/2023	16:53:00	1.4	3.3	27	190
09/04/2023	16:54:00	1	1.6	27	166
09/04/2023	16:55:00	1	2	27	207
09/04/2023	16:56:00	1.2	2.3	27	100
09/04/2023	16:57:00	1.2	1.8	27	214
09/04/2023	16:58:00	1.4	2.2	27	69
09/04/2023	16:59:00	1.2	1.9	27	162
09/04/2023	17:00:00	1.6	3.2	27	236
09/04/2023	17:01:00	1.7	2.5	27	74
09/04/2023	17:02:00	1.5	2.2	27	145
09/04/2023	17:03:00	1.4	2.4	27	186
09/04/2023	17:04:00	1.1	1.5	27	257
09/04/2023	17:05:00	1.1	2.1	27	220
09/04/2023	17:06:00	0.9	1.8	27	184
09/04/2023	17:07:00	1.4	2.3	27	202
09/04/2023	17:08:00	1	1.6	27	249
09/04/2023	17:09:00	1.1	1.7	28	74
09/04/2023	17:10:00	1.1	1.7	28	331
09/04/2023	17:11:00	1.5	3.2	28	106
09/04/2023	17:12:00	1.4	2.4	28	222
09/04/2023	17:13:00	1.7	2.6	27	283
09/04/2023	17:14:00	1.8	3.6	27	114
09/04/2023	17:15:00	1.2	2.1	27	198
09/04/2023	17:16:00	2.2	4.4	27	347
09/04/2023	17:17:00	1.7	3.7	27	85
09/04/2023	17:18:00	1.5	3.7	27	353
09/04/2023	17:19:00	2.1	5.1	27	138
09/04/2023	17:20:00	2.2	3.8	27	345
09/04/2023	17:21:00	1.1	1.6	27	180
09/04/2023	17:22:00	2.3	5.3	27	13
09/04/2023	17:23:00	1.9	3.9	27	53
09/04/2023	17:24:00	2	4.7	27	43
09/04/2023	17:25:00	2.1	3.5	27	210
09/04/2023	17:26:00	1.5	2.7	27	220
09/04/2023	17:27:00	2.2	4.5	27	46
09/04/2023	17:28:00	2.6	4.6	27	24
09/04/2023	17:29:00	2.7	4.8	27	32
09/04/2023	17:30:00	2.2	4.4	27	90
09/04/2023	17:31:00	2	4.3	27	139
09/04/2023	17:32:00	2.1	4.4	26	124
09/04/2023	17:33:00	2.3	3.9	26	93
09/04/2023	17:34:00	1.7	3.4	26	89
09/04/2023	17:35:00	1.4	3.1	26	96
09/04/2023	17:36:00	1.5	2.8	26	149
09/04/2023	17:37:00	1.7	2.8	26	155
09/04/2023	17:38:00	1.3	1.8	26	176
09/04/2023	17:39:00	1.4	2.3	26	187
09/04/2023	17:40:00	1.8	3.5	26	337
09/04/2023	17:41:00	2	4.6	26	225
09/04/2023	17:42:00	2.3	5.7	26	92
09/04/2023	17:43:00	1.8	3.2	26	132
09/04/2023	17:44:00	1.5	2.5	26	207
09/04/2023	17:45:00	1.7	3.4	26	229
09/04/2023	17:46:00	1.4	3.2	26	200
09/04/2023	17:47:00	1.9	4.2	26	139
09/04/2023	17:48:00	1.6	4	26	168
09/04/2023	17:49:00	1.5	3.2	25	140
09/04/2023	17:50:00	1.8	4.9	25	73
09/04/2023	17:51:00	1.6	3.7	25	179
09/04/2023	17:52:00	1.8	3.6	25	206

Date	Time	Wind speed average	Wind Speed maximum	Temperature	Wind Direction
09/04/2023	17:53:00	1.8	4.2	25	60
09/04/2023	17:54:00	1.7	3.1	25	359
09/04/2023	17:55:00	2.2	4.1	25	124
09/04/2023	17:56:00	2.3	4.3	24	199
09/04/2023	17:57:00	2	3.1	24	166
09/04/2023	17:58:00	1.8	3.6	24	130
09/04/2023	17:59:00	1.9	4.8	24	196
09/04/2023	18:00:00	1.8	4.3	24	283

Certificate of calibrated noise meter

ANV MEASUREMENT SYSTEMS

CERTIFICATE OF CALIBRATION

ilac-MRA UKAS CALIBRATION 0653

Date of Issue: 21 February 2023

Certificate Number: UCRT23/1245

Calibrated at & Certificate issued by:
ANV Measurement Systems
Beaufort Court
17 Roebuck Way
Milton Keynes MK5 8HL
Telephone 01908 642846 Fax 01908 642814
E-Mail: info@noise-and-vibration.co.uk
Web: www.noise-and-vibration.co.uk
Acoustics Noise and Vibration Ltd trading as ANV Measurement Systems

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Approved Signatory

K. Mistry

Customer	Juru Energy Ltd Suite 1 One George Yard London United Kingdom EC3V 9DF			
Order No.	JE1			
Description	Sound Level Meter / Pre-amp / Microphone / Associated Calibrator			
Identification	*Manufacturer*	*Instrument*	*Type*	*Serial No. / Version*
	Rion	Sound Level Meter	NL-52	00410151
	Rion	Firmware		2.0
	Rion	Pre Amplifier	NH-25	10591
	Rion	Microphone	UC-59	19220
	Rion	Calibrator	NC-74	34536109
		Calibrator adaptor type if applicable		NC-74-002
Performance Class	1			
Test Procedure	TP 10. SLM 61672-3:2013 *Procedures from IEC 61672-3:2013 were used to perform the periodic tests.*			
Type Approved to IEC 61672-1:2013	Yes *If YES above there is public evidence that the SLM has successfully completed the applicable pattern evaluation tests of IEC 61672-2:2013*			
Date Received	20 February 2023	ANV Job No.	UKAS23/02116	
Date Calibrated	21 February 2023			

The sound level meter submitted for testing has successfully completed the periodic tests of IEC 61672-3:2013, for the environmental conditions under which the tests were performed. As evidence was publicly available, from an independent testing organisation responsible for approving the results of pattern-evaluation tests performed in accordance with IEC 61672-2:2013, to demonstrate that the model of sound level meter fully conformed to the class 1 specifications in IEC 61672-1:2013, the sound level meter submitted for testing conforms to the class 1 specifications of IEC 61672-1:2013.

Previous Certificate	*Dated*	*Certificate No.*	*Laboratory*
	29 June 2021	UCRT21/1801	0653

CERTIFICATE OF CALIBRATION	Certificate Number UCRT23/1245
UKAS Accredited Calibration Laboratory No. 0653	Page 2 of 2 Pages

Sound Level Meter Instruction manual and data used to adjust the sound levels indicated.

SLM instruction manual title	NL-52/NL-42 Description for IEC 61672-1		
SLM instruction manual ref / issue	No. 56034 21-03	Source	Rion
Date provided or internet download date	19 March 2021		

	Case Corrections	Wind Shield Corrections	Mic Pressure to Free Field Corrections
Uncertainties provided	Yes	Yes	Yes

Total expanded uncertainties within the requirements of IEC 61672-1:2013	YES		
Specified or equivalent Calibrator	Specified		
Customer or Lab Calibrator	Lab Calibrator		
Calibrator adaptor type if applicable	NC-74-002		
Calibrator cal. date	16 February 2023		
Calibrator cert. number	UCRT23/1227		
Calibrator cal cert issued by Lab	0653		
Calibrator SPL @ STP	94.04	dB	Calibration reference sound pressure level
Calibrator frequency	1001.97	Hz	Calibration check frequency
Reference level range	Single	dB	

Accessories used or corrected for during calibration - Extension Cable & Wind Shield WS-15
Note - The Extension Cable was used between the SLM and the pre-amp for this calibration.

Environmental conditions during tests	Start	End	
Temperature	23.64	22.59	± 0.30 °C
Humidity	39.9	40.0	± 3.00 %RH
Ambient Pressure	100.84	100.84	± 0.03 kPa

Indication at the Calibration Check Frequency					
Initial indicated level	94.0	dB	Adjusted indicated level	94.0	dB
Uncertainty of calibrator used for Indication at the Calibration Check Frequency ±				0.10	dB

Self Generated Noise									
Microphone installed -	Less Than	16.9	dB	A Weighting					
Microphone replaced with electrical input device -				UR = Under Range indicated					

Weighting	A			C			Z		
	11.9	dB	UR	15.8	dB	UR	21.4	dB	UR

Self Generated Noise reported for information only and not used to assess conformance to a requirement

Certificate of calibrated air monitoring system

ENVIRONMENTAL Instruments

Tel. +44 (0)1789 207459
Email. info@aqmesh.com
www.aqmesh.com

AQMesh

Certificate of calibration

This is to certify that the sensors:

NO: 160410106

NO2: 202761658

CO2: 0330FF15

SO2: 164041109

CO: 162941352

AQMesh pod 2450963 have been calibrated against certified reference equipment for the following measurements:

NO, NO2	Thermo Scientific 42i
CO2	Comparison to AQMesh Gold pod, created via co-location with Licor CO2 analyser
SO2	Thermo Scientific 43i
CO	Ecotech Serinus 30

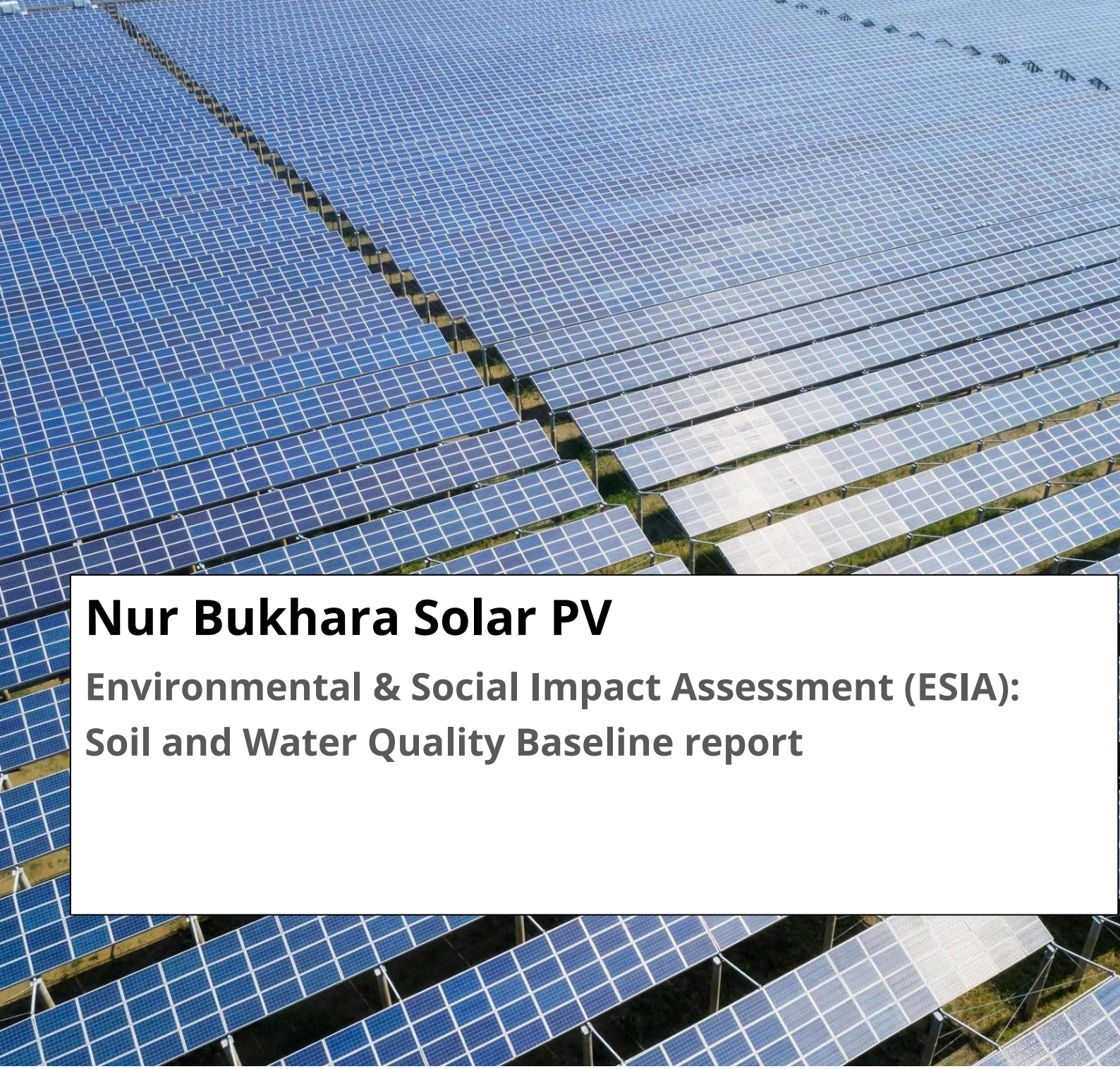
This is to certify that the AQMesh pod 2450963 has passed end of line testing for the following measurements:

PM 10, PM 2.5, PM 1, Particle count	Fidas 200

Date of manufacture: 25th August 2022

Richard Handy
Operations Manager

Technical appendix 5:
Soil and Water Quality Baseline report



Nur Bukhara Solar PV

Environmental & Social Impact Assessment (ESIA): Soil and Water Quality Baseline report

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1 Introduction

The project site is located in the southwestern part of the Kyzylkum desert and in administrative part of the Alat district of Bukhara province. The area is generally flat with low altitudes, which is due to the uneven relief of the bedrock and the thickness of the aeolian cover formations. The elevation in the area ranges from 210 m to 239 m. The terrain is covered with desert soils, specifically gray-brown alkaline skeleton-loam soils, and sandy alluvium. The most spread soils are sandy desert soils with an undifferentiated profile. The project site is surrounded by the man-made channel known as the Amu-Bukhara Irrigation System (ABIS canal). The climate of the project area is characterized by sharp continentality with little precipitation, high temperatures in summer and low temperatures in winter. Low humidity and frequent winds increase evaporation of moisture from the soil and contribute to soil salinization.

The vegetation of this area is described by the predominance of psammophytic, halophytic and, in some places, hypsophytic flora. Mostly, species from the genus *Calligonum L.* tree and shrub vegetation are widespread in these Kyzylkum ecotopes, with tall species such as *Ammodendron conollyi, Haloxylon persicum, Calligonum setosum, C. eriopodum* and *C. Arborescens*, clearly prominent on the upper tier. Cherkez-Kandym vegetation is also present.

The main objective of the soil and water quality baseline report is to evaluate the quality of the soil and water resources within and near the project area to provide an understanding of the status of soil and water resources (ABIS canal).

The report includes a detailed analysis of soil and water samples collected from identified locations within the project site. The analysis includes chemical and physical parameters such as pH, electrical conductivity, nutrients, heavy metals, organic matter, and other contaminants. The results of the analysis are compared to relevant national and international standards.

2 Soil and Water sampling

A visual soil assessment and water and soil sampling were conducted on 04 April 2023. In addition, soil samples were taken at four representative locations within the site, including the substation area where most groundworks may occur.

The soil texture was also determined using the Bouyoucos method (Figure 2), In addition to visual analysis, a soil-adjusted vegetation index (SAVI) with a correction factor for arid regions for the project area was used to analyze soil type using the Landsat 8 OLI raster object and QGIS.

Figure 1: Physical appearance of the sample and the rest of the roots with stones

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Figure 2: Estimation of soil texture by Bouyoucos method

Water samples were taken from six representative location upstream and downstream of the proposed site.
Figure 3 and Table 1 shows the locations and coordinates of the sampling points respectively.

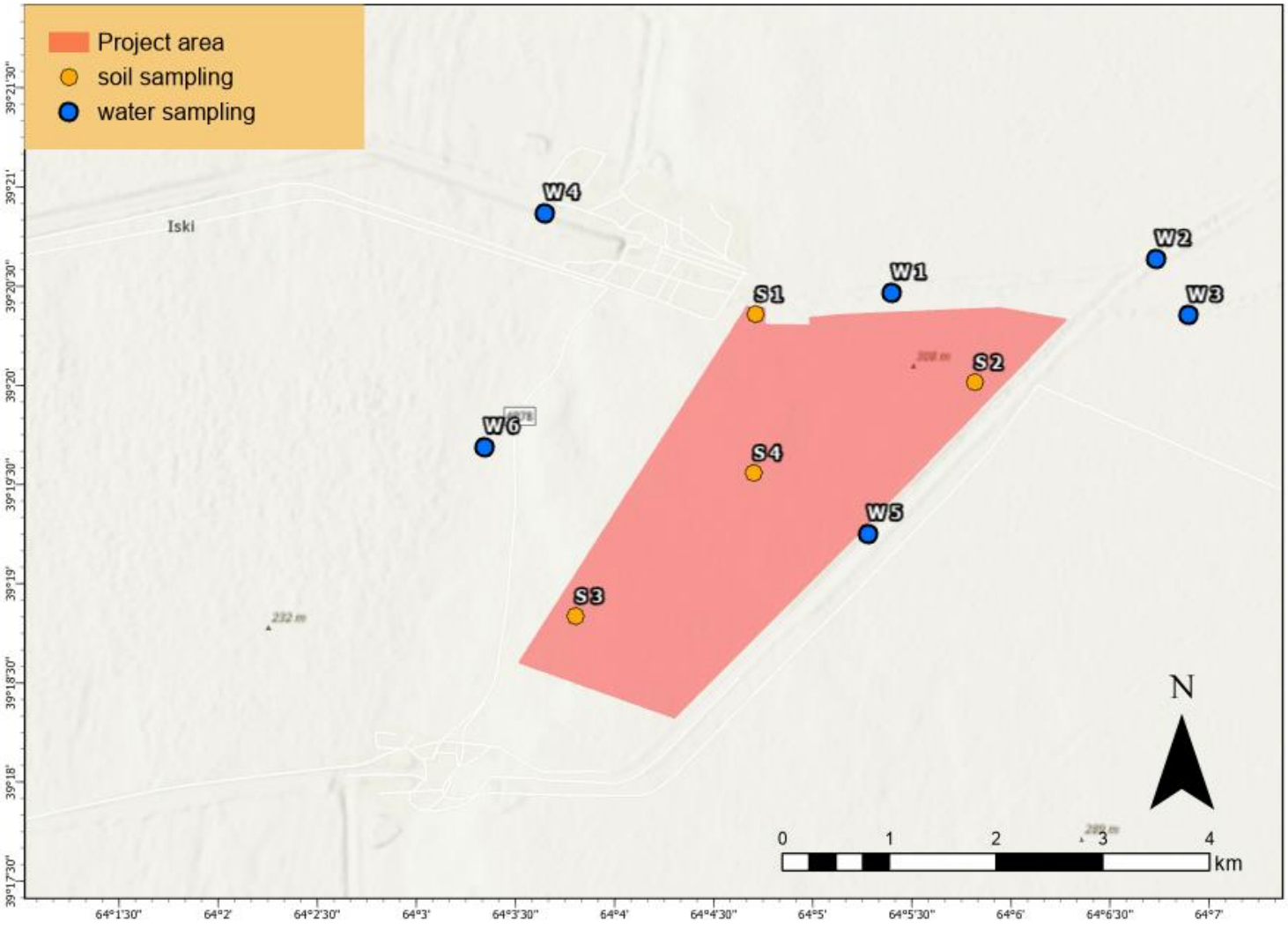

Figure 3: Location of soil and water samples

Table 1: Coordinates of locations

Name of sample	Coordinates
S1	39.339350° 64.078535°
S2	39.333624° 64.096981°
S3	39.313960° 64.063395°
S4	39.325995° 64.078381°
W1	39.341142° 64.089997°
W2	39.343977° 64.112194°
W3	39.339257° 64.114893°
W4	39.347827° 64.060810°
W5	39.320878° 64.087954°
W6	39.328194° 64.055757°

Soil samples were taken from depths 20 cm in accordance with the established State standard 17.4.4.02-2017 “Nature protection. Soils. Methods for sampling and preparation of soil for chemical, bacteriological, helminthological analysis”.

Water sampling was carried out in accordance with the established State standard 31861-2012 “Nature protection. Water. General requirements for sampling”. The water samples were collected from the ABIS canal, from the entrance to the pumping station Hamza I (W4) and from the outlet from station (W1) as well as in four further branches of the canal that surround the project area. Water samples were collected and stored in plastic and glass bottles for laboratory analysis.

For soil sampling, at each of the four locations, 0.5 kg of soil was collected by taking three separate samples. The collected samples were placed in individual bags and taken to four different laboratories to measure the parameters shown in Table 2.

Table 2: Parameters provided for analysis in the laboratory

<table>
<tr><th colspan="3">Parameters</th><th>Laboratory</th></tr>
<tr><td rowspan="9">Water</td><td rowspan="4"></td><td>Conductivity µS/cm</td><td>Center of hydrometeorological of the Republic of Uzbekistan (Uzhydromet) Department of natural environmental pollution monitoring (DNEPM)</td></tr>
<tr><td>Dissolved Oxygen mgO_2/dm^3</td><td rowspan="3">Namangan SES Laboratory of Sanitary-Epidemiological Well-Being and Public Health of the Republic of Uzbekistan</td></tr>
<tr><td>Total suspended particles, mg/dm^3</td></tr>
<tr><td>Chromium (Cr^{+3}, Cr^{+6}, Cr total mg/dm^3)</td></tr>
<tr><td rowspan="5">Soil</td><td>Petroleum Products</td><td>Bukhara Regional Department of Ecology and Environmental Protection</td></tr>
<tr><td>pH</td><td rowspan="5">Uzbek geological exploration JSC (Central laboratory)</td></tr>
<tr><td>Turbidity</td></tr>
<tr><td>Metals (As, Al, Cd, Pb, Cu, Ni, Zn,)</td></tr>
<tr><td>Na, K mg/kg</td></tr>
<tr><td></td><td>Nitrates (NO_3) mg/dm^3</td></tr>
</table>

3 Results of visual investigation and laboratory analysis

3.1 Soil quality

Based on visual observation, all the soil sampling locations are slightly brown sandy soil derived from ancient alluvium. Soil type of classification based on the SAVI around 0.1027 to 0.3631[1] which is sand and loamy sand, also sandy loam. There is no visible signs of human contamination

Location S1 - this sample location is situated near the pumping station and is about 0.26 km from the ABIS canal. The soil is covered by a layer of shrubs with a small presence of lumps which can easily be broken by hands, it is sandy soil with uniform soil structure. The percentage of stones and roots in the sample is approximately 0.1 % which indicated a light granulometric composition consisting of sand, loamy sand.

Location S2 - The soil at the second location S2 is placed around 0.24 km from the irrigation channel. S2 is a loamy sand in texture, the surrounding area also is covered by shrubs and bushes. The soil contained a higher amount of stones than the first sample, and its structure was more loose. There were no apparent signs of contamination, suggesting that the soil had not been affected by human activities.

Location S3 - The soil at S3 has a loamy sand texture and absence of contamination, just as was observed at S1 and S2. S3 has similar soil characteristics as S2, except for the content of slight surface crust.

Location S4 – is near the middle of the site, and around 10m from the old OHTL route. This location is characterized by a soil type consisting of sandy soils. The vegetation covering the soil amounts to 25-30% of the surface area.

The results of chemical analyses are presented in Table 3.

Table 3: Results of the soil analyses[2]

Name of parameters	Locations				The lower limit of detection	MPC in mg/kg	Dutch intervention Value / Target Value[3]	
	S1	S2	S3	S4				
pH	7.97	8.14	8.30	8.30	1-14	-	-	-
Nitrate (NO3), mg/dm³	17.0	19.00	20.00	21.00	10-6 mg/kg	130.0 (gross content)	-	-
Sodium (Na), mg/kg	9000	10000	10000	9200	40 mg/kg	-	-	-

[1] Huete, A. R., 1988, "A soil-adjusted vegetation index (SAVI)," Remote Sensing of Environment, Vol 25, 295–309." (ESRI, 2018).
[2] Appendix 2 provides an extended analysis of the metals, for soil and water samples.
[3] Dutch Standards for Soil and groundwater Contamination (2013).

Name of parameters	Locations				The lower limit of detection	MPC in mg/kg	Dutch intervention Value / Target Value[3]	
	S1	S2	S3	S4				
Potassium (K), mg/kg	15000	16000	15000	15000	80 mg/kg	-	-	-
Chromium (Cr), mg/kg	52.0	62.0	61.0	59.0	1.0 mg/kg	6.0	180	-
Manganese (Mn), mg/kg	230	470	290	230	20 mg/kg	1500.0 (gross content)	-	-
Iron (Fe), mg/kg	14000	18000	15000	15000	60 mg/kg		-	-
Nickel (Ni), mg/kg	20.0	48.0	41.0	20.0	1.0 mg/kg	4.0	100	35
Copper (Cu), mg/kg	18.0	18.0	17.0	17.0	1.0 mg/kg	3.0	190	36
Zinc (Zn), mg/kg	40.0	37.0	32.0	40.0	1.0 mg/kg	23,0	7200	140
Cadmium (Cd), mg/kg	0.081	0.064	0.060	0.016	0.005 mg/kg	-	13	0.8
Mercury (Hg), mg/kg	<0.03	<0.03	<0.03	<0.03	**	2.1	36	0.3
Lead (Pb), mg/kg	1700	1300	1000	700	0.1mg/kg	32.0	530	85
Petroleum products, mg/kg	0.013	0.011	0.014	0.011	0.01 mg/kg	0.1-1.0[4]	-	-

3.2 Water quality

The results of the water quality sample are provided in Table 4.

[4] According SanPIN standards value.

Table 4: Results of water analysis

Name of parameters	Locations						MPC O'zDSt 950:2011	Fishery water use[5]	Irrigation water use
	W1	W2	W3	W4	W5	W6			
pH	8.07	8.15	8.15	8.14	8.17	8.17	6-9	6.5-8.5	6.5-8.5
Turbidity, mg/dm³	0.03	0.03	0.03	0.03	0.03	0.03	1,5	-	-
Electrical conductivity µS/cm	1246	1233	1240	1236	1227	20685	-	-	-
Dissolved Oxygen mgO_2/dm^3	5.9	6.5	7.05	4.9	6.5	3.7	>4[6]	-	-
Total Suspended solids, mg/dm³	9.435	8.375	13.475	8.925	10.675	3.895	0.25/0.27[7]	15	50
Cr^{3+} mg/dm³	0.061	0.040	0.063	0.041	0.027	0.042	-	-	-
Cr^{6+} mg/dm³	0.00	0.00	0.00	0.00	0.005	0.005	-	0.001	0.1
Cr (total) mg/dm³	0.061	0.040	0.063	0.041	0.032	0.047	0,05	-	-
Arsenic (As) mg/dm³	0.0029	0.0030	0.0027	0.0027	0.0024	0.0044	0.05	0.05	0.1
Aluminum (Al) mg/dm³	0.067	0.076	0.055	0.076	0.083	0.0076	0,2(0,5) ****	-	-
Cadmium (Cd) mg/dm³	0.00038	0.00074	0.0001	0.0001	0.00013	0.0002	0.001	0.005	-
Copper (Cu) mg/dm³	0.0025	0.0031	0.0026	0.0027	0.0023	0.03	1.0	0.001	1
Nickel (Ni) mg/dm³	0.0047	0.0047	0.0045	0.0043	0.0043	0.012	0.1	0.01	0.2

[5] SanPiN RUz № 0318-15
[6] According SanPIN № 0318-15 standards value.
[7] According SanPIN standards value.

Name of parameters	Locations						MPC O'zDSt 950:2011	Fishery water use[5]	Irrigation water use
	W1	W2	W3	W4	W5	W6			
Lead (Pb) mg/dm³	0.000085	0.000097	0.000071	0.000082	0.000010	0.000011	0.03	0.03	0.2
Zinc (Zn) mg/dm³	0.00720	0.00550	0.00630	0.00590	0.00550	0.0031	3.0	0.01	5
Petroleum products, mg/ dm³	0.011	0.012	0.012	0.011	0.012	0.011	0.	0.05	0.3
Sodium (Na) mg/dm3	110	110	100	100	97	>	-	-	-
Calcium (Ca)	180	170	160	160	160	480	-	-	-
Magnesium (Mg) mg/dm3	26	25	23	23	22	120	-	-	-

4 National standards and Maximum Permissible Concentrations (MPC) for soil and water

In accordance with SanPiN № 0191-05 "Maximum permissible concentrations (MPC) and Approximate permittable concentrations of exogenous harmful substances in soil", the MPC of exogenous chemicals in the soils (in mg/kg) is as follows:

Table 5: **Maximum Permissible Concentrations (MPC) of Exogenous Chemicals in Soil (mg/kg)**

According to the general sanitary limiting indicator of harmfulness in mg/kg:	
1. BENZAPIRENE (gross content)	0.02
2.VANADIUM (gross content)	150.0
3. Manganese + VANADIUM (gross content)	1000.0
4. TUNGSTEN (moving forms)	10.0
5. CELTAN	1.0
6 COBALT (mobile forms)	5.0
7. COPPER (mobile forms)	3.0
8. Molybdenum (mobile forms)	10.0
9. NICKEL (mobile forms)	4.0
10. COAL FLOTATION WASTE (OFU) (gross content)	3000.0
11. LEAD (gross content)	32.0
12. SULFUR ELEMENTARY (gross content)	160.0
13. SULFURIC ACID (gross content)	160.0
14. PHOSPHATES	27.2
15. FURFUROL	3.0
16. CHROME (moving forms)	6.0
by air-migration limiting hazard indicator:	
17. ALFAMETHYLSTYROL	0.5
18. BENZENE	0.3
19. ISOPROTTILBENZENE	0.5
20. HYDROGEN SULFUR (gross content)	0.4
21. STYROL	0.1
22. FORMALDEHYDE	0.7
by water-migration limiting hazard indicator:	
23. LIQUID COMPLEX FERTILIZERS (gross content)	80.0
24. INTEGRATED GRANULATED FERTILIZERS (gross content)	120.0
25. Manganese: (gross content) (mobile forms)	1500.0 60.0
26. NITRATES (gross content)	130.0
27. POTASSIUM CHLORIDE (gross content)	560.0
by trans locational limiting hazard indicator:	
28. ACIDS (ortho, -meta, -pa)	0.3

According to the general sanitary limiting indicator of harmfulness in mg/kg:	
29. ARROW (gross maintenance)	2.0
30. Mercury (gross content)	2.1
31. LEAD + MERCURY (gross content)	20.0+1.0
32. ANTIMONY (gross content)	4.5
33. TOLUOL	0.3
34. FLUORINE (water soluble forms)	10.0
35. ZINC	23.0

Table 6: Maximum permissible concentrations of pollutants in water of surface water bodies by category of use[8]

Name of parameters	Fishery water use	Cultural and domestic water use.	Domestic Drinking water	Irrigation water use
COD, mgO_2/dm^3	15	40	30	40
BOD, mgO_2/dm^3	3	3-6	3-7	10
pH	6.5-8.5	6.5-8.5	6.5-8.5	6.5-8.5
Total suspended solids mg/dm^3	15	30	30	50
Mineralization mg/dm^3	1000	1000	1000–1500	1000
Sulphates mg/dm^3	100	500	400-500	
Chloride mg/dm^3	300	350	250-350	
Ammonium nitrogen (NH4+N)	0,5	2	0.5	1.5
Nitrite nitrogen (NO2-N)	0.02	0.5	3	0.5
Nitrate nitrogen (NO3-N)	9.1	25	45	25
Nitrites	0.08	3.3	3	
Nitrates	40	45	45	
Phosphates (PO_4^{3-})	0.3	1	3.5	1
Ether - soluble	0.05	0.8	0.8	0.8
Petroleum products	0.05	0.3	0.1	0.3
Surfactants	0.1	0.5	0.5	0.5
Phenol	0.001	0.001	0.001-0.1	0.001
Fluorine (F)	0.05	1.5	0.7	1
Arsenic (As)	0.05	0.05	0.05	0.1
Iron (Fe)	0.05	0.5	0.3-3	5
Chrome (Cr6-)	0.001	0.1	0.05	0.1
Copper (Cu)	0.001	1	1	1
Zinc (Zn)	0.01	1	3	5
Cyanides	0.05	0.1		
Lead (Pb)	0.03	0.1	0.03	0.2
Nickel (Ni)	0.01	0.1	0.1	
Cadmium (Cd)	0.005	0.01		
Cobalt (Co)	0.1	1		
Molybdenum (Mo)	0.0012	0.5	0.25	

[8] Source: "Handbook of the Ecologist-Expert". State Committee of the Republic of Uzbekistan on Nature Protection. State Environmental Expertise 2009. Tashkent.

Name of parameters	Fishery water use	Cultural and domestic water use.	Domestic Drinking water	Irrigation water use
Strontium (Sr2+)		2	7	
Selenium (Se)	0.001		0.01	
Rodanids	0.1			
Mercury (Hg)		0.005	0.0005	

Table 7: Relevant MPC according to SanPin RUz N 0255-08

Name of parameters	SanPiN RUz N 0255-08 (Criteria for hygienic assessment of surface water pollution levels in terms of public health danger)
pH	6,5-8,5
Turbidity, mg/dm^3	1.0
Dissolved oxygen	>4
Total suspended solid mg/dm^3	
Chlorides mg/dm^3	350
Sulphates mg/dm^3	500
Ferrum (Fe) mg/dm^3	-
COD, mgO_2/dm^3	30
BOD_{20}, mgO_2/dm^3	6

Table 8: Relevant MPC value according to O'zDSt 950-2011

Name of parameters	O'zDSt 950-2011 Drinking water. Hygiene requirements and quality control.
pH	6-9
Turbidity, mg/dm^3	1.5 mg/dm^3
Ammonia mg/dm^3	-
Chlorides mg/dm^3	250 mg/dm^3
Sulphates mg/dm^3	400 mg/dm^3
Arsenic (As) mg/dm^3	0.05 mg/ dm^3
Aluminum (Al) mg/dm^3	0.2 mg/dm^3
Cadmium (Cd) mg/dm^3	0.001 mg/dm^3
Copper (Cu) mg/dm^3	1 mg/dm^3
Mercury (Hg) mg/dm^3	0.0005 mg/dm^3
Nickel (Ni) mg/dm^3	0.1 mg/dm^3
Ferrum (Fe) mg/dm^3	0.3 mg/dm^3
Lead (Pb) mg/dm^3	0.03 mg/dm^3
Zinc (Zn) mg/dm^3	3 mg/dm^3
COD, mgO_2/dm^3	30 mgO_2/dm^3
BOD_{20}, mgO_2/dm^3	3 mgO_2/dm^3

Table 9: Dutch Standards for Soil and Groundwater Contamination (2013)

Parameters	Soil (mg/kg dry matter)		Groundwater (µg/l)	
	Target value*	Intervention value	Target value	Intervention value
Heavy Metals				
Arsenic	29	76	10	60
Barium	160	-	50	625
Cadmium	0.8	13	0.4	6
Chromium	100	-	1	30
Chromium III	-	180	-	-
Chromium IV	-	78	-	-
Cobalt	-	190	20	100
Copper	36	190	15	75
Lead	85	530	15	75
Mercury	0.3	36 (inorganic) 4 (organic)	0.05	0.3
Molybdenum	3	190	5	300
Nickel	35	100	15	75
Zinc	140	720	65	800
Aromatic Compounds				
Benzene	0.01	1.1	0.2	30
Ethyl benzene	0.03	110	4	150
Toluene	0.01	32	7	1000
Xylene (sum)	0.1	17	0.2	70
Styrene (vinyilbenzene)	0.3	86	6	300
Phenol	0.05	14	0.2	2000
Cresols (sum)	0.05	13	0.2	200
Chlorinated Hydrocarbons				
Volatile Hydrocarbons				
monochloroethene (vinyl chloride)	0.01	0.1	0.01	5

Parameters	Soil (mg/kg dry matter)		Groundwater (µg/l)	
	Target value*	Intervention value	Target value	Intervention value
dichloromethane	0.4	3.9	0.01	1,000
1,1-dichloroethane	0.02	15	7	900
1,2-dichloroethane	0.02	6.4	7	400
1,1-dichloroethene	0.1	0.3	0.01	10
1,2-dichloroethene (sum)	-	1	0.01	20
Dichloropropanes (sum)	-	2	0.8	80
Trichloromethane (chloroform)	0.02	5.6	6	400
1,1,1-trichloroethane	0.07	15	0.01	300
1,1,2-trichloroethane	0.4	10	0.01	130
Trichloroethene (Tri)	0.1	2.5	24	500
Tetrachloromethane (Tetra)	0.4	0.7	0.01	10
Tetrachloroethene (Per)	0.002	8.8	0.01	40
Chlorobenzenes				
Monochlorobenzene	-	15	7	180
Dichlorobenzenes (sum)	-	19	3	50
Trichlorobenzenes (sum)	-	11	0.01	10
Tetrachlorobenzenes (sum)	-	2.2	0.01	2.5
Pentachlorobenzene	-	6.7	0.003	1
Hexachlorobenzene	-	2.0	0.00009	0.5
Chlorophenols				
Monochlorophenols (sum)	-	5.4	0.3	100
Dichlorophenols (sum)	-	22	0.2	30
Trichlorophenols (sum)	-	22	0.03	10
Tetrachlorphenols (sum)	-	21	0.01	10
Pentachlorophenol	-	12	0.04	3

Source: Soil Remediation Circular 2013, (*Target values for soil refer to 2000 version as they are not present in the 2013)

Note: The soil values are calculated for a 'Standard Soil' with 10% organic matter and 25% clay. A case of environmental contamination is defined as 'serious' if >25 m³ soil or >100 m³ groundwater is contaminated above the intervention value. Where contaminants are found to exceed 'intervention' levels, this is considered to be a case of soil contamination, which is dangerous to the health of humans and the natural environment. Such a level of contamination should prompt a need for remediation, appropriate treatment and disposal.

Annex 1. Picture of the soil sampling

Annex 2. Results of the metals for water and soil

Содержание в ppm (mkg/g, g/t)

№	Lab №	Geolog №	Li	Be	B	Na *	Mg *	Al	P	K *	Ca *	Sc	Ti	V	Cr	Mn	Fe *	Co
Measurement range of the defined elements			0,2-1000	0,1-1000	2-1000			2-1000	80-10000			2-1000	2-1000	2-1000	2-1000	0,2-1000		0,1-1000
1	259a-1	W -1	21,0	<0,10	5,30	110000	26000	67,0	9,30	4900	180000	3,50	2,40	4,10	10,0	0,920	13,0	1,00
2	259a-2	W -2	19,0	<0,10	5,00	110000	25000	76,0	9,40	4700	170000	3,50	5,10	4,30	9,50	1,30	13,0	1,90
3	259a-3	W -3	18,0	<0,10	4,80	100000	23000	55,0	7,20	4500	160000	3,40	6,50	3,90	8,50	1,60	13,0	1,40
4	259a-4	W -4	18,0	<0,10	4,70	100000	23000	76,0	8,30	4500	160000	3,20	3,60	3,90	8,80	1,30	14,0	0,710
5	259a-5	W -5	17,0	<0,10	4,60	97000	22000	83,0	7,20	4300	160000	3,20	4,50	3,70	7,90	1,00	14,0	0,680
6	259a-6	W -6	140	<0,10	70,0	>***	120000	7,60	6,50	6500	480000	3,50	2,20	6,60	21,0	370	19,0	1,70

№	Lab №	Geolog №	Ni	Cu	Zn	Ga	As	Se	Br	Rb	Sr	Y	Zr	Nb	Mo	Ag	Cd	In
Measurement range of the defined elements			2-1000	2-1000	2-1000	0,2-1000	0,1-10000	5-10000	25-10000	0,1-1000	2-1000	0,1-1000	0,2-1000	0,1-1000	0,2-1000	0,1-1000	0,1-1000	0,1-1000
1	259a-1	W -1	4,70	2,50	0,720	2,40	2,90	6,60	150	2,20	1500	<0,10	0,230	<0,10	230	<0,10	0,380	<0,10
2	259a-2	W -2	4,70	3,10	0,550	2,20	3,00	6,40	140	2,20	1400	<0,10	<0,20	0,120	520	<0,10	0,740	<0,10
3	259a-3	W -3	4,50	2,60	0,630	2,10	2,70	6,00	150	2,10	1400	<0,10	0,220	<0,10	48,0	<0,10	0,100	<0,10
4	259a-4	W -4	4,30	2,70	0,590	2,10	2,70	5,80	140	2,20	1400	<0,10	0,200	<0,10	73,0	<0,10	0,100	<0,10
5	259a-5	W -5	4,30	2,30	0,550	2,00	2,40	4,70	130	2,10	1300	<0,10	<0,20	<0,10	84,0	<0,10	0,130	<0,10
6	259a-6	W -6	12,0	30,0	3,10	0,400	4,40	18,0	870	1,40	5200	<0,10	<0,20	<0,10	92,0	<0,10	0,200	<0,10

№	Lab №	Geolog №	Sn	Sb	Te	I	Cs	Ba	La	Ce	Pr	Nd	Sm	Eu	Gd	Tb	Dy	Ho
Measurement range of the defined elements			0,2-1000	0,1-1000	0,5-1000	0,05-1000	0,05-1000	0,2-1000	0,05-1000	0,05-1000	0,05-1000	0,05-1000	0,05-1000	0,05-1000	0,05-1000	0,05-1000	0,05-1000	0,05-1000
1	259a-1	W -1	<0,20	0,340	<0,50	7,50	0,190	22,0	<0,05	0,100	<0,05	<0,05	<0,05	0,071	<0,05	<0,05	<0,05	<0,05
2	259a-2	W -2	<0,20	0,280	<0,50	7,30	0,170	22,0	0,088	0,120	<0,05	0,410	<0,05	0,056	<0,05	<0,05	<0,05	<0,05
3	259a-3	W -3	<0,20	0,320	<0,50	7,20	0,073	22,0	<0,05	0,073	<0,05	<0,05	<0,05	0,060	<0,05	<0,05	<0,05	<0,05
4	259a-4	W -4	<0,20	0,280	<0,50	7,30	0,034	22,0	0,053	0,140	<0,05	<0,05	<0,05	0,061	<0,05	<0,05	<0,05	<0,05
5	259a-5	W -5	<0,20	0,310	<0,50	7,30	0,086	22,0	<0,05	0,160	<0,05	<0,05	<0,05	0,060	<0,05	<0,05	<0,05	<0,05
6	259a-6	W -6	<0,20	0,190	<0,50	220	0,054	3,90	<0,05	<0,05	<0,05	<0,05	<0,05	<0,05	<0,05	<0,05	<0,05	<0,05

№	Lab №	Geolog №	Er	Tm	Yb	Lu	Hf	Ta	W*	Re	Pt	Au	Hg *	Tl	Pb	Bi	Th	U
Measurement range of the defined elements			0,05-1000	0,05-1000	0,05-1000	0,05-1000	0,05-1000	0,05-1000	0,1-10000	0,05-1000	0,05-1000	0,05-1000		0,05-1000	0,2-1000	0,05-1000	0,05-1000	0,05-1000
1	259a-1	W -1	<0,05	<0,05	<0,05	<0,05	<0,05	<0,05	9,80	0,014	<0,05	0,100	<0,05	<0,05	0,085	<0,05	<0,05	4,30
2	259a-2	W -2	<0,05	<0,05	<0,05	<0,05	<0,05	<0,05	22,0	0,011	<0,05	<0,05	<0,05	<0,05	0,097	<0,05	<0,05	4,40
3	259a-3	W -3	<0,05	<0,05	<0,05	<0,05	<0,05	<0,05	1,90	0,014	<0,05	<0,05	<0,05	<0,05	0,071	<0,05	<0,05	4,30
4	259a-4	W -4	<0,05	<0,05	<0,05	<0,05	<0,05	<0,05	7,80	0,018	<0,05	0,680	<0,05	<0,05	0,082	<0,05	<0,05	4,40
5	259a-5	W -5	<0,05	<0,05	<0,05	<0,05	<0,05	<0,05	7,80	0,014	<0,05	0,110	<0,05	<0,05	0,100	<0,05	<0,05	4,50
6	259a-6	W -6	<0,05	<0,05	<0,05	<0,05	<0,05	<0,05	0,930	0,086	<0,05	0,053	<0,05	<0,05	0,110	<0,05	<0,05	12,0

Содержание в (ppm, mkg/g, g/t)

№	Lab №	Geolog №	Li	Be	B *	Na *	Mg *	Al *	P	K *	Ca *	Sc	Ti *	V	Cr	Mn	Fe *	Co
Measurement range of the defined elements			0,05-4000	0,05-4000	1,0-4000	0,004-11%	0,004-11%	0,002-20%	1,0-4000	0,008-30%	0,005-28%	0,10-4000	0,0006-9%	0,10-4000	1,0-4000	0,002-10%	0,006-30%	0,10-4000
1	259a-1	S-1	29,0	2,30	79,0	15000	11000	54000	480	20000	50000	6,70	1400	66,0	64,0	290	20000	5,50
2	259a-2	S-2	30,0	1,50	39,0	10000	11000	58000	400	20000	66000	8,20	1800	73,0	66,0	460	25000	8,40
3	259a-3	S-3	21,0	1,30	69,0	13000	10000	45000	370	17000	50000	5,60	1300	60,0	66,0	280	17000	4,90
4	259a-4	S-4	22,0	1,30	<14,00	9700	10000	44000	380	16000	59000	5,60	1400	61,0	64,0	360	21000	6,20

№	Lab №	Geolog №	Ni	Cu	Zn	Ga	As	Se	Rb	Sr	Y	Zr *	Nb	Mo	Ag	Cd	In*
Measurement range of the defined elements			1,0-4000	1,0-4000	1,0-4000	0,10-4000	0,10-4000	0,50-4000	0,10-4000	0,10-4000	0,10-4000		0,005-4000	0,10-4000	0,05-10,0	0,005-4000	
1	259a-1	S- 1	64,0	31,0	52,0	11,0	15,0	<0,50	77,0	190	9,30	33,0	4,80	3,50	0,230	0,056	0,034
2	259a-2	S- 2	75,0	58,0	120	11,0	28,0	<0,50	86,0	270	12,0	32,0	5,70	3,50	0,280	0,085	0,043
3	259a-3	S- 3	43,0	20,0	41,0	10,0	18,0	<0,50	74,0	280	10,0	34,0	4,60	3,10	0,230	0,036	0,037
4	259a-4	S- 4	100	46,0	99,0	9,80	18,0	<0,50	73,0	280	9,90	35,0	5,10	4,10	0,240	0,064	0,028

№	Lab №	Geolog №	Sn	Sb	Te	Cs	Ba	La	Ce	Pr	Nd	Sm	Eu	Gd	Tb	Dy	Ho
Measurement range of the defined elements			0,10-10	0,10-4000	0,30-4000	0,02-4000	0,10-4000	0,50-4000	0,04-4000	0,01-4000	0,01-4000	0,01-4000	0,01-4000	0,01-4000	0,01-4000	0,01-4000	0,01-4000
1	259a-1	S- 1	2,50	2,90	<0,30	3,10	640	17,0	33,0	4,20	15,0	3,00	0,710	2,50	0,300	1,70	0,340
2	259a-2	S- 2	2,60	1,80	<0,30	4,00	520	22,0	42,0	5,20	19,0	3,50	0,740	3,20	0,420	2,30	0,420
3	259a-3	S- 3	2,10	2,10	<0,30	2,80	580	17,0	33,0	4,20	15,0	2,70	0,640	2,40	0,360	1,80	0,340
4	259a-4	S- 4	2,10	1,80	<0,30	2,90	590	17,0	33,0	4,30	15,0	2,90	0,690	2,70	0,330	2,00	0,360

№	Lab №	Geolog №	Er	Tm	Yb	Lu	Hf	Ta	W*	Re	Pt*	Au *	Hg*	Tl	Pb	Bi	Th	U
Measurement range of the defined elements			0,01-4000	0,01-4000	0,01-4000	0,01-4000	0,05-4000	0,04-4000	0,08-4000	0,01-4000	0,05-4000	0,05-4000	0,03-4000	0,01-4000	0,1-4000	0,01-4000	0,01-4000	0,01-4000
1	259a-1	S -1	0,910	0,120	0,860	0,120	0,900	0,330	0,590	<0,01	<0,05	<0,05	<0,03	0,310	350	0,140	5,00	1,40
2	259a-2	S -2	1,10	0,170	1,10	0,170	0,970	0,460	1,80	<0,01	<0,05	<0,05	<0,03	0,350	94,0	0,180	7,10	1,80
3	259a-3	S -3	0,890	0,130	0,770	0,120	0,990	0,350	0,630	<0,01	<0,05	<0,05	<0,03	0,300	270	0,150	5,50	1,60
4	259a-4	S -4	0,960	0,150	0,890	0,150	0,990	0,430	4,30	<0,01	<0,05	<0,05	0,180	0,290	51,0	0,110	5,40	1,40

Technical appendix 6:
Fish Baseline Report

CONTEMPORARY DIVERSITY OF FISHES IN THE AMU-BUKHARA IRRIGATIONAL SYSTEM

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Freshwater fishes are an important component of aquatic ecosystems and play a crucial role in maintaining the ecological balance. They provide various ecosystem services such as nutrient cycling, food web dynamics, and water quality regulation. However, the conservation of freshwater fishes has become a major concern due to various anthropogenic activities such as overfishing, habitat degradation, pollution, and climate change. The loss of freshwater fish species can have cascading effects on the entire ecosystem, leading to the collapse of fisheries, loss of biodiversity, and reduction in ecosystem services. Therefore, it is essential to implement effective conservation strategies to ensure the long-term survival of freshwater fishes and maintain healthy aquatic ecosystems [7].

Uzbekistan is doubly land-locked country and fish diversity is very poor, exciding more than 70 fish species [5,9] and one of the main river is that Amu Darya River pumps water to the Amu-Bukhara irrigational system (ABIS canal) from middle reach. The ABIS canal is located on the right bank of Amu Darya River, has a command area of 315,000 ha, length of channel is 400 km, it provides water to Bukhara and Navoi region for agricultural purposes. After construction of the ABIS, Zaravshan River has connected to the Amu Darya River directly. Fish diversity of the ABIS is not well studied, it comprises both from Amu Darya and Zaravshan Rivers [1].

It is expected that ABIS canal is home to 32 fish species belonging to 14 families, 7 orders (Table 1). Their IUCN status are following: 2 (CR); 2 (EN); 2 (VU); 20 (LC); 1 (DD), 4 species not assessed and 1 species taxonomic status is unclear. Seven fishes are listed in the Red book of Uzbekistan such as, *Aspiolucius esocinus* (EN); *Ballerus sapa*, *Capoetobrama kuschakewitschi*, *Luciobarbus conocephalus* (VU); *Pseudoscaphirhynchus hermanni*, *P. kaufmanni* (CR); *Sabanejewia aurata* (NT). At present, there is no recordings of *A. esocinus*, *B. sapa* and *P. hermanni* from the ABIS canal [2,4,8].

Currently, Big Amu-Darya Shovelnose sturgeon *Pseudoscaphirhynchus kaufmanni* (Kessler, 1877) is distributed in the Amu Darya and Vakhsh Rivers. Official information of the State Ecological Committee of Uzbekistan confirms the presence of the *P. kaufmmani* in the ABIS canal. In April 2020, twenty-four (24) individuals were released to the ABIS in Alat region, Bukhara from poachers (Figure 1) [3].

Table 1

An annotated checklist of fishes of the Amu-Bukhara Irrigational Canal

Order	Family	Species	IUCN status	Status in Redbook of Uzb
Acipenseriformes	Acipenseridae	*Pseudoscaphirhynchus hermanni* (Kessler, 1877)	CR	CR
		Pseudoscaphirhynchus kaufmanni (Kessler, 1877)	CR	CR
Cypriniformes	Cobitidae	*Sabanejewia aurata* (De Filippi, 1863)	LC	NT
	Nemacheilidae	*Dzihunia amudarjensis* (Rass, 1929)	LC	Not assessed
		Paracobitis longicauda (Kessler, 1872)	Not assessed	Not assessed
	Cyprinidae	*Carassius gibelio* (Bloch, 1782)	Not assessed	Not assessed
		Capoeta capoeta (Güldenstädt 1773)	LC	Not assessed
		Cyprinus carpio Linnaeus, 1758	VU	Not assessed
		Luciobarbus conocephalus (Kessler 1872)	VU	VU
	Xenocyprididae	*Ctenopharyngodon idella* (Valenciennes, 1844)	LC	Not assessed
		Hemiculter leucisculus (Basilewskiy, 1855)	LC	Not assessed
		Parabramis pekinensis (Basilewsky, 1855)	LC	Not assessed
	Acheilognathidae	*Rhodeus ocellatus* (Kner, 1866)	DD	Not assessed
	Gobionidae	*Abbottina rivularis* (Basilewskiy, 1855)	LC	Not assessed
		Pseudorasbora parva (Temminck & Schlegel, 1846)	LC	Not assessed
	Leuciscidae	*Abramis brama* (Linnaeus, 1758)	LC	Not assessed
		Alburnoides holciki Coad & Bogutskaya, 2012	Not assessed	Not assessed
		*Alburnus chalcoide*s (Güldenstädt, 1772)	LC	Not assessed
		Aspiolucius esocinus (Kessler, 1874)	EN	EN
		Ballerus sapa (Pallas, 1814)	LC	VU
		Capoetobrama kuschakewitschi (Kessler, 1872)	EN	VU
		Leuciscus aspius (Linnaeus, 1758)	LC	Not assessed
		Leuciscus lehmanni Brandt 1852	LC	Not assessed
		Pelecus cultratus (Linnaeus, 1758)	LC	Not assessed
		Rutilus lacustris (Pallas, 1814)	Not assessed	Not assessed
		Scardinius erythrophthalmus (Linnaeus, 1758)	LC	Not assessed
Siluriformes	Siluridae	*Silurus glanis* Linnaeus, 1758	LC	Not assessed
Gobiiformes	Gobiidae	*Rhinogobius sp*	Unknown	Not assessed
	Odontobutidae	*Micropercops cinctus* (Dabry de Thiersant 1872)	LC	Not assessed
Anabantiformes	Channidae	*Channa argus* (Cantor 1842)	LC	Not assessed
Cyprinodontiformes	Poeciliidae	*Gambusia holbrooki* Girard 1859	LC	Not assessed
Perciformes	Percidae	*Sander lucioperca* (Linnaeus 1758)	LC	Not assessed
7 orders	**14 families**	**32 species**		

Note: Contemporary status of fishes are given by ECoF (Eschmeyer's Catalog of Fishes) [6].

Figure 1. Dwarf form of the Big Amu Darya Shovelnose sturgeon, Alat, Bukhara. Amu-Bukhara irrigational canal, April 21, 2020. https://t.me/ecogovuz/2862

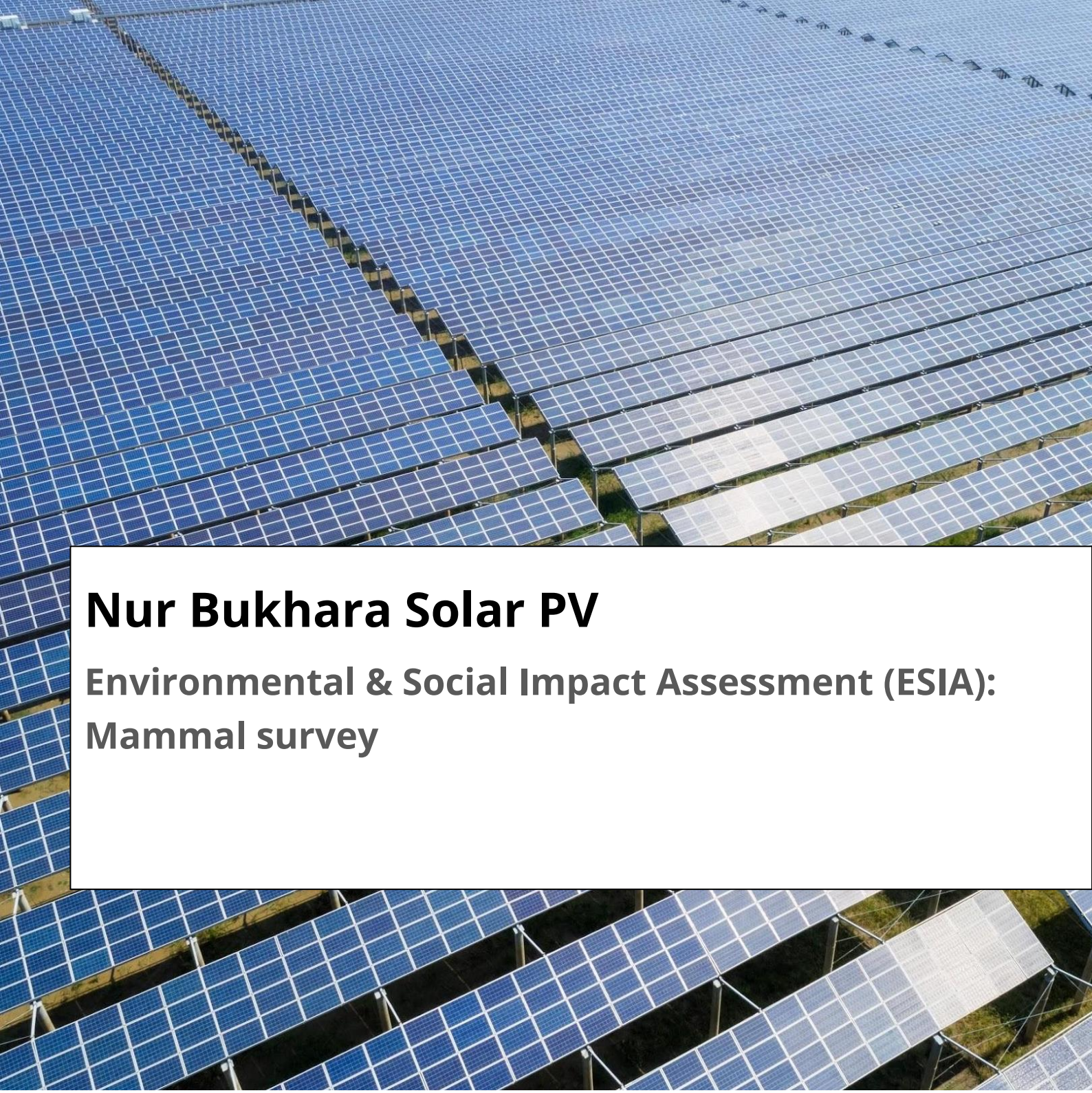
Conclusion. Freshwater fishes are one of the most diverse groups of vertebrates, but are also amongst the most threatened. The Amu-Bukhara irrigational canal has diversity of threatened and endemic fishes like, *Pseudoscaphirhynchus kaufmanni* and etc.

Inappropriate construction of water pumps and dams without fish path and other specific constructions are limiting migration of fishes between the ABIS and the Amu Darya, Zeravshan Rivers.

References

1. Abdimominov T.A., Muhammadova S.Yo. Amu-Buxoro va Amu-Qorakoʻl kanallari suvlaridan Buxoro viloyatida samarali foydalanish istiqbollari. Экономика и социум. 2022 (№12,103-1), 9-13b.
2. Oʻzbekiston Respublikasining Qizil kitobi, II jild: Hayvonlar; J.A. Azimovning umumiy tahriri ostida. Toshkent: «Chinor ENK» ekologik-noshirlik kompaniyasi, 2019, –374b.
3. Oʻzbekiston Respublikasi Tabiat resurslari vazirligining rasmiy telegram kanali: https://t.me/ecogovuz/2862
4. Мирабдуллаев И.М., Муллабаев Н.Р. Ихтиофауна Узбекистана: таксономический состав и современное состояние // Узбекский биологический журнал, – 2020 (№5), С43-49.
5. Мирабдуллаев И.М., Кузметов А.Р., Қурбонов А.Р. Ўзбекистон балиқлари хилма-хиллиги. – Тошкент: “Classic” нашриёти. 2020, – 115б.
6. Fricke R., Eschmeyer W.N., Fong, J.D. Eschmeyer’s Catalog of Fishes: Genera/SpeciesbyFamily/Subfamily.https://researcharchive.calacademy.org/research/ichthyology/catalog/SpeciesByFamily.asp
7. Lost fishes, who is counting? The extent of the threat to freshwater fish biodiversity William R. T. Darwall and Jörg Freyhof.
8. The IUCN Red List of Threatened Scpecies - https://www.iucnredlist.org/
9. Sheraliev B., Peng Z. 2021. Molecular diversity of Uzbekistan’s fishes assessed with DNA barcoding. Scientific Reports, Vol. 11(1), 16894.

Technical appendix 7:
Mammal Survey Report



Nur Bukhara Solar PV

Environmental & Social Impact Assessment (ESIA): Mammal survey

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Client	Masdar
Juru's Project Manager	Nicola Davies
Juru's Project Director	Jushkinbek Ismailov

Document Control

Version	Date	Description	Author	Reviewer	Approver
1	26/05/2023	Final Draft	Mariya Gritsina	Caleb Gordon	Nicola Davies

Disclaimer

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1 Introduction

Each project area has a typical species composition. However, some of the species are rare, included in the IUCN Red list, Red data book of Uzbekistan and conventions applications. When the presence of rare species is confirmed in the territory, it is necessary to apply measures to mitigate the impact on them during and after construction works. In this case, after literature review, it was determined that three rare species can potentially inhabit the territory:

- **Central Asian Otter** which is included in the Red Data Book of the Republic of Uzbekistan (2019) with the status 1(EN) and IUCN Red List with NT status. Otter occurs along the Amu Darya River, through the ABIS canal spread into the lakes of the breeding center "Jeyran" and Dengizkul Lake. There is also evidence of an otter sighting in Karakul, located on another branch of the ABIS canal (39°30'15.24"N N63°51'31.65"E) (Soldatov and Ten, 2016). This site is located downstream of the project area. In 2021, an otter was found along the South Karakalpak collector, which starts in the Amu Darya River in the Turtkul oasis and flows into the Karazheneldy reservoir (Takhtakupyr district) (Marmazinskaya et al., 2021). It is obvious that due to an otter there is an active development of water sources in the Kyzylkum desert. Thus, the presence of an otter in the ABIS canals near the project area is quite realistic.
- **Caracal** *Caracal caracal* (Schreber, 1776) is listed in the Red Book of Uzbekistan (2019) with the status 1(CR). Traces and presence of caracal recorded near Dengizkul Lake and adjacent desert in 15-20 km from project site (Gritsina, 2012; Gritsina et al., 2016). This desert area is located close to the project area.
- **Goitered Gazelle** *Gazella subgutturosa* (Güldenstädt, 1780) included in the Red Book of Uzbekistan (2019) with status 2 (VU:D) and in the IUCN Red List as VU. Goitered Gazelle included in the list of the Convention on Migratory Species (CMS) as it is a transboundary species. The southwestern Kyzylkum population includes the Amu Darya area (Kyzylrabad, Uchkyr, Parsankul, Akkum, Dayatkhatyn), Kimerekkum sands (Karakul GLOH, Alata district), Sundukli sands (Khoja-Davlet, Dengizkul, Sechankul) (Marmazinskaya, 2012; Marmazinskaya, Gritsina, 2017). The closest areas to the project area are the following: the Sundukli massif - the main concentration of goitered gazelle is confined to the vicinity of the Dengizkul reservoir (Soldatova, Salimov, 1997; Mitropolsky et al., 2007; The most important ornithological territories of Uzbekistan, 2008).

The task of the field trip was to check whether the habitat conditions in the project area correspond to the needs of these species, and to assess the possibility of the presence/absence of these species on the territory.

2 Geographical features of the study area

The project area is located in the Alat district of the Bukhara region, close to the Alat city in the southwestern Kyzylkum desert (Figure 1). The peculiarity of the project area is its encirclement by the Amu-Bukhara Irrigation System (ABIS canal) from the northern, eastern and southern parts. Small drainage channel with 2 ponds are located one kilometer to the west of the site. The ABIS canal was built in the 1970s, originates on the right bank of the Amu Darya and runs 400 km along the southwestern Kyzylkum. At the northwestern end is the Hamza I pumping station and at the southwestern end is the Hamza II pumping station.

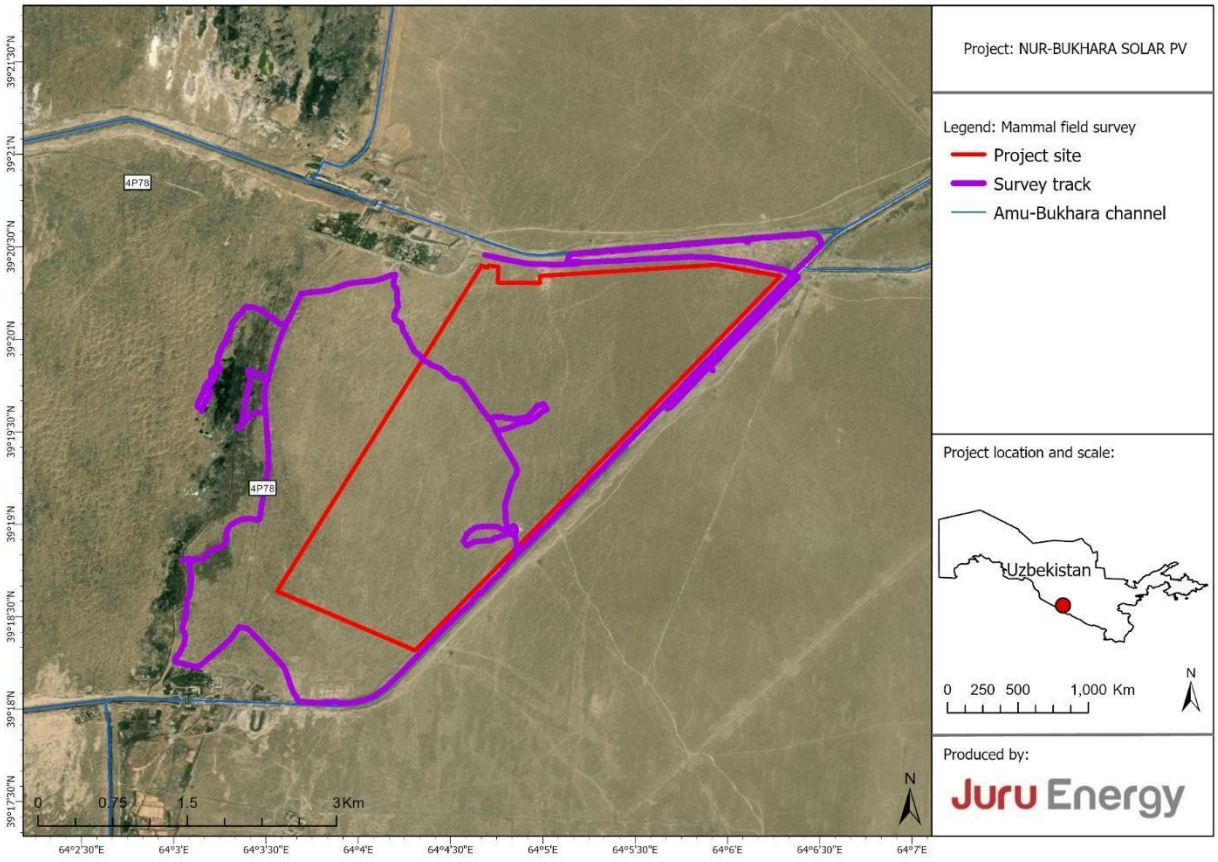


Figure 1: Mammal field survey

Habitats of mammals are represented by the following biotopes: ABIS canal with open water, trees and shrubs (Figure 2), plant-filled drainage channel on the western side of the area (Figure 3), lake (Figure 4), small ponds from the west side of the area covered by shrubs which are a good shelter for mammals and a permanent accessible watering place (Figure 5), semi-fixed sands (Figure 6), hilly semi-fixed sands (Figure 7) and ruderal territories (Figure 8).

Figure 2: ABIS canal with open water, trees and shrubs

Figure 3: Plant-filled drainage channel on the western side of the Project area

Figure 4: Pond on the western side of the Project area (1km)

Figure 5: Drainage area from the west side of the Project area covered by shrubs

Figure 6: Semi-fixed sands

Figure 7: Hilly semi-fixed sands

Figure 8: Excavated soil

3 Materials and methods

Research methods were divided into two phases: preparatory work before leaving the field was the analysis of detailed topographic maps of the area (scale: 1:100 000, 1:200 000) and satellite images of Google Earth. The maps were used to determine locations (GPS coordinates) of observations of the area and for walking transects. The data were then transferred to the LocusPro smartphone program for further use in the field.

Field works, the following approaches were used to conduct zoological work:

Car Route Transects (CRT). The main part of observations was made during walking transects, nevertheless all movements by car have also been recorded. The length of the vehicle transect was recorded using LocusPro. In case of mammal records, coordinates of the place of registration, time and species of the animal were recorded.

Walking transects (WT), were carried out in in pre-planned areas and during the search for places to install camera traps. The main task was to survey the section of ABIS canal 6.5 km long from eastern and western parts and 3 km cdrainage canal to the west. The length of the route along the drainage canal and ponds was 3 km. The length of the route in the desert area was 4 km. The length of the transect was determined using LocusPro. Start and end time of the transect, the biotope, the presence/absence and the type of anthropogenic impact were recorded. During the transect surveys, the data obtained was entered into a field journal. In addition, animals and traces of their life activities were photographed (if possible). Binocular was used to survey the area during the transect walkover and at all points where stops were made.

Equipment. A smartphone (BV9900E) with the LocusPro program, Google Hybrid and Marshruty.ru map underlays were used for terrain orientation and track recording. Nikon Aculon 10x42 binocular was used for terrain observation. Photography was done using a smartphone (BV9900E) and a Nikon D7200 SLR camera with a Nikkor 500 mm lens

All the information obtained was recorded in a notebook, and the locations of mammal surveys were mapped in the LocusPro smartphone application.

4 Results

4.1 Central Asian Otter

The potential biotope is represented by ABIS canals , which were carefully surveyed and evaluated in terms of habitat suitability for otters.

The shoreline of the eastern section of the ABIS canal is covered by a narrow strip (1-3 m) of riparian vegetation. Along 3.6 km, the banks of the canal are precipitous, which does not allow otters to come ashore (Figure 9). There are no shoals, islands, or large rocks necessary for the otter's existence. There were only three points along the ABIS canals where the shoreline was approaching the water: slanting trees (2) (Figure 10) and a low bank about 1 m long (Figure 11). On careful inspection of these sites, traces of otter activity were not found.

Figure 9: The steep banks of the ABIS canal

Figure 10: Tilted trees suitable for going to the shore

For 2.32 km, there is almost no vegetation along the canal banks up to the Khamza-2 pump station (Figure 12). There are only infrequent stands of tamarisk (Támarix) and *Erianthus sp.* bushes. On the right side of the canal the bank is clayey and goes straight down to the water for 1.8 km, on the left side it continues to be precipitous and only about 500-700 meters are at water level (Figure 13). Despite the presence of places accessible to exit the water, these are completely open areas with minimal shelters like sparse bushes, but the area is suitable for digging burrows. Shelters, for example hollows between stones are absent.

Figure 11: A shore low down to the water

Figure 12: Bald banks of the ABIS canal looking west

Figure 13: The flat bank of the ABIS canal

All of the above-mentioned sites were carefully inspected, but no traces of otters were found. It is worth noting that in the habitats of the species it is quite easy to find traces on the clay, food remnants, marking sites, "canteens".

The drainage channel and ponds located on the western part of the project area is densely overgrown with grassy vegetation, the ponds are shallow and dry, which makes this area unsuitable for otter habitat.

Two shepherds were interviewed and one of them saw a large animal come out to the bank of the canal and then dive back into the water. However, it could be an otter as well as a muskrat (*Ondatra zibethicus*) or nutria (*Myocastor coypus*). Both of these species also use ABIS canal for their habitat . It is worth noting that traces of their presence have also not been found. Employees of the pumping station did not observe an otter.

The canal seems to be a popular place for fishing and recreation, at least ten campfires were counted along the bank, scatter garbage. In some places there is illegal cutting of T uranga (*Populus sp.*) (Figure 14-16).

Thus, the ABIS canal in the project area is definitely not a permanent habitat for otters due to the lack of proper living conditions, but it is more likely to be a transit site for individuals, which spread through the waterways of the Kyzylkum desert.

Figure 14: Campfire site on the bank

Figure 15: Garbage on the bank of the canal

Figure 16: A felled tree of a turanga

4.2 Caracal

For caracal the team surveyed the watering area (drainage channel and ponds) and the sandy area. At the watering area, the places of reaching to the water were surveyed and clay areas where traces may be imprinted. Walking transects were laid in the sandy area, areas that stood out in the terrain — stones, iron structures (Figure 17-Figure 19), and areas where there are remnants of mining. Such areas usually attract mammalian predators, including the caracal to mark the area or make shelters.

Traces of caracal presence in the territory were not found. However, given that the biotope is suitable; there is a food base — great gerbil (*Rhombomys opimus)*, Long-clawed g round s quirrel (*Spermophilopsis leptodactylus*), tolai hare (*Lepus tolai*), etc. It is not possible to completely exclude the presence of the caracal.

Figure 17: Freestanding stone

Figure 18: Iron structures

Figure 19: Old mining area

4.3 Goitered Gazelle

The drainage channel and ponds to the west and the sandy desert on the project area were surveyed. A track of a single individual of Goitered gazelle was found on the western side of the drainage channel. It is reasonable to assume that gazelles use this area as a watering place. This is also confirmed by interview data from a shepherd who is permanently in the project area. The shepherd is sure that there are no gazelles in the sandy area, but small groups come to the drainage channel for watering, especially in hot season.

Gazelles may occasionally enter a sandy area crossing a low-traffic road, but a ABIS canal located behind a sandy part of the project area with steep banks could not be watering place, and the area

where the banks are flat is completely without shelters, and with a high disturbance factor. Tracks on the sandy area were not found.

Thus, the sandy area may be an occasional habitat where gazelles are only temporarily present and is not a breeding site. The main gazelle habitat is on the other side of the drainage channel to the west of the project area.

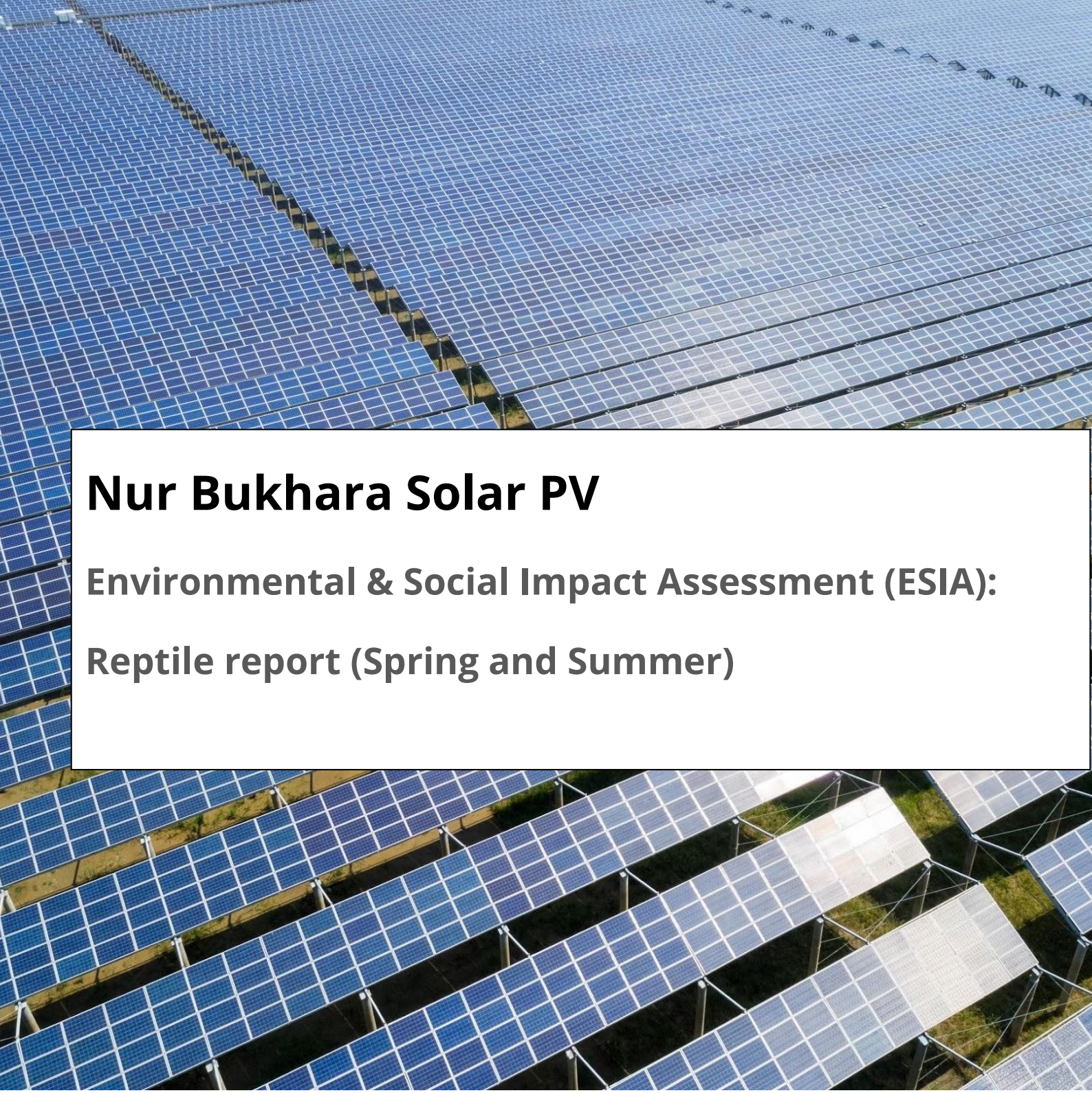
Figure 20: Goitered Gazelle track

Figure 21: Potential watering place of goitered gazelle

4.4 Summary

Thus, given the proximity of pump substations, human settlements, permanent grazing in the project area, the level of disturbance is quite high, but there is a connection of the territory with the adjacent desert, which makes the temporary presence of gazelles possible. There is also a low probability of the presence of caracal. The ABIS canal is most likely a transit zone for otters.

Technical appendix 8:
Reptile Baseline Report



Nur Bukhara Solar PV

Environmental & Social Impact Assessment (ESIA):

Reptile report (Spring and Summer)

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1 Introduction

Uzbekistan is located in the central part of Central Asia and borders on four Central Asian countries — Kazakhstan, Kyrgyzstan, Tajikistan and Turkmenistan, as well as Afghanistan in the south. Its geographical location at the junction of a number of biogeographic regions determines the age, diversity, origin and complex genetic relationships between the regional flora and fauna. The gene pool of wild animals inhabiting the territory of Uzbekistan is unique. The country is an important habitat for endemic species and subspecies of Central Asian animals. Most of it is represented by native fauna (Yunusov et al., 2015).

This report presents a faunistic overview of the territory projected for the construction of the Nur Bukhara Solar photovoltaic (PV) Project with a capacity of 250 MWA and 63 MW/126 MWh Battery Energy Storage System (“Project") in the vicinity of the Alat town, Bukhara region. At this stage, an overview of the fauna is provided, based on the literary, departmental and personal data of the authors of the report.

2 Physiographical description of the studied area

The project area for the construction of a solar power plant, located in the vicinity of the city of Alat, Bukhara region, is located within the Nizhnezarafshan physical-geographical district[1]. The border point with the Republic of Turkmenistan is located 30 kilometers to the southwest. The southern location of the project area and the large number of canals in the vicinity determine the climate and fauna on it.

[1] This is the zoogeographical district as opposed to the administrative district.

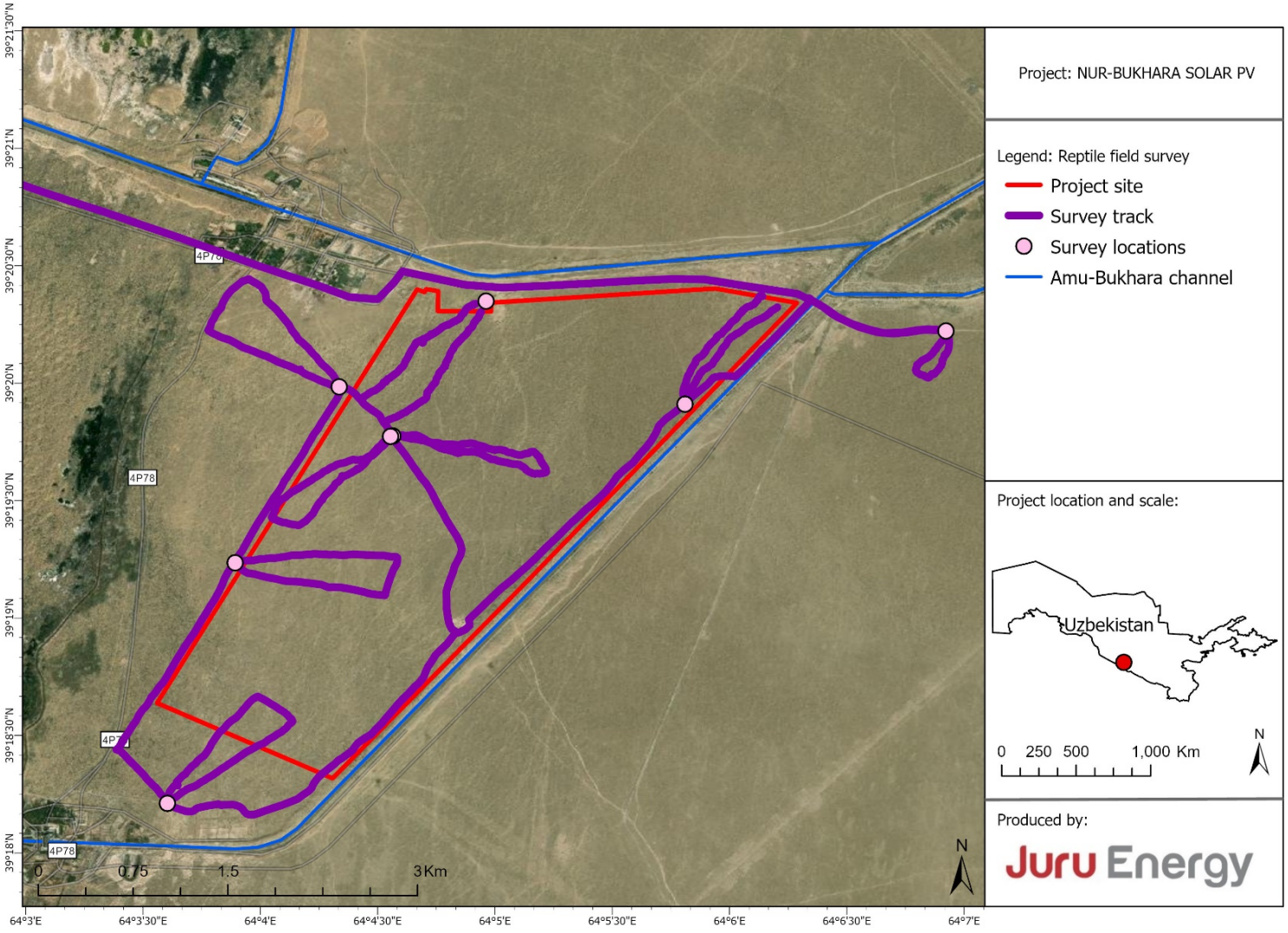

Figure 1: Reptile field survey

The Nizhnezarafshan district is located in the lower reaches of the Zarafshan River, including the Bukhara and Karakul oases. The district in the northeast is separated from the Srednezarafshan by a narrow Khazar gorge, 8-10 km wide. The district is bordered in the north and west with the Kyzylkum district, in the south-west along the Sundukli sands — with Turkmenistan, in the east — with the Kashkadarya district (Gulomov et al., 2013).

Geological structure, minerals, landscape of the Nizhnezarafshan district occupies a tectonic depression, the foundation of which is composed of Paleozoic limestone shales, overlapped from above by sedimentary deposits of the Mesozoic and Cenozoic ages. The sediments of the Jurassic and Cretaceous periods of the Mesozoic era (limestone, dolomite, etc.) come to the surface on the uplands of the eastern part of the district.

The most widespread rocks in the Nizhnezarafshan district — gravel, sand, sandy loam, loess — belong to the Anthropogenic period and are associated by their origin with the activity of the Zarafshan River, temporary streams, lakes and winds.

The division of the river into separate channels and periodic earthquakes on the territory of the Nizhnezarafshan district are associated with the latest tectonic movements. Until recently, the Nizhnezarafshan district was considered a seismically calm territory. However, the earthquakes in Bukhara in 1821-1822 with a force of 8 points and in Gazli in 1976 and 1984 with a force of 8-9 points are the basis for the inclusion of the Nizhnezarafshan district in a number of seismic regions of Uzbekistan (Gulomov et al., 2013).

The Bukhara oasis, lowering and narrowing to the southwest, abuts against the Karakul plateau. Having passed the gorge of the Karakul plateau, the river forms the second delta — the Karakul delta, which is also occupied by the Karakul oasis. The Karakul oasis in the southeast is bordered by the Sundukli sands, and in the south by the Eshakchi sands.

The length of the Karakul oasis is about 100 km, and the width is 50 km. The surface is flat, barely noticeably lowering to the southwest, towards the Amu Darya. The absolute height of the oasis in the north-east is 200 m, in the south-west is 180 m, at the border with the Amu Darya valley it is 178 m (Gulomov et al., 2013). The Karakul oasis differs from the Bukhara oasis by the presence of salt marshes, salt depressions, numerous salt lakes and sandy massifs in the vicinity.

The climate of the Nizhnezarafshan district is characterized by short and non-severe winters, dry, sunny and very hot summers. Due to the fact that cold dry winds from the north penetrate the territory of the district in winter, average January temperatures throughout its territory are below 0°C. Despite the fact that humid air masses from the west enter the Nizhnezarafshan district in summer, due to very high air temperatures, precipitation almost does not fall during this period of the year.

In the Nizhnezarafshan district, the average annual air temperature is + 14.2° ... + 15°C, and the average July temperature is + 28° ... + 29.6°C. In some years, when the Siberian anticyclone penetrates into the district, the air temperature in winter can drop to -20° ... -25°C. In summer, the maximum air temperature reaches + 44° ... + 45°C (Gulomov et al., 2013). The frost-free period in Nizhnezarafshan district lasts 204-214 days, the sum of positive temperatures for the growing season is 5000°C.

Precipitation in the Nizhnezarafshan district is unevenly distributed over seasons and across the territory. In the Bukhara and Karakul oases, the average annual precipitation is 100-200 mm. If we take the annual amount of precipitation in the district as 100, 44-48% of it falls in spring, 36-44% — in winter and only 2-3% — in summer. Most precipitation falls in March-April, and the least of it — in July-August. Snow falls within the district every year, but does not last long (5-10 days). The thickness of the snow cover usually does not exceed 5 cm (Gulomov et al., 2013).

3 History of the study of the region

The history of the study of reptiles inhabiting the territory of Uzbekistan, as was the case with other vertebrates in Central Asia, began with the trip of E. A. Eversmann and K. Pander from Orenburg to Bukhara (October 1820-April 1821). The few and occasional collections of E. A. Eversmann, transferred to the University of Berlin, were processed by Prof. G. Lichtenstein and published in 1823 as an annex to the work of E. A. Eversmann (Bogdanov, 1960). Prof. G. Liechtenstein lists 18 species of reptiles (including 5 new ones) and 2 species of amphibians. In another work, G. Lichtenstein (1823) mentions 6 species of lizards and 2 species of snakes.

A. Lehmann in July 1841 crossed the Kuvan-Darya, crossed the Kyzylkum desert, visited Samarkand, then Bukhara, from where he traveled to the mountains to Iskanderkul and in early April went to Orenburg. The most interesting collections by A. Lehmann were mentioned by I.F. Brandt (1852), A.M. Nikolskii (1899a, 1905a, 1915, 1916, 1918). The latter indicates 2 species of amphibians and 22 species of reptiles.

G. Ye. Grum-Grzhimailo traveled across Uzbekistan with his expedition in 1885 (see Fauna of the Uzbek SSR, vol. 2). His collections were processed by A. M. Nikolsky.

In 1936, S.K. Dal on the basis of observations carried out from 14 to 31 October 1935 in the vicinity of st. Khoja-Davlet, in the nearby village of Arap-khona and near Lake Sungur and Karanga (15-20 km east of the Khoja-Davlet railway station), published an article “Vertebrates of the Zeravshan River”. It mentions Turan toad, Steppe agama, Sunwatcher toad-headed agama, Rapid racerunner, Reticulate racerunner, Desert sand boa, and Sand racer. Then S. K. Dahl (1937) notes Russian tortoise, 2 species of geckos, Steppe agama, 2 species of toad-headed agamas, 3 species of racerunners, Desert lidless skink, 2 species of sand boas, Sand racer, Spotted desert racer. He also (1939) mentions Reticulate racerunner and Dice snake.

M.V. Kaluzhina in 1951 published the work "Morphology and biology of the order of lizards of the Zeravshan Valley". For 10 years, M.V. Kaluzhina has participated in many expeditions, excursions and short-term trips at different times of the year, including to the areas of the current project area.

O. P. Bogdanov in his work “Fauna of the Uzbek SSR. Amphibians and reptiles” (1960) provides data that he collected in southern part of Bukhara region in 1949, 1950, 1954 and 1955.

N. N. Shcherbak (1974) studied racerunners (genus *Eremias*) throughout their habitat, including southern part of Bukhara region.

The publication of D. A. Bondarenko and E. A. Peregontsev (2017) describes the spatial distribution of the Russian tortoise *Testudo horsfieldii* in Uzbekistan, including southern part of Bukhara region. Also, this report presents the author's personal data collected during field studies of the area in 2010, 2017, 2018 and 2021.

The list of reptiles is given according to the latest updated reptile database (http://www.reptile-database.org/data/Reptile_checklist_2019_07.xlsx).

4 Results

The basis for compiling a list of herpetofauna of the studied area in the vicinity of the Alat town, Bukhara region, was the modern list of amphibian fauna of Uzbekistan, consisting of five species from one family and the list of reptile species of Uzbekistan, consisting of 62 species from 13 families.

It should be noted that the lists of these species are preliminary and based on the available literary and official data and, partially, on the author's personal field observations. To reconstruct the existing situation, it is necessary to conduct focal field studies in the period of the highest reptile activity (April-May) and, based on the results, compile complete lists of species and obtain comprehensive information on population statuses and reptile numbers for each of the affected areas.

5 Annotated list of reptiles inhabiting the project area

5.1 Class Amphibia. Family Bufonidae. Turan toad. *Bufotes turanensis* (Hemmer, Schmidtler & Böhme, 1978)

Figure 2: Turan toad. Photo by T. V. Abduraupov

The length of the body with the head is up to 140 mm. The upper side is light grey-olive or greyish-green with or without black spots. The male has an internal resonator under the skin of the throat. During the mating season, the male has black calluses on the first two or three toes of the forepaws. The inner edge of the tarsus has a longitudinal skin fold. The pupil is horizontal. The toes of the hind

paws are partly interconnected with the help of the swimming membrane. The parotid glands (parotids) are well developed behind the eyes. The caviar has the form of cords.

This is an economically important species, which destroy harmful insects in huge numbers. Local people sometimes catch it to use in traditional medicine. In February and March toads have a diurnal lifestyle. At this time, they bask in the sun or mate and spawn in irrigation canals, puddles and swamps. They then switch to a nocturnal lifestyle, which lasts until late autumn. In the flatland part of the range most toads begin to hibernate in late October or early November and often appear on the surface of the earth only in mid-February, but most of them finish hibernating in early March. The Turan toad is most active during the spawning period, which begins in late February and lasts until late May. Animal burrows and various cavities in the ground are used as wintering places.

Habitats are highly diverse. The Turan toad occurs in river valleys, on the plains, in the foothills, in various agricultural fields, vegetable gardens, in human settlements and deserts with any types of sources of water, even seasonal ones, available. They hide in the burrows of various rodents and cracks in the ground.

Economically significant species. It eats harmful insects in huge quantities. Occasionally gathers by the local population for the preparation of traditional medicine. S.K. Dal (1936) noted it 7 km to the east of the Khoja-Davlet railway station and in the eastern corner of Lake Sungur (15 km from the railway station).

This species was recorded by Abduraupov T.V. near the Alat town in 2018.

5.2 Class Reptilia. Family Gekkonidae. Comb-toed gecko. *Crossobamon eversmanni* (Wiegmann, 1834)

Figure 3: Comb-toed gecko. Photo by T. V. Abduraupov

A medium-sized gecko, body length is up to 60 mm and tail length is up to 80 mm. The body and large head are somewhat flattened. Thin, prehensile and unbreakable tail is covered with uniform scales. The fingers gradually become thinner towards their distal parts, and their lower surface is

covered with one row of transversely widened, slightly ribbed or serrate plates along the free edge of the plates, equipped on the sides with fringes of long conical scales. The color of the upper side of the body is sandy pinkish. The underside of the body is white. In juveniles, the limbs and the lower surface of the tail are light lemon or orange-lemon color.

Comb-toed Gecko is a typical psammophile that lives on fixed and semi-fixed sands with sparse vegetation (saxaul, calligonum, sandy acacia, selin, etc.), less often it occurs on the slopes and at the base of the dunes, avoiding their bare tops. Usually, these lizards do not live on clay and compacted soils, but occasionally they are found on small takyrs between sandy ridges. This species is characterized by a twilight-nocturnal lifestyle. On the surface in spring, lizards appear in mid-March, are active until the second half of October.

They dig their own burrows with a length of 70-110 cm as shelters, sometimes they use minks of large beetles. Comb-toed gecko is able to jump from branch to branch, using a tenacious long, flexible and unbreakable tail. Sexual maturity occurs the next year after hatching. Mating was noted in mid-April; this process in different individuals continues until early June. During the mating season, lizards actively use sound communications (weak squeak). The period of oviposition (1-2 per clutch) is extended, lasts about two months (from late May to late July).

Economically significant species. The state of the species on the territory of the Republic of Uzbekistan does not cause concern. M.V. Kaluzhina (1951) found this species near the railway stations Alat, Khoja-Davlet, Kagan and near Bukhara. S. K. Dal (1937) — in the sands of Uchkum east of Kagan, and S. F. Tsarevsky found it in the vicinity of the Karakul railway station. Comb-toed gecko was recorded by Abduraupov T.V. near Dengizkul Lake, as well as in the Kuvachi-Alat area in April 2018.

5.3 Common wonder gecko. *Teratoscincus scincus* (Schlegel, 1858)

Figure 4: Common wonder gecko. Photo by T. V. Abduraupov

Quite large geckos, body length up to 116 mm. The ratio of body length to tail length varies from 0.15 to 2.13. A large, broad and tall head with a blunt muzzle and very large protruding eyes that glow with a bright red light in the dark, which is usually used for night observations. The covers of the body and tail are very delicate and easily damaged when touched. The tail is relatively short, fleshy, brittle. It is also characterized by easily damaged integuments, which are also capable of subsequently regenerating. The upper side of the body is sulphurous-yellowish or pale greenish; with a complex pattern of brown or dark brown stripes and spots. On the sides there is a rusty-red color, a dark longitudinal stripe, below it the sides acquire a lilac-smoky shade. The underside of the body is white with a lemon-yellow bloom on the throat. Like the Comb-toed Gecko, it is a psammophile and lives on similar surfaces. Occasionally, it was noted on dense soils adjacent to sands, on plakors and takyrs.

The activity is strictly nighttime regardless of the season. The first active individuals were found in the middle of March in the southern Kyzylkum. Each gecko has an individual site, these lizards are strictly territorial and aggressive, fights of males during the mating season are common. Common wonder gecko hibernates at the end of September - mid-November, depending on climatic conditions.

Common wonder gecko becomes sexually mature 18-20 months after hatching, when the body length reaches 68-70 mm. As a shelter, it uses its own burrows of a rather complex structure, consisting of a main passage, a system of snorkels and a chamber where lizards spend the daytime, and also lay eggs and hibernate. The hole is sealed with a special cork. Sometimes it lives together

with dung beetles, uplifted and small jerboa, midday gerbil. Mating takes place in late April - mid-May, egg-laying — in early June. There are 1-2 eggs in a clutch. There are known cases of communal laying.

Economically significant species. The state of the species on the territory of the Republic of Uzbekistan does not cause concern. The Central Asian expedition of the Academy of Sciences recorded this species from the vicinity of the Karakul town (Bogdanov, 1960). In the lower reaches of the Zeravshan River, Common wonder gecko near the station Alat, Karakul, Khoja-Davlet and lakes Khoja-Kab, Khoja-Sait and Karanga was collected by M.V. Kaluzhina (1951).

Common wonder gecko was recorded by Abduraupov T.V. near Dengizkul Lake, as well as in the Kuvachi-Alat area in April 2018. On the project site for the construction of a solar power plant in the vicinity of the city of Alat, we noted the Common wonder gecko in June 2023.

5.4 Family Agamidae. Steppe agama. *Trapelus sanguinolentus aralensis* (Lichtenstein, 1823)

Figure 5: Steppe agama. Photo by T. V. Abduraupov

This is a medium-size lizard. The total length of the steppe agama does not exceed 300 mm, with the length of the body with the head up to 120 mm and the tail 1.3-2 times longer than the body. Steppe agama inhabits sandy, clayey and stony deserts and semi-deserts, preferring areas with shrubby or semi-woody vegetation. It is also found on gentle rocky slopes in the foothills, along the edges of loosely fixed sands, along river banks and in tugai, along the edges of human settlements and roadsides. It shelters in the burrows of gerbils, sousliks, jerboas, hedgehogs and tortoises, cavities under stones and cracks in the soil. In the hot season, agamas often climb on the branches of shrubs, thus protecting themselves from overheating on the soil heated by the sun. Males survey their site from an elevated position, protecting it from the invasion of competitors. After wintering,

these lizards appear in mid-February, March or early April, depending on the weather at that time. Males leave their winter shelters earlier than females.

Economically significant species. The state of the species on the territory of the Republic of Uzbekistan does not cause concern.

In Uzbekistan, it is widely distributed in arid zones. In the Zeravshan valley, the steppe agama was noted by S.K. Dal (1936) at the railway station Khoja-Davlet, in the same place and near Lake Karakul — M. V. Kaluzhina (1951). It was also obtained from this lake by A.P. Fedchenko (Moscow State University) and the Central Asian Zoological Expedition.

Steppe Agama was recorded by Abduraupov T.V. near Dengizkul Lake, as well as in the Kuvachi-Alat area in 2018 and 2021. On the project site for the construction of a solar power plant in the vicinity of the city of Alat, we noted the Steppe Agama both in April and June 2023.

5.5 Lichtenstein's toadhead agama. *Phrynocephalus interscapularis* (Lichtenstein & Martens, 1856)

Figure 6: Lichtenstein's toadhead agama. Photo by T. V. Abduraupov

A small lizard, one of the smallest species of the genus, the size of the body from the tip of the snout to the tip of the tail usually does not exceed 9 cm. The body is very slender, the tail is strongly flattened throughout. Characterized by the development on the hind edge of the femur and on the sides of the base of the tail of a series of strongly prickly white scales, forming a kind of fringe. Lichtenstein's toadhead agama is a typical inhabitant of naked and scattered, almost devoid of vegetation sands. This strictly psammophilic lizard is usually found in the form of isolated settlements on island dunes, often located quite far from each other (up to tens of kilometers). Usually, it adheres to the tops of dunes, only occasionally running over to areas of more fixed sands

with sandy acacia, saxaul and other sparse vegetation. The abundance is generally high everywhere. Minks are used as shelters, which are an inclined passage up to 20 cm long, with a small slot-like entrance. It can also plunge into the sand, pushing it apart with the help of rapid oscillatory movements of the body, which has special folds of skin along the edges, directing sand particles to the back. Individual plots vary from 30 to 180 m2.

Activity begins in the middle - end of February in spring, in the more northern parts of the range — in the second half of March. It feeds on various insects, mainly ants.

The state of the species on the territory of the Republic of Uzbekistan does not cause concern.

This species was recorded in the vicinity of the Khoja-Davlet railway station by A. N. Kirichenko (Bogdanov, 1960). For the vicinity of the last point and Lake Sungur and Karanga, Lichtenstein's toadhead agama is indicated by S.K. Dal (1936). M.V. Kaluzhina (1951) saw this species on the railway stations Khoja-Davlet, Karakul, Alat and near lakes Karanga, Khoja-Kab and Khoja-Sait.

Lichtenstein's toadhead agama was recorded by Abduraupov T.V. near Dengizkul Lake, as well as in the Kuvachi-Alat area in 2018 and 2021. On the project site for the construction of a solar power plant in the vicinity of the city of Alat, we noted the Lichtenstein's toadhead agama both in April and June 2023.

5.6 Family Lacertidae. Rapid racerunner. *Eremias velox velox* (Pallas, 1771)

Figure 7: Rapid racerunner. Photo by T. V. Abduraupov

The length of the body with the head is up to 84 mm (males) and up to 81 mm (females). In juveniles, three even black-brown or black stripes run along the back, with the central one forking on the neck; one stripe of the same colour with light round spots on it can be found on each side of the body. In adults (the main background of the upper part of the body is grey or sandy, often with an olive or brown tint) these stripes break into separate spots, while the sides of the body display light, black-edged, rounded spots, which in the front part of the body (especially in males) turn blue. It should be borne in mind that the pattern of this lizard varies greatly from individual to individual. The belly and throat are white. In juveniles, the bottom of the tail and sometimes the small scales on the thighs and legs are red or red-orange.

Economically significant species. One of the most widely distributed and abundant species of racerunners in the Palaearctic. It is widespread on the territory of Uzbekistan.

After hibernation, first individuals appear in the second half of March, most of them in early April. Hibernation begins in late October - early November. In summer, they are active mainly in the morning and evening hours. In Uzbekistan, Rapid racerunner is a typical inhabitant of river valleys, where it is most abundant. However, it also occurs in a wide range of other biotopes, which it inhabits depending on the presence of other species of racerunners.

Rapid racerunner was recorded near the Karakul railway station by S. F. Tsarevsky and by the Central Asian Zoological Expedition, as well as at the Khoja-davlet railway station by the same expedition and by S.K. Dal (1936).

This species was recorded by Abduraupov T.V. not far from the project area in 2018.

5.7 Reticulate racerunner. *Eremias grammica* (Lichtenstein, 1823)

Figure 8: Reticulate racerunner. Photo by T. V. Abduraupov

A medium-sized lizard with a body length of up to 93 mm and a little more than one and a half times, a long tail. The toes bear on the sides long, more or less triangular scales that form combs. The main background of the upper part of the body is gray with a brownish or slightly greenish tint. The back, neck, upper side of the base of the tail and legs are covered with a black-gray or dark brown mesh pattern, often with individual black specks.

Inhabits sandy deserts, inhabiting mainly various kinds of scattered and weakly fixed sands with sparse herbaceous and shrubby vegetation. In some places it temporarily enters the areas of takyrs and soddy salt marshes bordering on the sands. It uses the burrows of desert rodents as shelters, as well as its own burrows up to 1 m long and up to 70 cm deep, usually dug at the base of the bushes. They are able to quickly bury themselves in loose sand and move in its thickness for distances of up to 2-3 m. In the north of the range, it is active from early April to mid-October. In its southern regions, wintering lasts no more than three months — from December to February, but

even during this period, in the presence of warm weather, at times it can leave the wintering shelters for heating under the sun.

Economically significant species. The state of the species on the territory of the Republic of Uzbekistan does not cause concern.

M. V. Kaluzhina (1951) recorded Reticulate racerunners in the vicinity of the Khoja-Davlet railway station. S.K. Dal recorded racerunners there and near the lakes Sungyr and Karanga. S. A. Lidsky (A. M. Nikolsky, 1905) discovered this species in the desert near Kagan, and A. P. Fedchenko (Moscow State University) in the vicinity of the city of Karakul.

Reticulate racerunner was recorded by Abduraupov T.V. near Dengizkul Lake, as well as in the Kuvachi-Alat area in April 2018. On the project site for the construction of a solar power plant in the vicinity of the city of Alat, we noted the Reticulate racerunner both in April and June 2023.

5.8 Striped racerunner. *Eremias lineolata* (Nikolsky, 1897)

Figure 9: Striped racerunner. Photo by T. V. Abduraupov

Body length with head is up to 54 mm (males up to 54 mm, females up to 50 mm). There are no noticeable differences in the coloration of young species and adults. The main background of the upper surface of the body is sand-gray. Four or six narrow (very rarely, approximately from the middle of the body, there is also a seventh) even brown or dark brown stripes running along the back, starting from the posterior edge of the parietal scutes; they pass to the tail and merge there in pairs; in the case of the development of four stripes, there is usually a short fifth, expressed in the cervical region, and sometimes in the back of the body and tail; in the case of six stripes, the two middle ones, the narrowest, are brought closer to each other. One of the same color, but wider, starting from the eyes, runs along the sides of the body to the front half of the tail; usually an indistinct narrow brown strip also extends near the border of the lateral scale with the ventral

scutes. Head dorsally with or without small dark spots. ruled Limbs dorsally with light rounded or oval spots on a dark brown or brown background. The underside of the body is white.

Recorded by S. F. Tsarevsky (collection of the Central Asian Zoological Expedition) Karakul, O. P. Bogdanov (1960) on the southern bank of the Kuyu-Mazar reservoir and near st. Yakka-Tut. On the project site for the construction of a solar power plant in the vicinity of the city of Alat, we noted the Striped racerunner in April 2023.

5.9 Family Varanidae. Caspian monitor. *Varanus griseus caspius* (Eichwald, 1831)

Figure 10: Caspian monitor. Photo by T. V. Abduraupov

The species decreasing in numbers is included in the Red Book of the Republic of Uzbekistan (2019) with status 2 (VU: D). The largest lizard in Uzbekistan and neighboring countries. The length of the body with the head is up to 520 mm. The upper side of the body is greyish-brown, yellowish-brown or reddish-brown, with numerous dark dots and specks. On the upper side of the neck there are two or three longitudinal brown stripes, and on the back and tail there are several transverse stripes of the same colour. In youngsters, the stripes are very pronounced, they are black or almost black.

After hibernation, the first individuals appear relatively late – in early to mid-April. Active all day throughout April. In May, they are active in the morning and evening hours. They go into hibernation in September-October. Often the Caspian monitor has an estivation in summer, which gradually turns into winter hibernation. They begin estivating in late June - early July. It inhabits mainly fixed and semi-fixed sands, clay and stony-gravelly soils, visits solonchaks.

The Caspian Monitor has very characteristic footprints that cannot be confused with others. They are clearly visible on semi-fixed sands. Paw prints in the sand usually have traces of all fingers. The tail usually leaves a slightly undulating furrow (Oshmarin and Pikunov, 1990) (Pic. 26,27). On fresh prints of traces of a Caspian Monitor, rounded scales on the feet are clearly visible.

In Kyzylkum, this species was noted by M. N. Bogdanov (1882) and A. M. Andrushko (1953). However, in recent years, the number of the species has greatly decreased, in a number of places it has completely disappeared. On the project site for the construction of a solar power plant in the vicinity of the city of Alat, we noted the Caspian Monitor both in April and June 2023. However, it should be noted that this species was recorded in the project area only by footprints on the sand.

5.10 Family Boidae. Desert sand boa. Eryx miliaris (Pallas, 1773)

Figure 11: Desert sand boa. Photo by T. V. Abduraupov.

Desert sand boa is a near-threatened, sporadically distributed subspecies, included in the Red Data Book of the Republic of Uzbekistan (2019) with the status 3 (NT); also included in Appendix II of the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES).

A medium-size snake. Females reach 720 mm in length; males are somewhat smaller – 550-580 mm. Tail length is 50-70 mm. The tail is short and blunt.

It lives mainly in sand deserts, where it prefers drifting and semi-fixed dunes, as well as more or less loose soils in deserts and semi-deserts with wormwood-saltwort communities and saltwort populations. It is less common on takyrs with patches of vegetation near sands and on relatively hard loess and clay soils, near ruins, on the slopes of gullies and at the borders of irrigated lands. Often occurs near colonies of Gerbils, whose burrows it uses to shelter. It is able to plunge into the sand quickly, head first, and "swim" under its surface, leaving a characteristic trail in the form of a serpentine bulge. The upward-looking eyes allow the Desert sand boa to examine the surface without raising its head above the sand.

Active from April to October. In the hot season, it leads a nocturnal and crepuscular lifestyle. It uses the holes of rodents as a refuge; therefore, it often settles in colonies of Gerbils. The breeding season is in late March. In June-July, the female gives birth to 4-10 babies up to 12-14 cm long. It feeds on lizards, rodents and small birds.

Currently, the number is decreasing due to increased poaching (used in folk medicine), as well as economic development of land. We assume a low abundance of Desert sand boa constrictor in the study area.

S. K. Dal (1936) reports that he saw the tracks of these sand boas at the Khoja-Davlet railway station. At the same station, the Desert sand boa was caught by employee of the Central Asian Zoological Expedition, at the Karakul railway station – by S. F. Tsarevsky. A. M. Didusenko (1956) reports that this species is found from Lake Khoja-Kab (in the lower part of the Zeravshan valley) to the Karakul railway station.

Desert sand boa was noted by Abduraupov T.V. near Dengizkul Lake, as well as in the Kuvachi-Alat area in April 2018 and in June 2021. On the project site for the construction of a solar power plant in the vicinity of the city of Alat, we noted the Desert sand boa in April 2023. However, it should be noted that this species was recorded in the project area only by traces on the sand.

5.11 Family Colubridae. Dice snake. *Natrix tessellata* (Laurenti, 1768)

Figure 12: Dice snake. Photo by A. V. Yesipov

A large snake with a body length of up to 1400 mm and about 5-6 times shorter tail. The most common sizes of sexually mature individuals are up to 800 mm in males and 980 mm in females. The head is flattened, the muzzle is pointed. Scales both trunk and caudal, with strongly developed ribs. The coloration of the upper side of the body is olive, olive-gray, olive-greenish, olive-brown, brown or – very rarely – reddish-orange.

Dice snake is closely associated with water throughout its range, its habitats are confined to the shores of various flowing and stagnant bodies of water, from muddy irrigation canals, rich in suspended particles, to transparent mountain rivers and streams with very strong currents. Occurs along canals in the project area.

After wintering in the southern areas of the range in Central Asia, it appears on the surface in March-April, the activity continues until the end of October-November. Dice snakes are active during the day during the whole season. They spend most of their time in the water, swimming up to 3-5 km from the nearest land. When danger arises, Dice snakes usually take refuge in the water and hide at the bottom of water bodies. Dice snake mating takes place during April. Rodent burrows

located along the banks of reservoirs are used as winter shelters. Water snakes hibernate both singly and, more often, in large clusters, often together with other snakes.

In Bukhara (possibly in the Bukhara possessions) it was noted by Wilberg and P.V. Khorev (A.M. Nikolsky, 1905a, 1916) in the vicinity of Bukhara by O.P. Bogdanov (1960).

5.12 Spotted Desert Racer. *Platyceps karelinii* (Brandt, 1838)

Figure 13: Spotted Desert Racer. Photo by M. V. Pestov

A very slender snake of medium size with a relatively long tail: body length of females up to 865 mm, tail length, respectively, up to 270 mm; in males, body length up to 680 mm and tail length up to 235 mm. The tip of the muzzle is sharpened. The head is relatively weakly demarcated from the body. The coloration of the upper side of the body is light ash-gray with a yellowish or brownish tint. One row of narrow black or blackish transverse stripes running along the back, 1-3 scales not reaching the abdominal scutes. In the back of the body, the stripes become narrower, on the tail, sometimes they completely disappear.

The Spotted Desert Racer is biotopically related mainly to the plains, where it is found in all types of deserts.

In spring, they are active during the daytime, and from June to August, the activity becomes twilight-night and morning. After wintering, the first active snakes appear in the third decade of February, mass emergence in early April. Autumn activity continues until the end of November. Mating takes place in late April - mid-May.

Economically significant species. The state of the species on the territory of the Republic of Uzbekistan does not cause concern.

S.F. Tsarevsky (ZIN), this species was caught near the Karakul railway station (Bogdanov, 1960).

5.13 Spotted whip snake. Hemorrhois ravergieri (Menetries, 1832)

Figure 14: Spotted whip snake (black-headed form). Photo by T. V. Abduraupov

Body length with the head is up to 1,180 mm; the number of abdominal scales in males is 202—213, in females – 207—224; the number of scales on the tail in males is 90–103, in females – 86–99. The head contrasts with the neck. The tip of the muzzle is bluntly rounded. The upper side of the body is grey with a brownish or yellowish tinge. Along the back there are a number of dark (to black) transverse stripes or spots, between which there are a number of smaller spots on the sides of the body. Oblique dark stripes run on the sides of the head from the eyes to the corners of the mouth; other stripes can be found under the eyes. The belly is light, often with occasional small specks. In Central Asia, black-headed individuals (both males and females) and almost black ones occur alongside those with typical coloration. There are also individuals that have an almost one-colour body, without spots or stripes. This snake displays one of the most variable coloration in Central Asia.

After hibernation, it appears in the second third of March. At this time, it is observed on the surface only in the afternoon. In April-May, the Spotted whip snake becomes active in the morning and evening hours. In September, the snake is again active in the middle of the day. In October it begins hibernating.

Typical habitats for this species are foothills abounding in gullies or colonies of rodents, as well as precipitous slopes bordering river floodplains and human settlements in foothills and mountains. It is less common in piedmont clay desert.

This is an economically important species. One of the most abundant and widespread snakes in Uzbekistan.

For the mountains and gravelly plains of the Central Kyzyl Kum, this snake is noted by A. M. Andrushko (1953); for the Kenimekh desert and the northern slopes of Nuratau - T. Z. Zakhidov (1938). O.P. Bogdanov (1960), the snake was noted on the ruins of the city walls of Bukhara and in the city itself.

5.14 Diadem snake. *Spalerosophis diadema* (Schlegel, 1837)

Figure 15: Diadem snake. Photo by T. V. Abduraupov

Large, rather slender snakes with a body size of up to 1500 mm. The tail is 4-5 times shorter than the body. The head is clearly demarcated from the neck. The tip of the muzzle is rounded. The coloration of the upper body is light gray or light brown. Along the ridge there is one row of brown or brown, more or less rhombic or oval spots, more pronounced in young snakes, in which they are also limited by a light border.

The most preferred biotopes of Diadem snake are sandy and clayey deserts; they are also found, although much less frequently, on hilly areas and on mountain slopes. It uses holes of rodents, turtles, cracks in the soil, bushes as shelters.

Annoyed individuals mimic a cobra's threat pose by aggressively lifting and inflating the front of their torso. Activity, depending on the climatic conditions of the season, day or night, one or two peaks. They leave wintering in late February - early March, activity continues until November. Economically significant species. The state of the species on the territory of the Republic of Uzbekistan does not cause concern.

Diadem snake was noted by Abduraupov T.V. near Dengizkul Lake in June 2021. On the project site for the construction of a solar power plant in the vicinity of the city of Alat, we noted the Diadem snake in June 2023.

5.15 Sand Racer. *Psammophis lineolatus* (Brandt, 1838)

Figure 16: Sand Racer. Photo by T. V. Abduraupov

The length of the body with the head is up to 840 mm (males) and up to 710 mm (females). The number of abdominal scales – 181—204, sub-caudal scales – 83—105 pairs. The body is thin. The upper surface of the muzzle is concave, with a longitudinal groove. The upper side of the body is olive-grey or sandy-grey, the edges of the scales are lighter than their central parts; four dark stripes run from the head along the body; in some individuals, only traces of these stripes in the form of dark or black lines along the scales may remain. Sometimes the pattern on the body is missing. The belly is white with greyish, brownish or olive-grey spots, larger at the front of the body.

Single individuals appear after hibernation in February. Most of them emerge in late March-early April. At this time, the snakes are active all day. In May, the activity is observed in the morning and evening hours. They go into hibernation in October-November.

The Sand Racer inhabits all lowlands, from where it penetrates into foothills up to 1,100—1,200 m above sea level; however, it prefers more fixed and drifting sands, pebbly plains, mountains and broken grey soils near settlements. The sand racer is more often observed in places where areas with dense vegetation alternate with open patches. Therefore, in places with dense vegetation, it can always be found on low precipitous slopes, mounds and so on.

The state of the species on the territory of the Republic of Uzbekistan does not cause concern.

Sand Racer was found by S.K. Dal (1936), near the Khoja-Davlet railway station, on salt marshes near Lake Karanga and takyrs in the vicinity of Arap-Khana and by S.F. Tsarevsky (ZIN) - near the Karakul railway station. On the project site for the construction of a solar power plant in the vicinity of the city of Alat, we noted the Sand Racer both in April and June 2023.

6 Results of the field visit to the project area in April 2023

The field visit to the project area took place from 09 April 2023 to 11 April 2023. This period of the year is ideal for surveying the territory for the presence of the Central Asian Tortoise, most species of the genus Eremias and Phrynocephalus. Also, due to a rather warm and early spring, the period of the field visit coincided with the emergence of the Caspian Monitor from hibernation, the characteristic traces of which we managed to find in the project area (Table 1). However, nighttime temperatures also remained quite low (t soil - 11.0C^0, t air - 11.9 C^0) and no species were observed during the night counts on the territory. Daytime temperatures were quite high (ideal for reptiles) (t soil - 37-40C^0, t air 23-27C$^{0)}$.

Table 1: Primary data and the density of reptiles at the accounting points in the area of the solar power plant in the vicinity of the Alat town, Bukhara region in April of 2023

No	Species	No. of recorded animals	Population density on the site, inds/ha	Biotope	Transect length	Date and time	Air temperature	Soil temperature	Humidity, %
A001 **N** 39,33915 **E** 64,08271				Hummocky sands with areas of scattered sands. There is a degraded site - a former quarry.	1 km	10.04.23	C25,6°	C43,7°	37%
1	*Phrynocephalus interscapularis* Lichtenstein's Toadhead Agama	22	43,6						
2	*Trapelus sanguinolentus* Steppe agama	1	0,35						
3	*Eremias lineolata* Striped racerunner	2	4,1						
4	*Eremias grammica* Reticulate racerunner	2	1,4						
5	*Eryx miliaris* Desert sand boa	Traces	-						
6	*Varanus griseus caspius* Caspian Monitor	Footprints	_						

No	Species	No. of recorded animals	Population density on the site, inds/ha	Biotope	Transect length	Date and time	Air temperature	Soil temperature	Humidity, %
A002 **N** 39,33184 **E** 64,09682				Fixed, hummocky sands overgrown with ephemers	1 km	10.04.23	C26,9°	C43,8°	23%
1	*Phrynocephalus interscapularis* Lichtenstein's Toadhead Agama	3	5,5						
2	*Trapelus sanguinolentus* Steppe agama	2	1,01						
3	*Eremias lineolata* Striped racerunner	1	3,13						
A003 **N** 39,32958 **E** 64,07608				Fixed, hummocky sands overgrown with ephemers	1 km	11.04.23	C23,6°	C38,1°	37%
1	*Phrynocephalus interscapularis* Lichtenstein's Toadhead Agama	4	16,6						
2	*Trapelus sanguinolentus* Steppe agama	2	2,5						
3	*Eremias lineolata* Striped racerunner	2	6,7						
A004 **N** 39,32958 **E** 64,07608 **nocturnal surveys**				Fixed, hummocky sands overgrown with ephemers	1 km	10.04.23	C11,9	C11,0°	65%
0		-	-						
A005 **N** 39,33703 **E** 64,11538				Medium hilly sands overgrown with kandym and	1 km	11.04.23	C27,4°	C38,6°	27%

No	Species	No. of recorded animals	Population density on the site, inds/ha	Biotope	Transect length	Date and time	Air temperature	Soil temperature	Humidity, %
				saxaul					
1	*Phrynocephalus interscapularis* Lichtenstein's Toadhead Agama	5	12,5						
2	*Eremias lineolata* Striped racerunner	2	5,2						
3	*Psammophis lineolatus* *Sand racer*	1	1						

In total, during the study period in the project area, we examined four monitoring points in the project area itself and one point outside the project area.

During the survey period of the project area, we noted:

- 1 species of amphibians and 7 species of reptiles as indicated in the table above.
- Of these, Caspian Monitor and Desert sand boa are listed in the Red Book of the Republic of Uzbekistan (UzRDB) (see Table 3 below).
- No species are cited under IUCN vulnerable or above (see Table 3 below).
- Other species are widespread and often numerous on the territory of Uzbekistan.

An extra off-site point was needed to ensure that the area does not indeed contain Central Asian Tortoise. We paid special attention to this issue. After we surveyed the entire project area and at the same time did not find any evidence of the habitation of Central Asian Tortoise with enough food for it and seemingly suitable biotopes, we came to the conclusion that hard rocks of the soil lie very close under the layer of soft sand, which the turtle cannot dig, therefore cannot go deep enough for estivation and hibernation. Later, we received data from geologists who worked in the project area and examined the soil. Their conclusion is presented below.

According to engineering-geological zoning, the site belongs to the area of lacustrine-alluvial and alluvialproluvial elevated plains, transformed by aeolian processes.

Geologically, the area of work is complex of Neogene deposits of the Pliocene-Miocene age (N1-2) with an insignificant cover of Quaternary formations (QI-IV). The deposits of the complex compose the Karakul plateau and are represented by sands and sandstones with subordinate interlayers of brownish-gray and reddishbrown clays, siltstones and conglomerates from clay pellets. In the roof of the Neogene deposits, over a larger area, there is a layer of strongly cemented calcareous sandstone, which determines the plateau-like nature of the surface.

According to drilling data, Neogene sediments (N2), represented by sands, sandstones on clay cement, clays and siltstones, take part in the lithological section of the projected construction site to an explored depth of 15.0 m.

From the surface, the Neogene sediments are overlain by a cover of modern Quaternary formations (eoQIV) 0.05-0.3 m thick and undivided Lower Quaternary - Upper Neogene sediments (Q1 – N2) up to 0.5 - 1.5 m thick, less often up to 3.0 m. represented by sands from fine to medium size, from loose to medium density, with thin layers of clay. Modern deposits are represented by aeolian sands, fine, dry, loose structure.

The ground-vegetative layer is represented by scarce herbaceous and shrubby vegetation, occasionally typical desert forms are observed.

7 Results of the field visit to the project area in June 2023

The field visit to the project area took place from 26 to 27 June 2023. This field trip was intended to ascertain the presence in the project area of a number of species, mainly nocturnal. Since in April of this year, low night temperatures did not allow for full-fledged counts. Also, during this trip, we confirmed the permanent residence of the Caspian Monitor on project area. Average night air temperatures were 24-25C^0, soil - 21-22C^0.

Table 2: Primary data and the density of reptiles at the accounting points in the area of the solar power plant in the vicinity of the Alat town, Bukhara region in June of 2023

No	Species	No. of recorded animals	Population density on the site, inds/ha	Biotope	Transect length	Date and time	Air temperature	Soil temperature	Humidity, %
AJ1 **N** 39.338721 **E** 64.083577 **nocturnal surveys**				Hummocky sands with areas of scattered sands. There is a degraded site - a former quarry.	2,5 km	26.06.23	C25,6°	C24,7°	31%
1	*Teratoscincus scincus* Common Wonder Gecko	5	0,4						
2	*Spalerosophis diadema* Diadem snake	1	0,04						
AJ2 **N** 39.314188 **E** 64.080893 **nocturnal surveys**				Fixed, hummocky sands overgrown with ephemers	2,5 km	26.06.23	C23,9°	C18,0°	33%

No	Species	No. of recorded animals	Population density on the site, inds/ha	Biotope	Transect length	Date and time	Air temperature	Soil temperature	Humidity, %
1	*Teratoscincus scincus* Common Wonder Gecko	8	0,6						
AJ3 **N** 39.314188 **E** 64.080893				Fixed, hummocky sands overgrown with ephemers	2 km	27.06.23	C33,6°	C43,3°	21%
1	*Phrynocephalus interscapularis* Lichtenstein's Toadhead Agama	5	7,8						
2	*Trapelus sanguinolentus* Steppe agama	3	4,2						
3	*Eremias grammica* Reticulate racerunner	3	1,1						
4	*Varanus griseus caspius* Caspian Monitor	Footprints	_						
AJ4 **N** 39.335243 **E** 64.060448				Fixed, hummocky sands overgrown with ephemers	2,3 km	27.06.23	C33,8°	C44,2°	28%
1	*Phrynocephalus interscapularis* Lichtenstein's Toadhead Agama	5	8,2						
2	*Trapelus sanguinolentus* Steppe agama	8	4,1						
3	*Eremias lineolata* Striped racerunner	1	0,8						
4	*Eryx miliaris* Desert sand boa	Traces	-						
AJ5 **N** 39.303433 **E** 64.063506				Medium hilly sands overgrown with	2.5 km	27.06.23	C34,7°	C47,2°	21%

No	Species	No. of recorded animals	Population density on the site, inds/ha	Biotope	Transect length	Date and time	Air temperature	Soil temperature	Humidity, %
				kandym and saxaul					
1	*Phrynocephalus interscapularis* Lichtenstein's Toadhead Agama	5	6,2						
2	*Eremias lineolata* Striped racerunner	2	3,3						
3	*Psammophis lineolatus Sand racer*	1	1						

In total, during the study period in the project area, we examined five monitoring points in the project area itself.

During the survey period of the project area, we noted:

- 9 species of reptiles as indicated in the table above.
- Of these, Caspian Monitor and Desert sand boa are listed in the Red Book of the Republic of Uzbekistan (UzRDB) (see Table 3 below).
- No species are cited under IUCN vulnerable or above (see Table 3 below).
- Other species are widespread and often numerous on the territory of Uzbekistan.
- The density of most of the reptile species inhabiting the project area is quite low. The exception is Lichtenstein's Toadhead Agama, which is always quite dense both in the project area and in other suitable habitats.

8 Faunistic complexes of the project area

Each of the types of habitats in the study area is characterized by a specific set of species – a faunal complex of amphibians and reptiles that has formed historically in the area. Each species is adapted to a specific set of environmental factors and this determines its relationship with specific ecosystems and habitats. Within any faunal complex, two groups of species can be distinguished:

1. Species closely related to a limited set of environmental factors (stenobiontic species). These are species characteristic only of a particular type of habitat. When the combination of conditions is favourable, the characteristic species can be quite numerous and common. Any change in habitat conditions negatively affects the distribution and population status of the characteristic species. Therefore, they are

indicators of the degree of how natural habitats are conserved/disturbed. In the project area, these mainly include psammophilic species (Comb-toed Gecko, Common Wonder Gecko, Lichtenstein's Toad-head Agama and Reticulate racerunner), semi-aquatic species (Turan Toad and Dice snake).

2. Species that can adapt to a wider range of habitats (eurybiontic species). This determines their wide distribution and occurrence in various types of habitats, higher resistance to anthropogenic impacts. Many species from this group are economically important, can reach high numbers and serve as food for predators, including rare species. Such species inhabiting the project area include Steppe Agama, Rapid Racerunner and Spotted desert racer.

In addition to these faunistic complexes, it should be noted that synanthropic species of reptiles live in territories near the villages, to which Spotted whip snake can be referred. The Diadem snake forage occasionally in villages. Rapid Racerunner and Steppe Agama, and Sand Racer inhabit heaps of soil taken from canals and ditches along fields, as well as precipitous slopes and the territory along them.

9 Conclusions

According to the processed sources of information and the personal data of the author of the section, now, on the Project site, there are 1 species of amphibians and 14 species of reptiles belonging to 6 families (Table 2). The total number of amphibian species is 20% of the total diversity of the amphibian fauna of Uzbekistan, reptiles - 22.6%. Among reptiles, two species are listed in the Red Book of the Republic of Uzbekistan (2019) (14.3% of the total number of species inhabiting the project area), no species which is included in the IUCN Red List, and two species - in the Appendix of the Convention on International Trade in Endangered Species of Fauna and Flora (CITES) (14.3% of the total number of species inhabiting the project area).

We did not note the presence of the Central Asian tortoise in the project area due to the absence of the species on it as a whole. The reasons for the impossibility of inhabiting the species in the project area are described above.

As a result of the processing of literary sources, narrow-range endemic species, reptiles in this area have not been identified. However, it should be noted that a fairly large number of reptile species inhabit the rather limited project area, which is associated with the presence of sandy massifs on it. Most of the species from the list are widespread throughout the republic.

Table 3: List of reptile species potentially inhabiting the project territory

№	Species	Species presence acc. to literary sources	Species noted during surveys in April and June	Abundance	Endemism	Conservation status		
						UzRDB	IUCN	CITES
Amphibians								
Family *Bufonidae* (toads)								
1	Turan Toad *Bufotes turanensis*	+		Common	UZ, TJ, TM			

№	Species	Species presence acc. to literary sources	Species noted during surveys in April and June	Abundance	Endemism	Conservation status		
						UzRDB	IUCN	CITES
Reptiles								
Family *Gekkonidae* (geckoes)								
1	Comb-toed gecko *Crossobamon eversmanni*	+		Low numerous	UZ, TJ, TM, KZ, IR, AF			
2	Common Wonder Gecko *Teratoscincus scincus*	+	+	Common	UZ, TJ, TM, KG, IR,CN			
Family *Agamidae* (agamas)								
3	Steppe agama *Trapelus sanguinolentus*	+	+	Common				
4	Lichtenstein's Toadhead Agama *Phrynocephalus interscapularis*	+	+	Numerous	UZ, TM, KZ, AF, IR			
Family *Lacertidae* (true lizards)								
5	Rapid Lizard *Eremias velox*	+		Numerous				
6	Reticulate racerunner *Eremias grammica*	+	+	Numerous				
7	Striped racerunner *Eremias lineolata*	+	+	Common				
Family *Varanidae* (monitor lizards)								
8	Caspian Monitor *Varanus griseus caspius*	+	+	Rare		2 (VU:D)		I
Family *Boidae* (Boas)								
9	Desert sand boa *Eryx miliaris*	+	+	Rare		3 (NT)		II
Family *Colubridae* (colubrid snakes)								
10	Sand racer *Psammophis lineolatus*	+	+	Common				
11	Spotted whip snake Hemorrhois ravergieri	+		Common				
12	Spotted desert racer *Platyceps karelinii*	+		Low numerous				
13	Diadem snake *Spalerosophis diadema*	+	+	Low numerous				
14	Dice snake *Natrix tessellata*	+		Common				

Notes to Table 1: UzRDB– species/subspecies listed in the Red Data Book of Uzbekistan (2019) (VU – vulnerable; NT – near-threatened); IUCN – species included in the Red List of the International Union for Conservation of

Nature (VU - vulnerable); CITES I, II – species listed in the appendices (I, II) to the Convention on International Trade in Endangered Species of Wild Fauna and Flora; Endemism: AF – Afghanistan; CN – China; KZ – Kazakhstan; IR – Iran; TM – Turkmenistan; KG – Kyrgyzstan; TJ – Tajikistan; UZ – Uzbekistan.

10 Bibliography

1. Ананьева Н.Б., Боркин Л.Я., Даревский И.С., Орлов Н.Л. Земноводные и пресмыкающиеся. Энциклопедия природы России. - М.: ABF, 1998.
2. Богданов О.П. Фауна Узбекской ССР. Ч.1. Земноводные и пресмыкающиеся. – Ташкент: Изд-во АН УзССР, 1960. – 260с.
3. Богданов О. П. Экология пресмыкающихся Средней Азии. Ташкент: Наука, 1965. - 257 с.
4. Богданов О. П. Пресмыкающиеся // Редкие животные Узбекистана. Энциклопедический справочник. - Ташкент: Гл. ред. энциклопедий, 1992. С. 303-371.
5. Бондаренко Д. А. Распределение и плотность населения среднеазиатской черепахи в Центральных Кызылкумах (Узбекистан) // Бюл. Моск. о-ва испытателей природы. Отд. биол. 1994. Т. 99, вып. I. С. 22-26.
6. Бондаренко Д.А., Перегонцев Е.А. Распространение среднеазиатской черепахи *Agrionemis horsfieldii* (Gray, 1844) в Узбекистане (ареал, региональное и ландшафтное распределение, плотность населения) // Современная герпетология. 2017. Т. 17, вып. 3/4. С. 124 – 146.
7. Гуломов П., Вахобов Х., Баратов П., Маматкулов М. Физическая география Средней Азии и Узбекистана. «O‘qituvchi». Ташкент, 2013.
8. Даль С.К., Позвоночные низовьев реки Зеравшан. Труды УзГУ, т. VII, Самарканд, 1936.
9. Даль С. К., К изучению наземных позвоночных камышовых зарослей, тугаев и рисовых полей Зеравшанской долины, Труды УзГУ, т. X П, вып. 5, Самарканд, 1939.
10. Калужина М. В., Морфология и биология отряда ящериц Зеравшанской долины. Труды биолого-почвенного факультета УзГУ (зоология), Новая серия. вып. 46. Самарканд, 1951.
11. Красная Книга Республики Узбекистан, II том: Животные; под редакцией Ж.А. Азимова. Т., 2019. - 374 с.
12. Никольский А. М., Пресмыкающиеся и амфибии Туркестанского генерал-губернаторства (Herpetologia Turanica), Известия Общества любителей естествознания, антропологии и этнографии, т. XIIIV, 1899.
13. Никольский А. М., Пресмыкающиеся и земноводные Российской империи, СПб., 1905.
14. Никольский А. М. Фауна России и сопредельных стран. Пресмыкающиеся (Reptilia). Т. I. Chelonia и Sauria. Пг.: Типография Императ. Академии Наук. 1915. 532 с.
15. Никольский А. М., Фауна России и сопредельных стран, Пресмыкающиеся (Reptilia), т.II, СПб., 1916.
16. Никольский А. М., Фауна России и сопредельных стран, Земноводные, Пг., 1918.
17. Ошмарин П.Г. Пикунов Д.Г. Следы в природе. Следы ног животных на почве и на снегу. Практическая классификация следов ног зверей и птиц. М.: Наука. 1990 г. – 296 с.
18. Северцов Н. А., Вертикальное и горизонтальное распространение туркестанских животных, СПб., 1873.
19. Султанов Г.С., Персианова Л.А. Зоологические исследования в Средней Азии. - Ташкент: Фан, 1982, 239 с.
20. Хасанов И.А., Никадамбаева Х.Б. Физическая география Узбекистана. Учебное пособие. -Т.: «Университет», 2017. -252с.
21. Федченко А. П., Отчет о Туркестанской ученой экспедиции, Известия Общества любителей естествознания, антропологии и этнографии, т. VIII, вып. 1, 1871.
22. Царевский С. Ф., Каталог коллекций Музея при зоологическом кабинете Петроградского университета, Пг., 1914.
23. Царевский С. Ф., Обзор представителей степных удавов (*Eryx*) главным образом из России и сопредельных стран. Ежегодник Зоологического музея Академии наук, т. XX, № 3, СПб., 1915.
24. Щербак Н.Н. Ящурки Палеарктики. - Киев: Наукова думка, 1974. 296 с.

25. Юнусов Н., Григорьянц А, Гончаров Г., Шульгина Н., Тальских В., Митропольская Ю., Тожибаев К., Царук О. Пятый национальный доклад Республики Узбекистан о сохранении биологического разнообразия. Ташкент, 2015. - 58 с.
26. Brandt J. P., Zoologischer Anhang, Alexander Lehmann's Reise nach Buchara und Samarkand in der Jahren 1841 und 1842, 1852.
27. IUCN Red List of Threatened Species. Version 2019.1. www.iucnredlist.org
28. Lichtenstein H., Naturistor, Anhang an E. Eversmanns Reise nach Orenburg und Buchara. 1923.
29. Strauch A., Bemerkungen über die Geckoniden Sammlung im Zoologischen Museum der Kaiserlienen scademie der Wissenschaften zu St. Petersb., Mem. Acad. sci. Petersb. (7) XXXV, 1887, N 2.
30. Vashetko E.V., Khodjaev A.F., Nuridjanov A.S., Chikin Yu.A.. Resources of Testudo horsefieldii in Uzbekistan. // Congress of Testudo. Gonfaron, France, 2001.
31. http://www.reptile-database.org/data/Reptile_checklist_2019_07.xlsx.
32. www.cites.org

11 Photos

Figure 17: The main biotope of the Project area. Fixed fine-hummocky sands

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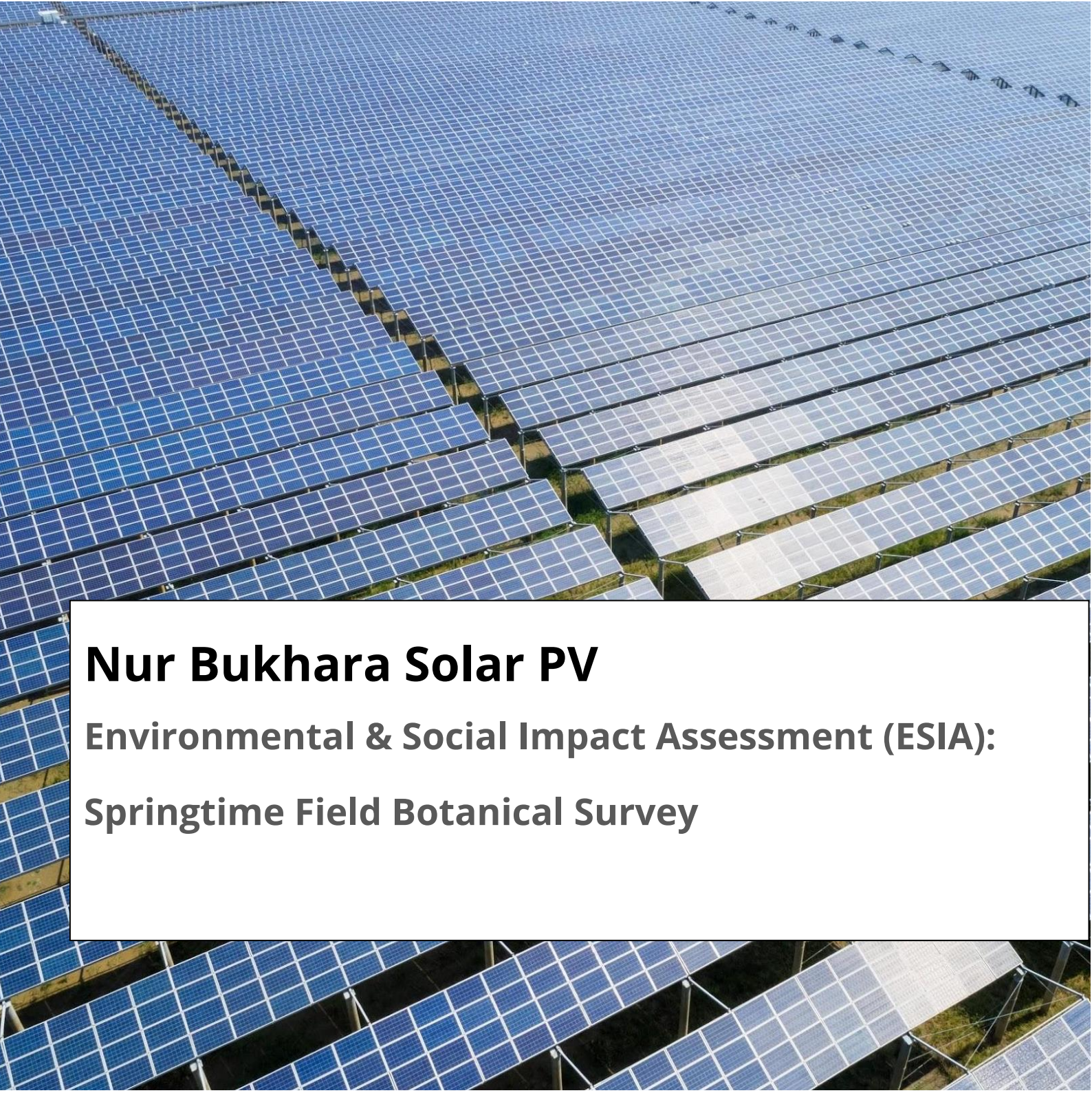
Technical appendix 9:
Spring Botanical Survey report



Nur Bukhara Solar PV

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1. Aims and objectives

In aims and objectives for the botanical survey (spring) at the Nur Bukhara PV project site (the Project) are the following:

- Field botanical research and field data processing.
- Analysis of any previous botanical surveys and other available data (publications, reports, etc.), compared to the results of the 2023 field survey.
- Detailed description and GIS-based mapping of habitat types present in the project area.
- Compilation of the check-list of plant species recorded on the project site (in particular, threatened species included in the Red Data Book of Uzbekistan and/or the IUCN Red List).
- Identification of *Calligonum* species, collection and relocation of seeds of *Calligonum* included in the IUCN Red List and Red Data Book of Uzbekistan.
- Reporting.

2. Project site

The project area is situated in Alat District of the Bukhara region of Uzbekistan, in the western part of the sandy desert called Sundukli Sands (south-western part of Kyzylkum Desert), about 10 km to the north of the lake Dengizkul (wildlife sanctuary/Ramsar site Dengizkul) and 25 km to the east of Alat town, between two branches of the Amu-Bukhara channel, near Khamza are 188–206 m above sea level.

Figure 1: Project area. Red line — project site, green line — wildlife sanctuary/Ramsar site Dengizkul (approximately 10km from the project site)

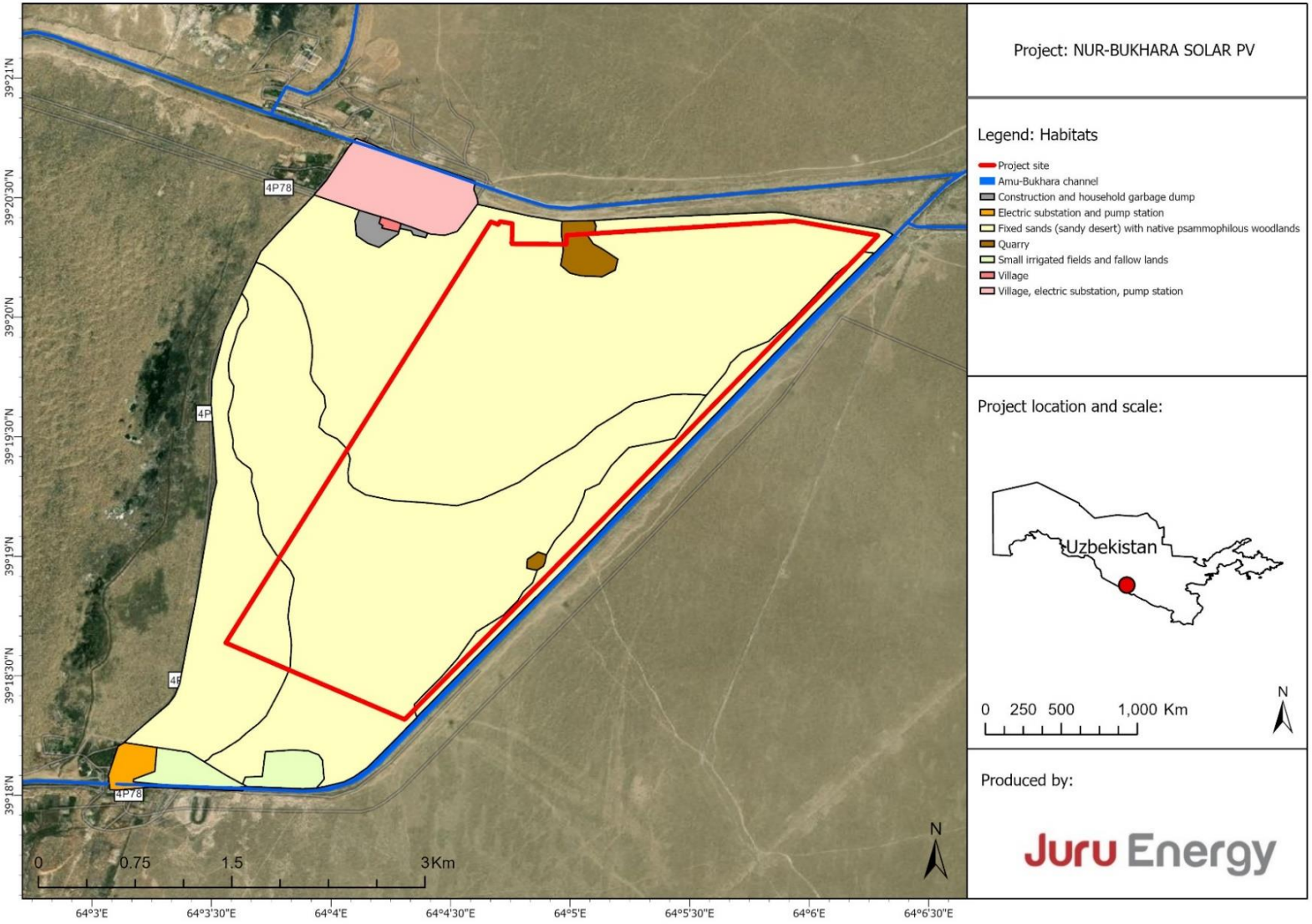


Figure 2: Habitat map

3. Literature review

The flora of the Uzbek part of Kyzylkum Desert, particularly its south-western part called Sundukli Sands, as well as the flora of Bukhara Oasis, has been well studied. The history of botanical research in this region has about 200 years. A huge amount of herbarium material collected from this area during two centuries is kept mainly in the National Herbarium of Uzbekistan in Tashkent (TASH), Herbarium of the Komarov Botanical Institute in St. Petersburg (LE), Herbarium of the Lomonosov Moscow State University (MW), and several other largest and oldest herbaria of the world (B, K, GOET, P, etc.).

The first scientific data on plant diversity of Kyzylkum Desert and Bukhara Oasis has been obtained during the 19th century by European and Russian naturalists who took part in several Russian diplomatic missions to Bukhara Khanate (E. A. Ewersmann, K. Pander and G. von Meyendorff in 1820–1821, and A. Lehmann in 1841–1842, A. P. Khoroshkhin in 1872, M. N. Bogdanov and F. I. Lobysevich in 1873, N. Barbot-de-Marni in 1874, and others).

Albert Regel, a physician and naturalist who worked in Russian Turkestan in 1875–1885 and conducted numerous excursions to the most remote and unexplored places of Central Asia, travelled to Bukhara and south-western Kyzylkum in 1884. Herbarium collections made by A. Regel were delivered to the Saint Petersburg Botanical Garden (currently, these specimens are stored mainly in LE, duplicates in B, K, GOET, H, MW, NY, W and other herbaria. Numerous new species were discovered on the basis of the material collected by Regel. Many species of Central Asian flora have been named after Albert Regel, including those described by his father, famous botanist Eduard Regel.

In 1878–1879, Russian botanist N. V. Sorokin, Professor from Kazan University, took part in an expedition dedicated to the design of the Central Asian Railway. Within the framework of this mission, he studied the vegetation of sandy desert (including south-western Kyzylkum) and the issues of fixing the sands.

In 1881, French scientists and explorers Guillaume Capus and Pierre Gabriel Bonvalot performed a large-scale expedition to Central Asia (including Kyzylkum Desert), collected plants and described vegetation and landscapes in several books devoted to their expedition. In particular, they visited Bukhara. Herbarium material collected by Capus and Bonvalot has been processed by French botanist A. R. Franchet, who published “Plantes du Turkestan: Mission Capus” in 1883. At the present, these specimens are kept mainly in the Herbarium of the National Museum of Natural History, Paris (P), and some duplicates are stored in LE.

In 1887–1903, Russian botanist Vladimir Lipsky performed large-scale expeditions in Central Asia, including surroundings of Bukhara, and provided one of the first scientific descriptions of the flora and vegetation, as well as published detailed history of botanical research in this region in the 19th century and early 20th century in his work “Flora of Central Asia, i.e. Russian Turkestan and Bukhara and Khiva Khanates” (1902–1905).

In 1895 and 1897, famous Russian botanist Sergey Korshinsky studied the flora and vegetation of Central Asia and collected about 15000 herbarium specimens, which are stored mainly in LE.

During field excursions, he visited surroundings of Bukhara. On the materials of these expeditions, Korshinsky published "Sketches of the vegetation of Turkestan: Trans-Caspian region, Fergana and Alay" (1896) and "Fragmenta florae Turkestanicae. Plantae novae vel minus cognitae Turkestaniae describuntur" (1898).

Herbarium collections made by above mentioned pioneers of the study of Central Asian flora laid the basis for our contemporary knowledge on the plant diversity of the Fergana Valley and great desert Kyzylkum.

In 1908–1917, the Migration Department of Russian government organized a number of expeditions for investigation of soils and vegetation of Central Asia within the framework of colonization of this region. Thus, botanists Mikhail Kultiasow, Eugeny Korovin and Mikhail Popov who at that time were young specialists and later became the leading figures of Central Asian plant science, studied the flora and vegetation of Amudarya River basin, including the south-western Kyzylkum and surroundings of Bukhara. The supervisor of botanical studies of these expeditions was Boris Fedtschenko, a son of Aleksei Fedtschenko and head botanist of the Imperial Botanical Garden in Saint Petersburg. During that period of time, Boris Fedtschenko several times visited Central Asia and participated in field surveys. As a result of those large-scale researches, a huge amount of herbarium was collected, numerous new taxa and a diversity of plant communities were described for the first time, the first geobotanical maps were compiled, and several works devoted to the plant diversity of the region were published, e.g. "Checklist of plants growing in the wild in Russian Turkestan" (1906, 1913) by O. A. Fedtschenko and B. A. Fedtschenko, "Vegetation of Turkestan" (1915) by B. A. Fedtschenko, etc. The fundamental monograph by E.P. Korovin "Vegetation of Central Asia and South Kazakhstan" (1934; 1961, 1962) also contains some data about the flora and vegetation of the Kyzylkum Desert.

In 1918, the Turkestan State University was established in Tashkent (it was given a name of Central Asian State University from 1923 to 1960, Tashkent State University in 1960–2000, and National University of Uzbekistan since 2000). Since early 1920s, botanists of the University (M. G. Popov, E. P. Korovin, M. V. Kultiasow, A. I. Vvedensky and others) performed field surveys covering the entire territory of Central Asia (including Kyzylkum Desert) and focused mainly on the inventory of the flora, investigation of the vegetation cover and identification of plant resources. In the 1930–1940s, geobotanical studies (first of all, survey of pastures) were also carried out in different regions of Uzbekistan by special expeditions of the Committee of Sciences (which in 1940 was reorganized into the Academy of Sciences of Uzbekistan); the results were used for creation of the first geobotanical map of Uzbekistan. As a result of these expeditions, dozens of new species and genera were found and described from different regions of Central Asia.

In 1934–1936, the Kenimekh complex expedition led by prominent expert in phytosociology I. I. Granitov explored the south-western part of Kyzylkum. The mission of this expedition was a comprehensive study of the climate, soil, vegetation, flora and fauna of this region. The Kenimekh expedition collected extensive data were on the natural conditions and biodiversity of the territory, including a huge amount of herbarium (currently kept at the National Herbarium of Uzbekistan, TASH).

After the completion of the Kenimekh expedition, I. I. Granitov continued studies of the flora and vegetation of south-western Kyzylkum; the results of his long-term research have been summarized in a 2-volume monograph "Vegetation cover of the South-Western Kyzylkum" (1964, 1967). I. I. Granitov provided the list of flora with 580 species from 290 genera and 55 families. Until now, this work remains one of the most fundamental publication on the plant diversity of this region. The book contains an essay of the history of botanical research, description of the physiographical and environmental conditions of the region, provides the analysis of the flora and vegetation, and a scheme of phytogeographical division of the territory, as well as the assessment of the influence of humans and wildlife on the vegetation.

The monograph by V. P. Drobow "Vegetation of sandy deserts of Uzbekistan" (1952) and two-volume monograph by K. Z. Zakirov "Flora and vegetation of the Zeravshan River basin" (1955, 1961) also contains some data about plant diversity of south-western Kyzylkum. In particular, K. Z. Zakirov compiled a summary checklist (with reference to herbarium collections) of 2588 plant species recorded for the entire Zeravshan River basin covering several phytogeographical regions of Mountain Central Asian and Turan provinces, among them, 320 species have been cited for lower reaches and ancient delta of Zeravshan River with adjacent areas of south-western Kyzylkum.

A significant amount of material was collected by the subsequent geobotanical expeditions of the 1950–1970s focused mainly on the investigation of rangelands. At that period, the specialists of the Institute of Botany of the Academy of Sciences of the Uzbek SSR experimented there with different methods of pastures restoration and improvement. Several prominent botanists, as T. A. Adylov, V. P. Botschantzev, I. F. Momotov, A. D. Lee, P. K. Zakirov, V. P. Drobow and others performed numerous field expeditions in Kyzylkum. These scientists made a significant contribution to the knowledge of the flora and vegetation of this region.

"Weed vegetation of the Bukhara region and measures of its control" (Guzairov, 1951, 1968), I. F. Momotov "Theoretical foundations and methods of phytomelioration of desert pastures in south-western Kyzylkum" (Momotov, 1973) and "Guide to a botanical excursion to the southern edge of Western Kyzylkum" (Saidov et al., 1975) should also be mentioned among the important scientific publications of the second half of the 20th Century devoted to the flora and vegetation of western and south-western Kyzylkum.

Several new botanical studies have been performed in western and south-western Kyzylkum and Bukhara Oasis since 2000 (Tojibaev, Beshko, 2007; Khassanov et al., 2011; Esanov, 2016, 2017, 2019; Shomurodov, 2018; Esanov, Sharipova, 2020; Rakhimova et al., 2020; Eshonkulov, Esanov, 2022, etc.). The most important botanical data were summarized in the book "Inventory of the flora of Uzbekistan: Bukhara Province" (Tojibaev et al., 2020). This book contains a checklist of 764 species vascular plants growing in the wild in this administrative region. The following information for each species is provided: life form, habitat, distribution within the Bukhara Province, conservation status, and economic use. Among them, 543 species are listed for the desert plain of Kyzylkum, 546 species – for lower reaches and ancient delta of Zeravshan River (Bukhara Oasis), and 463 species are recorded for the remnant low mountains; 25 species are red-listed at the national level; descriptions, photographs and distribution maps for threatened plant species are included.

Fundamental taxonomical treatments, as "Flora of the U.S.S.R." (1934–1964, in 30 volumes), 1st edition of the "Flora of Uzbekistan" (1941–1962, in 6 volumes), "Conspectus Florae Asiae Mediae" (1963–2015, in 11 volumes), and recently published first 4 volumes of the 2nd edition of the "Flora of Uzbekistan" (2016, 2017, 2019, 2022), should also be mentioned among the most important sources of information on the plant diversity of the project region. "Vegetation of Central Asia and South Kazakhstan" by E. P. Korovin (1934; 1961, 1962), "Vegetation cover of Uzbekistan and the ways of its practical use" (1971–1984, in 4 volumes), "Rangelands of the arid and semi-arid zones in Uzbekistan" (Gintzburger et al., 2003), "Botanical geography of Kazakhstan and Middle Asia" by E. I. Rachkovskaya et al. (2003), and "Botanical geography of Uzbekistan" (Tojibaev et al., 2017) also contains useful data about the flora and vegetation of project area. In particular, the general patterns of vegetation and a description of the main plant communities of Kyzylkum are given in the 2nd volume of the "Vegetation cover of Uzbekistan" (1973). The "Botanical geography of Uzbekistan" by Tojibaev et al. (2017) describes the main features of landscapes, flora and vegetation of each phyto-geographical region, as well as the history of botanical research.

The Red Data Book of Uzbekistan contains the data on nationally red-listed rare plants. National categories of threatened plants are the following: 0 (probably extinct species) — corresponds to EX or EW categories of the IUCN Red List, 1 (endangered, disappearing species) — meets CR or EN categories of IUCN, 2 (rare species) – meets VU category of IUCN and 3 (vulnerable, declining species) — corresponds to NT category of IUCN. To date, 5 editions of the Red Data Book of Uzbekistan have been published. The first (1984) included 163 plant species, the second (1998) — 301, the third (2006) — 302, the fourth (2009) — 321, and an actual, the fifth edition (2019) includes 314 plant species. Unfortunately, the data on globally threatened plants is not fully representative in case of Uzbekistan because currently only 236 taxa (5.4%) of more than 4380 species recorded for the flora of country were assessed by IUCN (mainly trees and shrubs), 16 species of them were included in the IUCN Red List as threatened (CR, EN and VU categories), and only 5 of them are red-listed at the national level. The rest 94.6% of species have not yet been assessed by IUCN and belong to NE category — Not Evaluated. 350 plant species of 112 genera are national endemics of Uzbekistan, 137 of them are red-listed at the national level, and none of them assessed as threatened (CR, EN, VU) in the IUCN Red List.

As for assessments of areas with high biodiversity conservation significance, they have been performed in Uzbekistan within the framework of UNDP-GEF project "Strengthening Sustainability of the National Protected Area System by Focusing on Strictly Protected Areas" and CEPF project "Mountains of Central Asia Biodiversity Hotspot". According to results of the first project published in the "Recommendations for protected areas system development in Uzbekistan" (Ismatov, 2013), 17 sites important for plant diversity were identified within Uzbekistan and recommended for protected areas. The second project has been focused on the assessment of Key Biodiversity Areas within Mountains of Central Asia Global Biodiversity Hotspot using the KBA standards; 36 KBA were identified for Uzbekistan. But the region of south-western Kyzylkum was not included in this analysis (Mountains of Central Asia Biodiversity Hotspot, 2017).

In 2016–2020, the Institute of Botany of the Academy of Sciences of the Republic of Uzbekistan participated in the regular environmental monitoring of oil and gas operations of LUKOIL Uzbekistan Operating Company LLC in the surroundings of Dengizkul Lake. In addition, in 2022, under a contract with the State Committee for Ecology of the Republic of Uzbekistan, the Institute

of Botany conducted botanical research in the Bukhara Province, including an inventory of the flora of all protected areas situated in this administrative region (including Dengizkul wildlife sanctuary) and determination of stocks of medicinal plants in accordance with the requirements of the Decree of the Cabinet of Ministers of the Republic of Uzbekistan "On the maintenance of state accounting, accounting of the volumes of use and the state cadastre of objects of flora and fauna" No. 914 dated November 07, 2018. However, in accordance with the terms of the above-mentioned contracts, the obtained data cannot be provided to a third party.

In 2021, as a result of the field surveys carried out within the framework of "Scaling Solar Uzbekistan Round 3" Project, 66 plant species were recorded in the project area, including 3 nationally and globally red-listed representatives of the genus *Calligonum* (*Calligonum matteianum, Calligonum molle* and *Calligonum paletzkianum*).

As other Central Asian representatives of *Calligonum*, these species bloom in April-May and bear fruits in May-June. The ripe fruits fall off, and remain under the mother plant or are carried by the wind and spread over quite long distances. Much of *Calligonum* fruits is consumed by livestock and wild animals, the rest, under favorable conditions, can germinate next spring or even after 4-7 years. The feature of *Calligonum* seeds is a deep dormancy and low germination due to their hard, thickened shell. Seed germination depends on the amount of precipitation falling during autumn, winter and spring. During the first year, young plants of *Calligonum* can reach a height of 50 to 100-115 cm; however, due to the extra-arid conditions of sandy desert, overgrazing and other negative impact, 90% or more of seedlings die in summer. Individuals of *Calligonum* begin to bear flowers and fruits at 2-5 years of age, and their lifespan is 12-20 years (Parpiev, 1974; Soskov, 2011; Butnik et al., 2016). The species of *Calligonum* are shrubs or small trees 0.5-4 m tall; one of the main features of the genus is a weak differentiation of morphological features of vegetative organs and flowers; species can be reliably distinguished and identified only by fruits. The taxonomy of this genus is very complex and difficult.

Calligonum L. is a genus of the family Polygonaceae widespread in arid regions of Central and Western Asia, North Africa and SE Europe. It is an ancient genus of the desert flora and the only genus in Polygonaceae that contains C4 species (Soskov, 2011; Butnik et al., 2016). They can tolerate extreme drought conditions by the loss of leaves and branches during the dry and hot season.

According to the different estimations, the genus *Calligonum* contains 28 (Soskov, 2011), 41 (POWO, 2022) to 81 (GBIF, 2022) accepted species. The desert zone of Central Asia is the main center of origin and diversity of *Calligonum.* 45 species have been reported for this region by Nabiev in the "Conspectus Florae Asiae Mediae" (1971), six of them are included in the IUCN Red List as globally threatened (Eastwood et al., 2009; IUCN Red List, 2023).

Publications on flora and vegetation of the project regions are listed in References.

4. Materials and methods

The springtime field survey was conducted 08 and 09 April 2023, by traditional methods of botanical survey commonly used for sampling and mapping of native non-forest vegetation, recognition of floristic composition and spatial patterns of plant communities (Field geobotany, 1959-1976; Granitov, 1980; Kent, 2011). The surveyed territory included the project site and adjacent areas with similar vegetation (potential sites for *Calligonum* relocation).

The structure of vegetation communities was described on 50x50 m geobotanical sample plots (squares) chosen in an area with homogeneous vegetation, representative for the project site. For each sample plot, photographs of the landscape and vegetation were taken using a digital camera, and following data were recorded: location and physical environment (including GPS coordinates, elevation, topography, and soil type), state of vegetation, type of land use and disturbance factors (grazing, roads, etc.), plant community, canopy cover (%), all plant species present at the plot, their cover and abundance, phenological stage and height. Species abundance was determined using the Braun-Blanquet cover-abundance scale (+ — occasional and less than 1% cover of the sample plot area; 1 — abundant with low cover, or less abundant but with higher cover, 1-5% of the sample plot area; 2 — abundant with >5-25% of the sample plot area, irrespective of the number of individuals; 3 — >25-50% cover of the sample plot area, irrespective of the number of individuals; 4 — >50-75% cover of the sample plot area, irrespective of the number of individuals; 5 — >75% cover of the sample plot area, irrespective of the number of individuals) and the DACFOR scale: D — Dominant; A — Abundant, C — Common, F — Frequent, O — Occasional, R — Rare.

Plant species were identified using special literature, as “Conspectus Florae Asiae Mediae” (1963-1993), “Flora of Uzbekistan” (1941-1963, 2016, 2017, 2019) and “Flora of USSR” (1934-1964). Available publications and online databases (Nikitin, 1983; IUCN/ISSG, 2014; CABI, 2017; Sennikov et al., 2018) were used for identification of alien species. The conservation status of plant species is given according the Red Data Book of Uzbekistan (2019) and IUCN Red List (www.iucnredlist.org).

It should be noted that currently only 289 taxa, or 6.6% of more than 4380 species recorded for the flora of Uzbekistan were assessed by IUCN, 27 species of them were included in the IUCN Red List as threatened (7 — CR, 10 — EN, 10 — VU), 17 of them are redlisted at the national level; 12 species are assessed as Near Threatened (NT), and 227 species belongs to the DD (Data Deficient) category (IUCN, 2023). The majority of species of the flora of Uzbekistan has not yet been assessed by IUCN and belongs to NE category — Not Evaluated.

To date, 5 editions of the Red Data Book of Uzbekistan have been published. The first (1984) included 163 plant species, the second (1998) — 301, the third (2006) — 302, the fourth (2009) — 321, and an actual, fifth edition (2019), includes 314 plant species, only 37 of them (11.8%) were assessed by IUCN to date. National categories of threatened plants are the following: 0 (probably extinct species) — corresponds to EX or EW categories of the IUCN Red List (www.iucnredlist.org), 1 (endangered, disappearing species) — meets CR category of IUCN, 2 (rare species) — meets EN category of IUCN and 3 (vulnerable, declining species) — corresponds to VU or NT category of IUCN.

As a result, the check-list of plant species recorded for the project area was compiled (Annex 1. Check-list of flora). Species in the check-list are arranged in alphabetic order. Accepted scientific

names are provided in accordance with the online global databases Plants of the World Online (www.plantsoftheworldonline.org/), International Plant Names Index (www.ipni.org) and Global Biodiversity Information Facility (www.gbif.org), as well as with recently published treatments of different taxonomical groups of the flora of Uzbekistan (Sennikov, 2016, 2017, 2019, 2022).

For the purposes of implementation of IFC Performance Standard 6, habitats are divided into modified, natural, and critical. Natural habitats are areas composed of viable assemblages of plant and/or animal species of largely native origin, and/or where human activity has not essentially modified an area's primary ecological functions and species composition. Modified habitats are areas that may contain a large proportion of plant and/or animal species of non-native origin, and/or where human activity has substantially modified an area's primary ecological functions and species composition. Critical habitats are a subset of modified or natural habitats.

As defined by the International Finance Corporation (IFC) Performance Standard 6 (PS6) and EBRD Performance Requirement 6 (PR6), critical habitats are areas with high biodiversity value, including (i) habitat of significant importance to Critically Endangered and/or Endangered species; (ii) habitat of significant importance to endemic and/or restricted-range species; (iii) habitat supporting globally significant concentrations of migratory species and/or congregatory species; (iv) highly threatened and/or unique ecosystems; and/or (v) areas associated with key evolutionary processes. Numerical thresholds have been defined for the first four critical habitat criteria (i.e., CR/EN species; endemic/restricted-range species; migratory/congregatory species; threatened and unique ecosystems); these thresholds are based on these published by IUCN in "A Global Standard for the Identification of Key Biodiversity Areas" (2016) and "IUCN Red List Categories and Criteria" (2012). For Criterion 5, there are no numerical thresholds.

Criterion 1 is triggered by species listed as CR or EN on the IUCN Red List, and nationally/regionally listed species assessed using similar criteria. Criterion 2 is triggered by habitats of significant importance for endemic or restricted-range species. Criterion 3 (migratory species) is inapplicable for plants. As for Criterion 4, unfortunately, the officially approved national list of highly threatened and/or unique ecosystems and habitats does not exist in Uzbekistan. But the National Biodiversity Conservation Strategy (1998), National reports on biodiversity conservation (2006, 2015) and other documents (Ismatov, 2013) indicated that the problem of conservation of all types of forest ecosystems (including saxaul stands and other desert shrublands) is a very critical issue in Uzbekistan. A specific legislation, management and forest protection measures are present at the national level. Forests and shrublands are key habitats for the conservation of many rare animals and plants in Central Asia. In the sandy desert, psammophilous shrublands have essential importance for sand fixation and combat desertification. But these ecosystems are under serious threat from over-exploitation as fuel wood source and over-grazing. Therefore, natural and planted desert "forests" must be taken into account.

The habitat map (Figure 2) was created using QGIS 3.18 free software on the basis of visual interpretation of Google Earth free satellite imagery, topographic maps (1:100,000, available online for free at http://loadmap.net/), and the data of field survey.

5. Results of the field survey

The springtime field survey (08 and 09 April 2023) showed that following habitat types can be identified in study area:

1. Fixed sands (sandy desert) with native psammophilous vegetation.
2. Banks of Amu-Bukhara Irrigation System (ABIS) canal with native riparian (tugay) vegetation.
3. Modified (anthropogenic) habitats with agricultural crops and sparse communities of wild rue, camel thorn and annuals.

Descriptions and photographs of habitats and plant communities recognized within construction site of planned solar power plant and in potential sites for relocation of threatened species of *Calligonum* are presented below (Table 1–Table 6, Figure 1–Figure 10). The total check-list of plant species recorded in April is represented in Annex 1. Check-list of flora. The habitat map created using QGIS 3.18 software on the basis of field data and visual interpretation of Google Earth satellite imagery is represented in Figure 2.

5.1. Fixed sands (sandy desert)

This is natural habitat, and main habitat type of the surveyed area. Almost all Project construction site is occupied with shallow fixed hilly, ridge-hilly and wavy sands, slightly saline near the ABIS canal. In the southern and south-western part of the area, sandy hills and ridges are 2-5 m high. The vegetation of sandy desert is represented with native psammophilous woodlands typical for south-western Kyzylkum. The canopy cover is 30 to 50%. Dominant species are *Haloxylon ammodendron, Haloxylon persicum, Calligonum sp., Xylosalsola arbuscula, Xylosalsola richteri*. The stock density is 0.3-0.5, 800-1500 shrubs per 1 hectare. Black and white saxaul (*Haloxylon ammodendron, Haloxylon persicum*) are up to 2.5-3 m tall, *Calligonum sp., Xylosalsola arbuscula* and *Xylosalsola richteri* are 1-1.5(1.7) m tall. In the northern part of the project site and on the eastern surroundings of the site, sandy hills are very low (about 1 m high).

Native psammophilous vegetation, particularly desert woodlands, forms a unique landscape of sandy deserts of Central Asia. The roots of plants, especially the desert sedge, form a dense network fixing sands. The formation of moving sands in Kyzylkum desert is the result of human impact (injurious felling of trees and shrubs for fuel, excessive grazing and various technological disturbance). Therefore, moving sands always occur around settlements, farmsteads, wells, developed mineral deposits, along roads, railways, pipelines and electric lines. The broken sands are susceptible to deflation and tend to fill cultural landscapes and infrastructure. In this connection, it is recommended to include special measures for fixation of sands.

Species of the genus *Calligonum* were not identified in early April because their flowering and fruiting had not yet started at the time of the survey. The main feature of the genus *Calligonum* is a weak differentiation of morphological features of vegetative organs and flowers; species can be reliably distinguished and identified only by fruits.

The herbaceous cover within all surveyed territory of this habitat is more or less uniform and typical for sandy desert of south-western Kyzylkum (except for disturbed areas); it is formed by

desert sedge (*Carex physodes*), annual ephemers (*Ceratocephala falcata, Eremopyrum bonaepartis, E. distans, Holosteum umbellatum, Strigosella brevipes, Tetracme recurvata*), xerophytic perennials (*Acanthophyllum elatius, Alhagi pseudalhagi, Smirnowia turkestana*) and psammophilous semishrubs (*Convolvulus divaricatus, Mausolea eriocarpa*).

The level of anthropogenic disturbance of this habitat type is low, it is connected mainly with grazing and collection of fuel wood by local people.

Following vegetation communities (map units) can be identified within the habitat type of sandy desert:

1. Psammophilous woodlands with the domination of saltworts (*Xylosalsola*) and *Calligonum.* In northern and eastern parts of the project site, as well as the area to the east of the SPP site (potential area of *Calligonum* relocation), they represented with ephemeral-*Astragalus-Convolvulus-Calligonum-Xylosalsola* community on fixed hilly and wavy shallow sands. Dominant species are *Xylosalsola arbuscula*, *Xylosalsola richteri, Calligonum sp.,* dwarf shrub *Astragalus villosissimus,* desert blindweed *Convolvulus divaricatus,* desert sedge *Carex physodes* and annuals (Table 1-Table 2, Figure 3-Figure 4).

Figure 3: Fixed shallow sands in the northern part of the project site with ephemeral-Astragalus-Convolvulus-Calligonum-Xylosalsola community (39.334162° N, 64.081665° E)

Figure 4: Fixed shallow sands in the northern part of the project site with ephemeral-Astragalus-Convolvulus-Calligonum-Xylosalsola community. Potential site for relocation of threatened species of Calligonum, about 1.5 km to the east of the project site (39.335404° N, 64.121382° E)

Table 1: Check-list of plants recorded for ephemeral-Astragalus-Convolvulus-Calligonum-Xylosalsola community on fixed hilly and wavy shallow sands (39.334162° N, 64.081665° E)

Species	Life form	Height, cm	Abundance		Phenol. Stage
			DACFOR	Braun-Blanquet	
Acanthophyllum elatius	perennial	40–50	O	+	vegetation
Agriophyllum lateriflorum	annual	25–30	O	+	dried
Alyssum desertorum	annual	5–7	O	+	Flowering, fruiting
Arnebia decumbens	annual	10–15	R	+	flowering
Astragalus unifoliolatus	dwarf shrub	40–50	O	+	flowering
Astragalus villosissimus	dwarf shrub	40–50	C	1	flowering
Bromus tectorum	annual	10–15	F	1	flowering
Calligonum sp.	shrub	100–150	C	1	vegetation
Carex physodes	Perennial	15–17	C	+	vegetation
Ceratocarpus arenarius	annual	12–15	C	+	vegetation
Ceratocephala falcata	annual	5–7	C	+	fruiting
Chamaesphacos ilicifolius	annual	7–10	O	+	flowering
Convolvulus divaricatus	semishrub	30–40	A	1	vegetation
Cousinia hamadae	perennial	20–25	R	+	vegetation
Delphinium camptocarpum	annual	12–15	R	+	flowering
Eminium lehmanii	perennial	15–20	R	+	fruiting
Eremopyrum bonaepartis	annual	7–10	C	+	flowering
Eremopyrum distans	annual	7–10	C	+	flowering
Erodium oxyrrhynchum	annual	12–15	R	+	flowering
Euphorbia turczaninowii	annual	7–10	F	+	flowering
Heliotropium arguzioides	perennial	15–20	O	+	vegetation
Heterocaryum szovitsianum	annual	10–15	R	+	Flowering
Holosteum umbellatum	annual	5–7	C	+	fruiting

Species	Life form	Height, cm	Abundance		Phenol. Stage
			DACFOR	Braun-Blanquet	
Hordeum murinum subsp. leporinum (H. leporinum)	annual	10–15	O	+	vegetation
Hyalea pulchella	annual	7–10	O	+	flowering
Hypecoum pendulum	annual	15–20	O	+	Flowering, fruiting
Isatis emarginata	annual	15–20	O	+	Flowering, fruiting
Isatis minima	annual	15–20	C	+	Flowering, fruiting
Koelpinia linearis	annual	12–15	R	+	flowering
Lomelosia olivieri (*Scabiosa olivierii*)	annual	12–15	R	+	flowering
Mausolea eriocarpa	semishrub	40–50	O	+	vegetation
Meniocus linifolius	annual	5–7	C	+	Flowering, fruiting
Peganum harmala	perennial	20–25	R	+	vegetation
Schismus arabicus	annual	7–10	O	+	flowering
Senecio subdentatus	annual	10–15	R	+	Flowering
Smirnowia turkestana	Perennial	30–40	O	+	flowering
Stipagrostis karelinii	perennial	40–50	O	+	vegetation
Streptoloma desertorum	annual	10–15	O	+	Flowering, fruiting
Strigosella brevipes	annual	15–20	C	+	Flowering, fruiting
Tetracme recurvata	annual	15–20	A	1	Flowering, fruiting
Xylosalsola arbuscula (Salsola arbuscula)	shrub	100–150	A	2	vegetation
Xylosalsola richteri (Salsola richteri)	shrub	100–150	C	1	vegetation

Table 2: Check-list of plants recorded for ephemeral-Astragalus-Convolvulus-Calligonum-Xylosalsola community on fixed hilly and wavy shallow sands (39.335404° N, 64.121382° E, potential area of Calligonum relocation)

Species	Life form	Height, cm	Abundance		Phenol. Stage
			DACFOR	Braun-Blanquet	
Acanthophyllum elatius	perennial	40–50	R	+	vegetation
Alyssum desertorum	annual	5–7	O	+	Flowering, fruiting
Arnebia decumbens	annual	10–15	R	+	flowering
Astragalus unifoliolatus	dwarf shrub	40–50	O	+	flowering
Astragalus villosissimus	dwarf shrub	40–50	C	1	flowering
Bromus tectorum	annual	10–15	F	1	flowering
Calligonum sp.	shrub	100–150	C	1	vegetation
Carex physodes	Perennial	15–17	O	+	vegetation
Ceratocarpus arenarius	annual	12–15	O	+	vegetation
Ceratocephala falcata	annual	5–7	O	+	fruiting
Chamaesphacos ilicifolius	annual	7–10	R	+	flowering
Convolvulus divaricatus	semishrub	30–40	A	1	vegetation
Cousinia sogdiana	biennial	15–20	R	+	vegetation
Delphinium camptocarpum	annual	12–15	R	+	flowering
Eremopyrum bonaepartis	annual	7–10	C	+	flowering
Eremopyrum distans	annual	7–10	C	+	flowering
Erodium oxyrrhynchum	annual	12–15	R	+	flowering

Species	Life form	Height, cm	Abundance		Phenol. Stage
			DACFOR	Braun-Blanquet	
Euphorbia turczaninowii	annual	7–10	F	+	flowering
Heliotropium arguzioides	perennial	15–20	O	+	vegetation
Heterocaryum szovitsianum	annual	10–15	R	+	Flowering
Holosteum umbellatum	annual	5–7	C	+	fruiting
Hordeum murinum subsp. leporinum (H. leporinum)	annual	10–15	O	+	vegetation
Hyalea pulchella	annual	7–10	O	+	flowering
Hypecoum pendulum	annual	15–20	C	+	Flowering, fruiting
Isatis emarginata	annual	15–20	O	+	Flowering, fruiting
Isatis minima	annual	15–20	O	+	Flowering, fruiting
Koelpinia linearis	annual	12–15	R	+	flowering
Lomelosia olivieri (*Scabiosa olivierii*)	annual	12–15	R	+	flowering
Mausolea eriocarpa	semishrub	40–50	R	+	vegetation
Meniocus linifolius	annual	5–7	C	+	Flowering, fruiting
Peganum harmala	perennial	20–25	R	+	vegetation
Schismus arabicus	annual	7–10	O	+	flowering
Senecio subdentatus	annual	10–15	O	+	Flowering
Smirnowia turkestana	Perennial	30–40	R	+	flowering
Stipagrostis karelinii	perennial	40–50	O	+	vegetation
Streptoloma desertorum	annual	10–15	O	+	Flowering, fruiting
Strigosella brevipes	annual	15–20	C	+	Flowering, fruiting
Tetracme recurvata	annual	15–20	A	1	Flowering, fruiting
Xylosalsola arbuscula (Salsola arbuscula)	shrub	100–150	A	2	vegetation
Xylosalsola richteri (Salsola richteri)	shrub	100–150	A	2	vegetation

2. Psammophilous woodlands with the domination of black and white saxaul (*Haloxylon ammodendron, Haloxylon persicum*), represented with ephemeral-*Convolvulus-Calligonum-Xylosalsola-Haloxylon* community, which occurs on slightly saline fixed ridge-hilly shallow sands in south-western and eastern part of the project site (Table 3, Figure 5). Similar vegetation is developed along the road between the pump station and small village Khamza to the west of the SPP site (

3. Table 4, Figure 6). This area is also potential for *Calligonum* relocation.

Table 3: Check-list of plants recorded for camel thorn-Convolvulus-Calligonum-Xylosalsola-Haloxylon community on slightly saline fixed ridge-hilly shallow sands (39.32121° N, 64.084403° E)

Species	Life form	Height, cm	Abundance		Phenol. Stage
			DACFOR	Braun-Blanquet	
Acanthophyllum elatius	perennial	40–50	O	+	vegetation
Agriophyllum lateriflorum	annual	25–30	R	+	dried
Alhagi pseudalhagi	perennial	40–50	F	+	vegetation
Alyssum desertorum	annual	5–7	C	+	Flowering, fruiting
Arnebia decumbens	annual	10–15	R	+	flowering
Astragalus unifoliolatus	dwarf shrub	40–50	O	+	flowering
Astragalus villosissimus	dwarf shrub	40–50	O	+	flowering
Bassia eriophora	annual	10–15	O	+	vegetation
Bromus tectorum	annual	10–15	A	1	flowering
Calligonum sp.	shrub	100–150	F	1	vegetation
Carex physodes	Perennial	15–17	C	+	vegetation
Ceratocarpus arenarius	annual	12–15	O	+	vegetation
Ceratocephala falcata	annual	5–7	C	+	fruiting
Chamaesphacos ilicifolius	annual	7–10	O	+	flowering
Convolvulus divaricatus	semishrub	30–40	C	1	vegetation
Convolvulus hamadae	semishrub	25–30	C	1	vegetation
Cutandia memphitica	annual	7–10	O	+	flowering
Delphinium camptocarpum	annual	12–15	R	+	flowering
Dorema sabulosum	perennial	25–30	R	+	vegetation
Ephedra strobilacea	shrub	100–150	R	+	vegetation
Eremopyrum bonaepartis	annual	7–10	C	+	flowering
Eremopyrum distans	annual	7–10	C	+	flowering
Erodium oxyrrhynchum	annual	12–15	R	+	flowering
Euphorbia turczaninowii	annual	7–10	F	+	flowering
Ferula karelinii	perennial	20–25	R	+	budding
Haloxylon ammodendron	Small tree	180–250	A	2	vegetation
Haloxylon persicum	Small tree	180–250	A	2	vegetation
Heliotropium arguzioides	perennial	15–20	O	+	vegetation
Heterocaryum szovitsianum	annual	10–15	R	+	Flowering
Holosteum umbellatum	annual	5–7	C	+	fruiting
Hordeum murinum subsp. leporinum (H. leporinum)	annual	10–15	O	+	vegetation
Hyalea pulchella	annual	7–10	O	+	flowering
Hypecoum pendulum	annual	15–20	F	+	Flowering, fruiting
Isatis emarginata	annual	15–20	O	+	Flowering, fruiting
Isatis minima	annual	15–20	C	+	Flowering, fruiting
Koelpinia linearis	annual	12–15	R	+	flowering
Lomelosia olivieri (*Scabiosa olivierii*)	annual	12–15	R	+	flowering
Mausolea eriocarpa	semishrub	40–50	O	+	vegetation
Meniocus linifolius	annual	5–7	C	+	Flowering, fruiting
Peganum harmala	perennial	20–25	R	+	vegetation
Schismus arabicus	annual	7–10	O	+	flowering
Senecio subdentatus	annual	10–15	R	+	Flowering

Species	Life form	Height, cm	Abundance		Phenol. Stage
			DACFOR	Braun-Blanquet	
Stipagrostis karelinii	perennial	40–50	O	+	vegetation
Streptoloma desertorum	annual	10–15	O	+	Flowering, fruiting
Strigosella brevipes	annual	15–20	C	+	Flowering, fruiting
Tetracme recurvata	annual	15–20	A	1	Flowering, fruiting
Xylosalsola arbuscula (Salsola arbuscula)	shrub	100–150	F	1	vegetation
Xylosalsola richteri (Salsola richteri)	shrub	100–150	F	1	vegetation

Figure 5: Psammophilous shrublands in the eastern part of the project site with domination of black and white saxaul (Haloxylon ammodendron, H. persicum), Xylosalsola richteri and Calligonum species

Table 4: Check-list of plants recorded for camel thorn-Convolvulus-Calligonum-Xylosalsola-Haloxylon community on slightly saline fixed hilly shallow sands (39.316088° N, 64.056204° E, potential area of Calligonum relocation)

Species	Life form	Height, cm	Abundance		Phenol. Stage
			DACFOR	Braun-Blanquet	
Acanthophyllum elatius	perennial	40–50	R	+	vegetation
Alhagi pseudalhagi	perennial	40–50	A	1	vegetation
Alyssum desertorum	annual	5–7	O	+	Flowering, fruiting
Arnebia decumbens	annual	10–15	R	+	flowering
Astragalus harpilobus	annual	5–7	R	+	flowering
Astragalus unifoliolatus	dwarf shrub	40–50	R	+	flowering
Astragalus villosissimus	dwarf shrub	40–50	O	+	flowering
Atriplex dimorphostegia	annual	10–15	O	+	flowering
Bassia eriophora	annual	10–15	O	+	vegetation
Bromus tectorum	annual	10–15	F	1	flowering
Calligonum sp.	shrub	100–150	C	1	vegetation
Carex physodes	Perennial	15–17	O	+	vegetation
Ceratocarpus arenarius	annual	12–15	O	+	vegetation
Ceratocephala falcata	annual	5–7	O	+	fruiting
Chamaesphacos ilicifolius	annual	7–10	R	+	flowering
Convolvulus divaricatus	semishrub	30–40	F	1	vegetation
Convolvulus hamadae	semishrub	25–30	O	+	vegetation
Delphinium camptocarpum	annual	12–15	R	+	flowering
Eminium lehmanii	perennial	15–20	C	+	fruiting
Ephedra strobilacea	shrub	100–150	R	+	vegetation
Eremopyrum bonaepartis	annual	7–10	C	+	flowering
Eremopyrum distans	annual	7–10	C	+	flowering
Euphorbia turczaninowii	annual	7–10	F	+	flowering
Haloxylon ammodendron	Small tree	150–180	F	1	vegetation
Haloxylon persicum	Small tree	150–180	F	1	vegetation
Heliotropium dasycarpum	perennial	10–15	O	+	flowering
Heterocaryum szovitsianum	annual	10–15	R	+	Flowering
Holosteum umbellatum	annual	5–7	C	+	fruiting
Hordeum murinum subsp. leporinum (H. leporinum)	annual	10–15	O	+	vegetation
Hyalea pulchella	annual	7–10	O	+	flowering
Hypecoum pendulum	annual	15–20	C	+	Flowering, fruiting
Isatis emarginata	annual	15–20	O	+	Flowering, fruiting
Isatis minima	annual	15–20	O	+	Flowering, fruiting
Koelpinia linearis	annual	12–15	R	+	flowering
Meniocus linifolius	annual	5–7	O	+	Flowering, fruiting
Peganum harmala	perennial	20–25	O	+	vegetation
Senecio subdentatus	annual	10–15	O	+	Flowering
Streptoloma desertorum	annual	10–15	O	+	Flowering, fruiting
Strigosella brevipes	annual	15–20	O	+	Flowering, fruiting
Tetracme recurvata	annual	15–20	F	+	Flowering, fruiting

Valerianella leiocarpa (V. dufresnia)	annual	5–7	C	+	Flowering, fruiting
Xylosalsola arbuscula (Salsola arbuscula)	shrub	100–150	O	+	vegetation
Xylosalsola richteri (Salsola richteri)	shrub	100–150	F	1	vegetation

Figure 6: Camel thorn-Convolvulus-Calligonum-Xylosalsola-Haloxylon community on slightly saline fixed hilly shallow sands, potential area for relocation of threatened species of Calligonum, about 0.5 km to the west of the project site

3. Psammophilous woodlands with the domination of white saxaul (*Haloxylon persicum*) and *Calligonum sp.* This plant community is located in central and western part of the Project site (

Table 5, Figure 7). In total, 58 species were recorded for the natural habitat type of sandy desert in April, 2023.

Figure 7: Psammophilous shrublands in the western part of the project site with domination of white saxaul (Haloxylon persicum) and Calligonum species

Table 5: Check-list of plants recorded for ephemeral-Astragalus-Convolvulus-Calligonum-white saxaul community on fixed ridge-hilly shallow sands (39.31658° N, 64.064228° E)

Species	Life form	Height, cm	Abundance		Phenol. Stage
			DACFOR	Braun-Blanquet	
Acanthophyllum elatius	perennial	40–50	O	+	vegetation
Alhagi pseudalhagi	perennial	40–50	O	+	vegetation
Alyssum desertorum	annual	5–7	C	+	Flowering, fruiting
Arnebia decumbens	annual	10–15	R	+	flowering
Astragalus flexus	perennial	15–20	R	+	vegetation
Astragalus harpilobus	annual	5–7	R	+	flowering
Astragalus unifoliolatus	dwarf shrub	40–50	O	+	flowering
Astragalus villosissimus	dwarf shrub	40–50	F	1	flowering
Atriplex dimorphostegia	annual	10–15	R	+	flowering
Bassia eriophora	annual	10–15	R	+	vegetation
Bromus tectorum	annual	10–15	F	+	flowering
Calligonum sp.	shrub	100–150	A	2	vegetation
Carex physodes	Perennial	15–17	F	1	vegetation
Ceratocarpus arenarius	annual	12–15	O	+	vegetation
Ceratocephala falcata	annual	5–7	C	+	fruiting

Species	Life form	Height, cm	Abundance		Phenol. Stage
			DACFOR	Braun-Blanquet	
Chamaesphacos ilicifolius	annual	7–10	O	+	flowering
Convolvulus divaricatus	semishrub	30–40	C	1	vegetation
Convolvulus hamadae	semishrub	25–30	O	+	vegetation
Cutandia memphitica	annual	7–10	O	+	flowering
Delphinium camptocarpum	annual	12–15	R	+	flowering
Eremopyrum bonaepartis	annual	7–10	F	+	flowering
Eremopyrum distans	annual	7–10	F	+	flowering
Erodium oxyrrhynchum	annual	12–15	R	+	flowering
Euphorbia turczaninowii	annual	7–10	F	+	flowering
Ferula karelinii	perennial	20–25	R	+	budding
Haloxylon persicum	Small tree	180–250	A	2	vegetation
Haplophyllum robustum	perennial	15–17	R	+	vegetation
Heliotropium arguzioides	perennial	15–20	O	+	vegetation
Heliotropium dasycarpum	perennial	10–15	O	+	flowering
Heterocaryum szovitsianum	annual	10–15	R	+	Flowering
Holosteum umbellatum	annual	5–7	O	+	fruiting
Hordeum murinum subsp. leporinum (H. leporinum)	annual	10–15	R	+	vegetation
Hyalea pulchella	annual	7–10	O	+	flowering
Hypecoum pendulum	annual	15–20	O	+	Flowering, fruiting
Isatis emarginata	annual	15–20	O	+	Flowering, fruiting
Isatis minima	annual	15–20	C	+	Flowering, fruiting
Koelpinia linearis	annual	12–15	R	+	flowering
Lomelosia olivieri (*Scabiosa olivierii*)	annual	12–15	R	+	flowering
Mausolea eriocarpa	semishrub	40–50	O	+	vegetation
Meniocus linifolius	annual	5–7	C	+	Flowering, fruiting
Schismus arabicus	annual	7–10	R	+	flowering
Senecio subdentatus	annual	10–15	O	+	Flowering
Stipagrostis karelinii	perennial	40–50	R	+	vegetation
Streptoloma desertorum	annual	10–15	O	+	Flowering, fruiting
Strigosella brevipes	annual	15–20	F	+	Flowering, fruiting
Tetracme recurvata	annual	15–20	C	1	Flowering, fruiting
Valerianella leiocarpa (V. dufresnia)	annual	5–7	C	+	Flowering, fruiting
Xylosalsola arbuscula (Salsola arbuscula)	shrub	100–150	O	+	vegetation
Xylosalsola richteri (Salsola richteri)	shrub	100–150	O	+	vegetation

5.2. Banks of Amu-Bukhara Irrigation System canal

Along the banks of ABSI canal, the vegetation is composed with poplars (*Populus euphratica, P. pruinosa*), reeds (*Phragmites australis, Typha sp.*), solitary specimens of willow (*Salix wilhelmsiana*), ravenna grass (*Tripidium (Erianthus) ravennae*), and other species typical for floodplains of major Central Asian rivers (*Alhagi pseudalhagi, Atriplex micrantha, Cynanchum acutum subsp. sibiricum, Tamarix ramosissima, Trachomitum lancifolium, Zygophyllum oxianum*), and annuals (*Erodium oxyrrhynchum*, *Hordeum murinum subsp. leporinum*) (Table 6, Figure 8). Poplar trees are up to between seven and eight meters tall. In total, 16 species were recorded for this habitat which should be regarded as semi-natural.

Table 6: Check-list of plants recorded for riparian vegetation along the banks of Amu-Bukhara channel (39.339447° N, 64.11002° E)

Species	Life form	Height, cm	Abundance		Phenol. Stage
			DACFOR	Braun-Blanquet	
Alhagi pseudalhagi	perennial	50–60	O	+	vegetation
Alyssum desertorum	annual	5–7	O	+	Flowering, fruiting
Atriplex micrantha	annual	15–20	R	+	vegetation
Bromus tectorum	annual	10–15	F	+	flowering
Cynanchum acutum subsp. sibiricum	Perennial, liana	50–60	R	+	vegetation
Erodium oxyrrhynchum	annual	12–15	O	+	flowering
Hordeum murinum subsp. leporinum (H. leporinum)	annual	10–15	O	+	vegetation
Phragmites australis	perennial	120–150	F	1	vegetation
Populus euphratica	tree	7–8 m	A	3	flowering
Populus pruinosa	tree	7–8 m	O	1	flowering
Salix wilhelmsiana	shrub	150–200	O	1	vegetation
Tamarix ramosissima	shrub	150–170	O	+	vegetation
Trachomitum lancifolium	Perennial, liana	50–60	R	+	vegetation
Tripidium (Erianthus) ravennae	perennial	200–250	R	+	vegetation
Typha sp.	perennial	100–120	O	+	vegetation
Zygophyllum oxianum	perennial	20–30	R	+	vegetation

Figure 8: Poplars (Populus euphratica, P. pruinosa) along the Amu-Bukhara channel

5.3. Modified (anthropogenic) habitats

The only modified habitat within the project site is represented with the quarry about almost devoid of vegetation, except of solitary specimens of camel thorn (*Alhagi pseudalhagi),* wild rue *(Peganum harmala)* and annuals (*Agriophyllum lateriflorum, Alyssum desertorum, Bromus tectorum, Ceratocarpus arenarius, Ceratocephala falcata, Eremopyrum bonaepartis, E. distans, Erodium oxyrrhynchum*, *Hypecoum pendulum, Meniocus linifolius, Tetracme recurvata*), 13 species in total. The quarry 300x400 m is located in the northern part of the project site, about 1 km to the east of the village Khamza (39.33723° N, 64.084327° E, Figure 9). Another quarry, 100x100 m, is located near the southern edge of SPP site (39.316277° N, 64.080925° E).

Modified habitats outside of the project site, but in adjacent areas, are represented with a small village, asphalt roads, irrigation channels, two electric substations, two pump stations and small-scale croplands. Near the south-western edge of the project site, there are small irrigated fields with wheat crops and fallow lands with very sparse vegetation represented with young black saxaul (*Haloxylon ammodendron*), solitary specimens of camel thorn (*Alhagi pseudalhagi),* wild rue *(Peganum harmala), Zygophyllum oxianum* and annuals (*Alyssum desertorum, Atriplex dimorphostegia, A.micrantha, Bassia eriantha, Bromus tectorum, Ceratocarpus arenarius, Ceratocephala falcata, Eremopyrum bonaepartis, E. distans, Erodium oxyrrhynchum*, *Hypecoum pendulum, Meniocus linifolius, Salsola praecox, S. paulsenii, Sinapis arvensis, Strigosella africana, Tetracme recurvata),* 21 species in total. These fields occupy an area of about 1 km x 300 m (Figure 10). Sparse communities of the same species occur along roadsides and near the village Khamza, pump stations and electric substations.

Figure 9: Small quarry in northern part of project site, near the village Khamza (39.33723° N, 64.084327° E). The vegetation is completely destroyed

Figure 10: Small irrigated wheat fields adjacent to the south-western edge of the project site (39.301583° N, 64.065495° E)

Nowadays the human impact within the project site is connected with economical activities of local people inhabiting a small village and several farmsteads (livestock farming, collection of fuel wood, pollution of the territory with household waste). In the surroundings of the project site, additional anthropogenic factors are infrastructure (roads, power lines, irrigation channels, two pump stations, two electric sub-stations), small quarries and small-scale agriculture. In general, the level of anthropogenic disturbance is medium (on the edges of the site) to low (in the center of the site).

During the April field survey, 72 plant species of 25 families were recorded in total, threatened species red-listed at the national or global level were not found (Annex 1. Check-list of flora). But it should be noted, that species of the genus *Calligonum* were not identified, because their flowering and fruiting had not yet started at the period of the survey. Most of recorded species are typical for south-western part of Kyzylkum Desert and more or less common and widely spread. *Peganum garmala*, a plant species which is an indicator of overgrazing and degradation of pastures, has been found everywhere within the project site, and its abundance varies from low (center of the site) to rather high (along roads and near the village Khamza). Two alien species, *Sinapis arvensis* and *Strigosella africana,* were recorded in modified habitat of irrigated croplands, near to but outside the southern edge of the SPP site.

6. Conclusion

Results of the field surveys conducted in the project site in April 2023 showed that the vegetation of this site is represented by native plant communities typical for south-western Kyzylkum. The Project site currently is used mainly as a rangeland. The level of anthropogenic disturbance is medium (on the edges of the site) to low (in the center of the site), and connected mainly with economical activities of local people (grazing, collection of fuel wood, pollution of the territory with household waste, small-scale agriculture), as well as with development of small quarries and infrastructure (roads, power lines, pump stations, electric substations, irrigation channels).

Three types of habitats were identified in study area:

1. Fixed sands (sandy desert) — natural habitat with native psammophilous woodlands composed of *Haloxylon ammodendron, Haloxylon persicum, Calligonum sp., Xylosalsola arbuscula* and *Xylosalsola richteri*.
2. Banks of Amu-Bukhara channel — semi-natural habitat with native riparian (tugay) vegetation composed of poplars, reeds and other species typical for floodplains of Central Asian rivers.
3. Modified (anthropogenic) habitats — small irrigated fields and fallow lands with agricultural crops and sparse communities of wild rue, camel thorn and annuals, small quarries almost devoid of vegetation, only with solitary specimens of wild rue, camel thorn and annuals.

A preliminary check-list of flora of the project site composed on the basis of the springtime survey includes 72 species of 25 families. Most of species recorded for the project site are typical and more or less common for south-western part of Kyzylkum Desert. Two species are alien (*Sinapis arvensis* and *Strigosella africana),* they were recorded among irrigated wheat crops, near the southern edge of the SPP site. Nationally and globally red-listed species *Calligonum matteianum, Calligonum molle* and *Calligonum paletzkianum*, recorded in this area in 2021, as well as other representatives of the genus *Calligonum,* were not identified during this survey because their flowering and fruiting had not yet started at this period. The main feature of the genus is a weak differentiation of morphological features of vegetative organs and flowers; species can be reliably distinguished and identified only by fruits.

References

1. A Global Standard for the Identification of Key Biodiversity Areas. Version 1.0. (2016) IUCN, Gland, Switzerland. 37 p.
2. Brauneder K.M., Montes C., Blyth S., Bennun L., Butchart S.H., Hoffmann M., Burgess N.D., Cuttelod A., Jones M.I., Kapos V., Pilgrim J., Tolley M.J., Underwood E.C., Weatherdon L.V., Brooks S.E. (2018) Global screening for Critical Habitat in the terrestrial realm. PloS one, 13(3), p.e0193102. doi:10.1371/journal.pone.0193102
3. Butnik A.A., Toderich K.N., Matyunina T.E., Zhapakova U.N., Yusupova, D.M. (2016) Handbook of Fruit Morphology and Biology of Seed Germination of Desert Plants of Central Asia. Yangi Nashr, Tashkent, Uzbekistan, 320 p. (In Russian)
4. CABI (2017) Invasive Species Compendium. CAB International, Wallingford, UK. Available from: www.cabi.org/isc.
5. Catalogue of Life (2021) Available from: https://www.catalogueoflife.org/.
6. Conspectus Florae Asiae Mediae. In 11 vol. (1963–2015) Fan Publishers, Tashkent. (In Russian).
7. Drobow V.P. (1953) *Calligonum* L. In: Flora of Uzbekistan, vol. 2. Academy of Sciences of the Uzbek SSR, Tashkent (In Russian).
8. Eastwood A., Lazkov G., Newton A. (2009) The Red List of Trees of Central Asia. Fauna & Flora International, Cambridge, UK, 27 p.
9. Esanov H.K. (2016) The alien fraction of the flora of Bukhara oasis. Stapfia 105: 92–98.
10. Esanov H.K. (2017) Analysis of the flora of Bukhara Oasis. Abstr. PhD Diss. Tashkent. 45 p. (In Uzbek and Russian)
11. Esanov H.K. (2019) Flora of Bukhara Oasis. Durdona Publishers, Bukhara. 128 p. (In Uzbek)
12. Esanov H.K., Sharipova V.K. (2020) Addition to the flora of Bukhara region (Uzbekistan). Turczaninowia 23 (1): 126–128
13. Eshonkulov A.H., Esanov H.K. (2022) Ethnobotanica of certain medicinal plants of Bukhara Region (Uzbekistan). American Journal of Plant Sciences 13: 394-402.
14. Fedtschenko B.A. (ed). (1912–1915) Preliminary reports on botanical research in Siberia and Turkestan in 1911–1914 r. Migration Depertment, St. Petersburg (In Russian).
15. Field geobotany. In 4 vol. (1959–1976) Academy of Sciences of the USSR, Moscow & Leningrad. (In Russian).
16. Flora of the U.S.S.R. In 30 vol. (1934–1964) Academy of Sciences of the USSR, Moscow & Leningrad. (In Russian).
17. Flora of Uzbekistan. In 6 vol. (1941–1963) Academy of Sciences of the Uzbek SSR, Tashkent. (In Russian).
18. GBIF (2023). Global Biodiversity Information Facility. Available from: https://www.gbif.org/
19. Geographical atlas of Uzbekistan. (2012) Goskomgeodeskadastr, Tashkent. 119 p. (In Russian).
20. Gintzburger G., Toderich K.N., Mardonov B.K. & Mahmudov M.M. (2003) Rangelands of the arid and semi-arid zones in Uzbekistan. CIRAD, ICARDA. 434 p.

21. Granitov A.I. (ed.) (1980) Methodological guidelines for geobotanical survey of natural rangelands in Uzbekistan. Uzgiprozem, Tashkent. 170 pp. (In Russian)
22. Granitov I.I. (1964, 1967) Vegetation cover of the South-Western Kyzylkum. Vol. 1–2. Fan Publishers, Tashkent. 335 p., 419 p. (In Russian).
23. Guzairov H.H. (1951) Weed vegetation of the Bukhara region and measures of its control. Abstr. PhD Diss. Bukhara-Samarkand. 11 p. (In Russian).
24. Guzairov H.H. (1968) Weeds of fallow lands and croplands of Bukhara. In: Harmful and useful wild plants of Bukhara Oasis. No. 1. Fan Publishers, Tashkent. P. 52-90. (In Russian).
25. IFC (International Finance Corporation) (January 1, 2012, updated June 27, 2019) Guidance Note 6: Biodiversity Conservation and Sustainable Management of Living Natural Resources. Word Bank Group, Washington, DC. 69 p.
26. International Plant Names Index (2020) Available from: http://www.ipni.org.
27. Ismatov A.T. (ed.) (2013) Recommendations for protected areas system development in Uzbekistan. UNDP, GEF, Main Department of Forestry of Ministry of Agriculture and Water Resources of the Republic of Uzbekistan. Baktria Press, Tashkent. 256 p. (In Russian).
28. IUCN Red List of Threatened species (2021) Available from: http://www.iucnredlist.org.
29. IUCN/SSC Invasive Species Specialist Group (ISSG) (2014) Global Invasive Species Database version 2014-2. Available from: http://193.206.192.138/gisd/
30. Kent M. (2011) Vegetation Description and Data Analysis: A Practical Approach, 2nd Edition. Wiley-Blackwell. 428 pp.
31. Khassanov F. O., Shomuradov Kh. F. & Kadyrov G. (2011) A short description and analysis of endemism of the Kyzylkum desert. Bot. Journ. (96) 2: 237–245. (In Russian).
32. Korovin E.P. (1934) Vegetation of Middle Asia and South Kazakhstan. Moscow & Tashkent. 479 p. (In Russian).
33. Korovin E.P. (1961) Vegetation of Middle Asia and South Kazakhstan. Vol. 1. Tashkent. 452 p. (In Russian).
34. Korovin E.P. (1962) Vegetation of Middle Asia and South Kazakhstan. Vol. 2. Tashkent. 547 p. (In Russian).
35. Lipsky V. I. (1902–1905) Flora of Central Asia, i.e. Russian Turkestan and Bukhara and Khiva Khanates. Vol. 1–3. Herald Publishers, St. Petersburg (In Russian).
36. Maassoumi A.A. 2011. A revision of the genus *Calligonum* (Polygonaceae) in Iran. Iranian Journal of Botany 17(1): 43-54.
37. Melnikova R.D. (1973) Psammophilous vegetation – Psammophyta. In: Vegetation cover of Uzbekistan and the ways of its practical use. Vol. 2. Fan Publishers, Tashkent. Pp. 4–80 (In Russian).
38. Momotov I.F. (1973) Theoretical foundations and methods of phytomelioration of desert pastures in south-western Kyzylkum. Fan Publishers, Tashkent (In Russian).
39. Mountains of Central Asia Biodiversity Hotspot: Ecosystem Profile. (2017). CEPF, Switzerland. 183 p.
40. Nabiev M.M. (1971) *Calligonum* L. In: Conspectus Florae Asiae Mediae, vol. 2. Fan Publishers, Tashkent. Pp. 182–201 (In Russian).

41. Nikitin V.V. (1983) Weeds of the flora of the USSR. Science Publishers, Leningrad. 454 p. (In Russian).
42. Nurov U.N. (1981) Main features of nature of Bukhara Oasis. In: Wild plants and crops of Bukhara Oasis. Vol. 211. Tashkent. P. 1-4.
43. Pavlov N.V. (1936) *Calligonum* L. In: Flora of U.S.S.R., vol. 5. Academy of Sciences of the USSR, Moscow & Leningrad. Pp. 527–594 (In Russian)
44. Pavlov N.V. (1937) *Calligonum* L. In: Flora of Turkmenistan, vol. 2. Turkmen branch of Academy of Sciences of the USSR, Ashkhabad. Pp. 55–79 (In Russian)
45. Parpiev Yu.P. (1974) Biological and ecological characteristics of the representatives of *Calligonum* L. and their phylogenetic aspects: Abstract Dissertation, Doctor of Biological Sciences, Tashkent, Uzbekistan, 55 p. (In Russian)
46. POWO (2023). Plants of the World Online. Available from: www.plantsoftheworldonline.org/)
47. Rachkovskaya E. I., Volkova E. A. & Khramtsov V. N. (eds.) (2003) Botanical geography of Kazakhstan and Middle Asia. Leningrad. 425 p. (In Russian and Engl.).
48. Rakhimova N.K., Rakhimova T., Sharipova V.K., Beshko N.Yu., Esanov Kh.K. (2020) Current state of coenopopulations of some rare species of the genus *Calligonum* L. (Polygonaceae) in the Bukhara region, Uzbekistan. Asia Life Sciences, 2020, 29 (1): 365–378
49. Red Data Book of the Uzbek SSR (1984) Vol. 2. Plants. Tashkent. 150 p. (in Uzbek and Russian).
50. Red Data Book of the Republic of Uzbekistan (1998) Vol. 1. Plants. Chinor ENK, Tashkent. 335 p. (in Uzbek and Russian).
51. Red Data Book of the Republic of Uzbekistan (2006) Vol. 1. Plants and Fungi. Chinor ENK, Tashkent. 250 p. (in Uzbek, Russian and English).
52. Red Data Book of the Republic of Uzbekistan (2009) Vol. 1. Plants and Fungi. Chinor ENK, Tashkent. 360 p. (in Uzbek, Russian and English).
53. Red Data Book of the Republic of Uzbekistan (2019) Vol. 1. Plants. Tasvir, Tashkent. 356 p. (in Uzbek, Russian and English).
54. Saidov D.K., Markova L.E., Momotov I.F. (1975) Guide to a botanical excursion to the southern edge of Western Kyzylkum. Leningrad. P. 2-12 (In Russian).
55. Sennikov A.N. (ed.) (2016) Flora of Uzbekistan, 2nd Edition. Vol. 1. Amaryllidaceae. Navroʻz Publishers, Tashkent. Xxviii + 173 p. (In Russian).
56. Sennikov A.N. (ed.) (2017) Flora of Uzbekistan, 2nd Edition. Vol. 2. Navroʻz Publishers, Tashkent. Xii + 200 pp. (In Russian)
57. Sennikov A.N. (ed.) (2019) Flora of Uzbekistan, 2nd Edition. Vol. 3. Ma'naviat Publishers, Tashkent. Xii + 201 pp. (In Russian)
58. Sennikov A.N., Tojibaev K.Sh., Beshko N.Yu., Esanov H.K., Jenna Wong L. & Pagad S. (2018) Global Register of Introduced and Invasive Species – Uzbekistan. Version 1.3. Invasive Species Specialist Group ISSG. Available from: https://doi.org/10.15468/m5vdwk.
59. Shomurodov Kh.F. (2018) Fodder plants of Kyzylkum and the prospects fortheir use. Dsci Diss. Tashkent. 296 p. (In Russian).

60. Soskov Yu.D. (1968) *Calligonum* L. In: Flora of Tajik SSR, vol. 3. Academy of Sciences of the USSR, Moscow & Leningrad. Pp. 224–242 (In Russian)
61. Soskov Yu.D. (2011) Genus *Calligonum* L. (taxonomy, geography, evolution, introduction). Novosibirsk, 362 p. (In Russian)
62. Tojibaev K.Sh. (2002) Vegetation cover and pastures of the Chadaksai river basin. Abstr. Cand. Diss. Tashkent. 19 p. (In Uzbek).
63. Tojibaev K.Sh. (2009) New species of *Tulipa* L. (subg. *Tulipa*) from Uzbekistan. Linzer Biol. Beitr. 41: 1063–1066.
64. Tojibaev K.Sh. (2010) Flora of the South-Western Tien Shan (within the Republic of Uzbekistan). Tashkent. 98 p. (In Russian).
65. Tojibaev K.Sh., Beshko N.Yu. (2007) The cadaster of rare and endemic plants of Dzhizak and Navoi provinces of the Republic of Uzbekistan. In: Biodiversity of Uzbekistan – monitoring and use. Tashkent. Pp. 200-208. (In Russian).
66. Tojibaev K.Sh., Beshko N.Yu. (2015) Reassessment of diversity and analysis of distribution in *Tulipa* (Liliaceae) in Uzbekistan. Nordic Journal of Botany 33: 324–334.
67. Tojibaev K.Sh., Beshko N.Yu. & Popov V.A. (2016) Botanical-geographical regionalization of Uzbekistan. Bot. Journ. 101 (10): 1105–1132. (In Russian).
68. Tojibaev K.Sh., Beshko N.Yu., Popov V.A., Jang C.G. & Chang K.S. (2017) Botanical Geography of Uzbekistan. Korea National Arboretum, Pocheon, Republic of Korea. 250 p.
69. Tojibaev K.Sh., Beshko N.Yu., Shomurodov Kh.F. & al. (2020) Inventory of the flora of Uzbekistan: Bukhara Province. O'kituvchi Publishers, Tashkent. 128 p. (In Russian).
70. Tojibaev K.Sh., de Groot J.J. & Naralieva N.M. (2014) *Tulipa intermedia* sp. nov. (Liliaceae) from the Ferghana Depression, Uzbekistan. Nordic Journal of Botany 32: 546–550.
71. Tojibaev K.Sh., Karimov F.I. & Turgunov M.D. (2014) A new species of the genus *Iris* L. (Iridaceae Juss.) from the Ferghana Valley. Turczaninowia 17 (4): 12–16. (In Russian).
72. Tojibaev K.Sh., Karimov F.I. (2012) Endemic monocotyledonous geophytes of Fergana Valley flora. Plant Life of Asian Russia 1: 55–59. (In Russian).
73. Tojibaev K.Sh., Naralieva N.M. (2012) New findings of rare and endemic Apiaceae species in Uzbekistan. Turczaninowia 15 (4): 31–33. (In Russian).
74. Tojibaev K.Sh., Naralieva N.M. & Ibrokhimova G.A. (2012) Addition to the flora of the South-western Tien-Shan. Uzbek. Biol. Journ. 6: 26–29. (In Russian).
75. Vegetation cover of Uzbekistan and the ways of its practical use (1971–1984) In 4 vol. Fan Publishers, Tashkent. (In Russian).
76. Vernik R.S., Rakhimova T. (1982) Natural vegetation and pastures of foothills of the Namangan region. Tashkent. 90 p. (In Russian).
77. Zakirov K.Z. (1955) Flora and vegetation of the Zeravschan river basin. Vol. 1. Fan Publishers, Tashkent. 205 p. (In Russian).
78. Zakirov K.Z. (1961) Flora and vegetation of the Zeravschan river basin. Vol. 2. Fan Publishers, Tashkent. 446 p. (In Russian).

Annex 1. Check-list of flora

Species	Life form	Distribution	Habitat type	Abundance	IUCN status	National status
Ephedraceae						
1. Ephedra strobilacea	shrub	Regional	Fixed sands	R	Least Concern (LC)	none
Araceae						
2. Eminium lehmanii	perennial	Regional	Fixed sands	O–R	Not Evaluated (NE)	none
Cyperaceae						
3. *Carex physodes*	Perennial	Regional	Fixed sands	O–A	Not Evaluated (NE)	none
Poaceae						
4. Bromus tectorum	annual	Transcontinental	All types	A–O	Not Evaluated (NE)	none
5. Cutandia memphitica	annual	Regional	Fixed sands	R–O	Not Evaluated (NE)	none
6. Eremopyrum bonaepartis	annual	Regional	All types	O	Not Evaluated (NE)	none
7. Eremopyrum distans	annual	Regional	All types	O	Not Evaluated (NE)	none
8. Hordeum murinum subsp. leporinum (H. leporinum)	annual	Transcontinental	All types	O–C	Not Evaluated (NE)	none
9. Phragmites australis	Perennial	Transcontinental	Banks of channel	F	Least Concern (LC)	none
10. Schismus arabicus	annual	Regional	Fixed sands	R	Not Evaluated (NE)	none
11. Stipagrostis karelinii	Perennial	Regional	Fixed sands	O	Not Evaluated (NE)	none
12. Tripidium ravennae (Erianthus ravennae)	perennial	Transcontinental	Banks of channel	O	Least Concern (LC)	none
Papaveraceae						
13. Hypecoum pendulum	annual	Regional	Fixed sands, modified habitats	R–O	Not Evaluated (NE)	none
Ranunculaceae						
14. Ceratocephala falcata	annual	Regional	Fixed sands, modifie	R–O	Not Evaluated (NE)	none

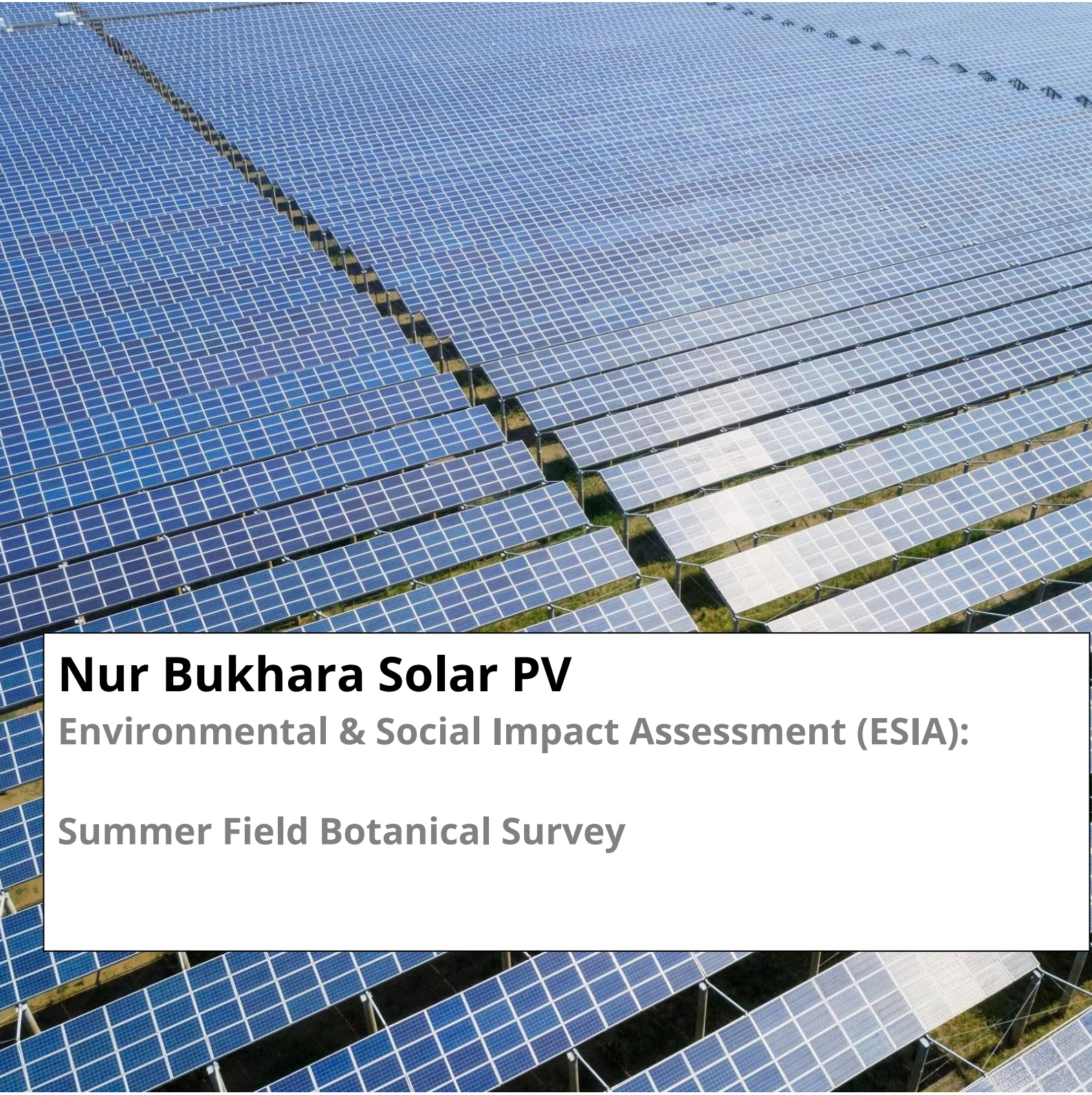
Species	Life form	Distribution	Habitat type	Abundance	IUCN status	National status
			d habitats			
15. Delphinium camptocarpum	annual	Regional	Fixed sands	R	Not Evaluated (NE)	none
Zygophyllaceae						
16. Zygophyllum oxianum	perennial	Regional	Banks of channel, modified habitats	R	Not Evaluated (NE)	none
Fabaceae						
17. Alhagi pseudalhagi	perennial	Regional	All types	O–A	Not Evaluated (NE)	none
18. Astragalus flexus	perennial	Regional	Fixed sands	R	Not Evaluated (NE)	none
19. Astragalus harpilobus	annual	Regional	Fixed sands	R	Not Evaluated (NE)	none
20. Astragalus unifoliolatus	dwarf shrub	Regional	Fixed sands	O–R	Not Evaluated (NE)	none
21. Astragalus villosissimus	dwarf shrub	Regional	Fixed sands	C–O	Not Evaluated (NE)	none
22. Smirnowia turkestana	Perennial	Regional	Fixed sands	R–O	Not Evaluated (NE)	none
Salicaceae						
23. Populus euphratica	Tree	Regional	Banks of channel	A	Least Concern (LC)	none
24. Populus pruinosa	Tree	Regional	Banks of channel	O	Near Threatened (NT)	none
25. Salix wilhelmsiana	shrub	Regional	Banks of channel	O	Least Concern (LC)	none
Euphorbiaceae						
26. Euphorbia turczaninowii	annual	Regional	Fixed sands	R–O	Not Evaluated (NE)	none
Geraniaceae						
27. Erodium oxyrrhynchum	annual	Regional	All types	R	Not Evaluated (NE)	none
Nitrariaceae						
28. Peganum garmala	Perennial	Regional	Fixed sands, modified habitats	R–C	Not Evaluated (NE)	None. Weed – indicator of overgrazing
Rutaceae						

Species	Life form	Distribution	Habitat type	Abundance	IUCN status	National status
29. Haplophyllum robustum	Perennial	Regional	Fixed sands	R	Not Evaluated (NE)	none
Brassicaceae						
30. Alyssum desertorum	annual	Regional	All types	O–C	Not Evaluated (NE)	none
31. Isatis emarginata	annual	Regional	Fixed sands	R–O	Not Evaluated (NE)	none
32. Isatis minima	annual	Regional	Fixed sands	O–C	Not Evaluated (NE)	none
33. Meniocus linifolius	annual	Regional	Fixed sands, modified habitats	R–O	Not Evaluated (NE) none	none
34. Sinapis arvensis	annual	Transcontinental	modified habitats	R	Alien, Not Evaluated (NE) none	None, alien weed
35. Streptoloma desertorum	annual	Regional	Fixed sands	R	Not Evaluated (NE) none	none
36. Strigosella africana	annual	Regional	modified habitats	R	Alien, Not Evaluated (NE) none	None, alien weed
37. Strigosella brevipes	annual	Regional	Fixed sands	R–C	Least Concern (LC) none	none
38. Tetracme recurvata	annual	Regional	Fixed sands, modified habitats	A–R	Least Concern (LC) none	none
Tamaricaceae						
39. Tamarix ramosissima	shrub	Transcontinental	Banks of channel	O	Least Concern (LC)	none
Polygonaceae						
40. Calligonum sp.	shrub	Regional	Fixed sands	O	???	???
Caryophyllaceae						
41. Acanthophyllum elatius	perennial	Regional	Fixed sands	O–R	Not Evaluated (NE)	none
42. Holosteum umbellatum	annual	Regional	Fixed sands	R–O	Not Evaluated (NE)	none
Amaranthaceae						
43. Agriophyllum lateriflorum	annual	Regional	Fixed sands, modified habitats	O–R	Not Evaluated (NE)	none

Species	Life form	Distribution	Habitat type	Abundance	IUCN status	National status
44. Atriplex dimorphostegia	annual	Regional	Fixed sands, modified habitats	O–R	Not Evaluated (NE)	none
45. Atriplex micrantha	annual	Transcontinental	Banks of channel, modified habitats	R	Not Evaluated (NE)	none
46. Bassia eriophora	annual	Regional	Fixed sands, modified habitats	O–R	Not Evaluated (NE) none	
47. Ceratocarpus arenarius	annual	Regional	Fixed sands, modified habitats	O–C	Not Evaluated (NE) none	
48. Haloxylon ammodendron	Small tree	Regional	Fixed sands, modified habitats	O–A	Not Evaluated (NE)	none
49. Haloxylon persicum	Small tree	Regional	Fixed sands	O–A	Least Concern (LC)	none
50. Salsola paulsenii	annual	Regional	modified habitats	O	Not Evaluated (NE)	none
51. Salsola praecox	annual	Regional	modified habitats	O	Not Evaluated (NE)	none
52. Xylosalsola arbuscula (Salsola arbuscula)	shrub	Regional	Fixed sands	O	Not Evaluated (NE)	none
53. Xylosalsola richteri (Salsola richteri)	shrub	Regional	Fixed sands	O–D	Least Concern (LC)	none
Apocynaceae						
54. Cynanchum acutum subsp. sibiricum	*Cynanchum acutum subsp. sibiricum*	Regional	Banks of channel	R	Least Concern (LC)	none
55. Trachomitum lancifolium	Perennial	Regional	Banks of channel	R	Not Evaluated (NE)	none
Boraginaceae						
56. Arnebia decumbens	annual	Regional	Fixed sands	R	Not Evaluated (NE)	none
57. Heliotropium arguzioides	perennial	Regional	Fixed sands	O	Not Evaluated (NE)	none

Species	Life form	Distribution	Habitat type	Abundance	IUCN status	National status
58. Heliotropium dasycarpum	perennial	Regional	Fixed sands	O–R	Not Evaluated (NE)	none
59. Heterocaryum szovitsianum	annual	Regional	Fixed sands	R	Not Evaluated (NE)	none
Convolvulaceae						
60. Convolvulus divaricatus	semishrub	Regional	Fixed sands	O–A	Not Evaluated (NE)	none
61. Convolvulus hamadae	semishrub	Regional	Fixed sands	O–C	Not Evaluated (NE)	none
Lamiaceae						
62. Chamaesphacos ilicifolius	annual	Regional	Fixed sands	R	Not Evaluated (NE)	none
Asteraceae						
63. Cousinia hamadae	Perennial	Regional	Fixed sands	R	Not Evaluated (NE)	none
64. Cousinia sogdiana	Biennial	Regional	Fixed sands	R	Not Evaluated (NE)	none
65. Hyalea pulchella	annual	Regional	Fixed sands	R	Not Evaluated (NE)	none
66. Koelpinia linearis	annual	Regional	Fixed sands	R	Not Evaluated (NE)	none
67. Mausolea eriocarpa	semishrub	Regional	Fixed sands	R–O	Not Evaluated (NE)	none
68. Senecio subdentatus	annual	Regional	Fixed sands	R–O	Not Evaluated (NE)	none
Caprifoliaceae						
69. Lomelosia olivieri (Scabiosa olivierii)	annual	Regional	Fixed sands	R	Not Evaluated (NE)	none
70. Valerianella leiocarpa (V. dufresnia)	annual	Regional	Fixed sands	R	Not Evaluated (NE)	none
Apiaceae						
71. Dorema sabulosum	perennial	Regional	Fixed sands	R	Not Evaluated (NE)	none
72. Ferula karelinii	perennial	Regional	Fixed sands	R	Not Evaluated (NE)	none

Technical appendix 10:
Summer Botanical Survey report



Nur Bukhara Solar PV

Environmental & Social Impact Assessment (ESIA):

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1. Aims and objectives

In accordance with TOR, the main tasks of expert-botanist are following:

- Field botanical research and processing of field data;
- Analysis of any previous botanical surveys and other available data (publications, reports, etc.) compared with the results of the 2023 survey;
- detailed description and GIS-based mapping of habitat types present in the project area;
- Compilation of the check-list of plant species recorded project site (in particular, threatened species included in the Red Data Book of Uzbekistan and/or the IUCN Red List);
- Identification of *Calligonum* species, count of population, collection and relocation of seeds of *Calligonum* included in the IUCN Red List and Red Data Book of Uzbekistan;
- Reporting.

2. Project site

The project area is situated in Alat District of the Bukhara Province of Uzbekistan, in the western part of the sandy desert called Sundukli Sands (south-western part of Kyzylkum Desert), about 10 km to the north of the lake Dengizkul (wildlife sanctuary/Ramsar site Dengizkul) and 25 km to the east of town Alat, between two branches of the Amu-Bukhara channel, near Khamza pump station (Figure 1). The elevations are 188–206 m a.s.l.

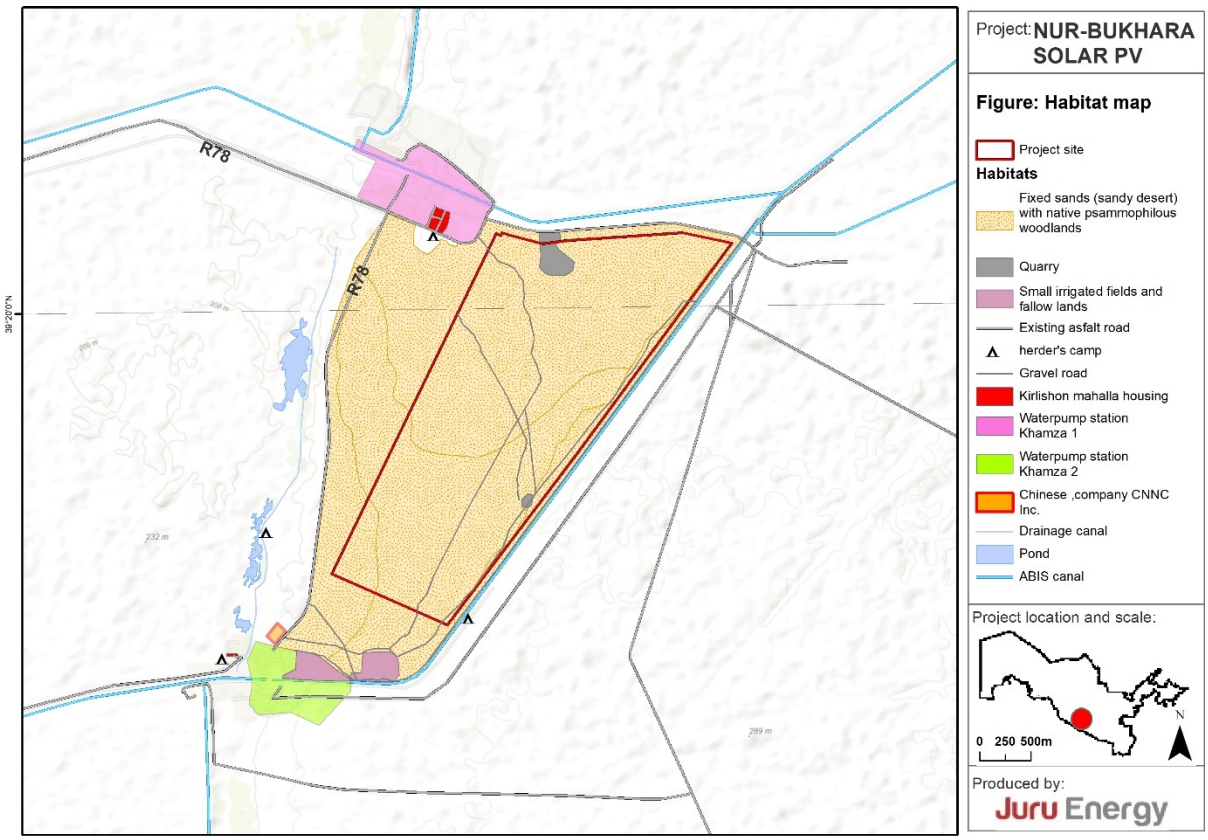


Figure 1: Project area.

3. Literature review

The review of literature and previous botanical surveys, as well as a short description of flora and vegetation of the project region and list of publications have been represented in the report on the springtime survey.

4. Materials and methods

The summer field survey was conducted June 17, 2023, by traditional methods of botanical survey commonly used for sampling and mapping of native non-forest vegetation, recognition of floristic composition and spatial patterns of plant communities (Field geobotany, 1959–1976; Granitov, 1980; Kent, 2011). The surveyed territory included the project site and adjacent areas with similar vegetation (potential sites for *Calligonum* relocation).

The structure of vegetation communities was described on 50x50 m geobotanical sample plots (squares) chosen in an area with homogeneous vegetation, representative for the project site. For each sample plot, photographs of the landscape and vegetation were taken using a digital camera, and following data were recorded: location and physical environment (including GPS coordinates, elevation, topography, and soil type), state of vegetation, type of land use and disturbance factors (grazing, roads, etc.), plant community, canopy cover (%), all plant species present at the plot, their cover and abundance, phenological stage and height. Species abundance was determined using the Braun-Blanquet cover-abundance scale (+ – occasional and

less than 1% cover of the sample plot area; 1 – abundant with low cover, or less abundant but with higher cover, 1–5% of the sample plot area; 2 – abundant with >5–25% of the sample plot area, irrespective of the number of individuals; 3 – >25–50% cover of the sample plot area, irrespective of the number of individuals; 4 – >50–75% cover of the sample plot area, irrespective of the number of individuals; 5 – >75% cover of the sample plot area, irrespective of the number of individuals) and the DACFOR scale: D – Dominant; A – Abundant, C – Common, F – Frequent, O – Occasional, R – Rare.

Plant species were identified using special literature, as "Conspectus Florae Asiae Mediae" (1963–1993), "Flora of Uzbekistan" (1941–1963, 2016, 2017, 2019, 2022) and "Flora of USSR" (1934–1964). Available publications and online databases (Nikitin, 1983; IUCN/ISSG, 2014; CABI, 2017; Sennikov et al., 2018) were used for identification of alien species. The conservation status of plant species is given according the Red Data Book of Uzbekistan (2019) and IUCN Red List (www.iucnredlist.org).

As a result, the check-list of plant species recorded for the project area was compiled (Annex 1). Species in the checklist are arranged in alphabetic order. Accepted scientific names are provided in accordance with the online global databases Plants of the World Online (www.plantsoftheworldonline.org/), International Plant Names Index (www.ipni.org) and Global Biodiversity Information Facility (www.gbif.org), as well as with recently published treatments of different taxonomical groups of the flora of Uzbekistan (Sennikov, 2016, 2017, 2019, 2022).

For the purposes of implementation of IFC Performance Standard 6, habitats are divided into modified, natural, and critical. Natural habitats are areas composed of viable assemblages of plant and/or animal species of largely native origin, and/or where human activity has not essentially modified an area's primary ecological functions and species composition. Modified habitats are areas that may contain a large proportion of plant and/or animal species of non-native origin, and/or where human activity has substantially modified an area's primary ecological functions and species composition. Critical habitats are a subset of modified or natural habitats.

As defined by the International Finance Corporation (IFC) Performance Standard 6 (PS6) and EBRD Performance Requirement 6 (PR6), critical habitats are areas with high biodiversity value, including (i) habitat of significant importance to Critically Endangered and/or Endangered species; (ii) habitat of significant importance to endemic and/or restricted-range species; (iii) habitat supporting globally significant concentrations of migratory species and/or congregatory species; (iv) highly threatened and/or unique ecosystems; and/or (v) areas associated with key evolutionary processes. Numerical thresholds have been defined for the first four critical habitat criteria (i.e., CR/EN species; endemic/restricted-range species; migratory/congregatory species; threatened and unique ecosystems); these thresholds are based on these published by IUCN in "A Global Standard for the Identification of Key Biodiversity Areas" (2016) and "IUCN Red List Categories and Criteria" (2012). For Criterion 5, there are no numerical thresholds.

Criterion 1 is triggered by species listed as CR or EN on the IUCN Red List, and nationally/regionally listed species assessed using similar criteria. Criterion 2 is triggered by habitats of significant importance for endemic or restricted-range species. Criterion 3 (migratory

species) is inapplicable for plants. As for Criterion 4, unfortunately, the officially approved national list of highly threatened and/or unique ecosystems and habitats does not exist in Uzbekistan.

The habitat map (represented in the springtime report) was created using QGIS 3.18 free software on the basis of visual interpretation of Google Earth free satellite imagery, topographic maps (1:100,000, available online for free at http://loadmap.net/), and the data of field survey.

5. Results of the field survey

The summer field survey (June 17, 2023) showed that the correction of the habitat map created after the spring expedition is not needed and confirmed the conclusion of the springtime study that following 3 habitat types can be identified in the project area:

1. Fixed sands (sandy desert) with native psammophilous vegetation.

2. Banks of Amu-Bukhara channel with native riparian (tugay) vegetation.

3. Modified (anthropogenic) habitats with agricultural crops and sparse communities of wild rue, camel thorn and annuals.

Descriptions and photographs of habitats and plant communities recognized within construction site of planned solar power plant and in potential sites for relocation of threatened species of *Calligonum* are presented below (Tables 1–5, photo 1–7). The total check-list of plant species recorded in April and June is represented in Annex 1, photos of *Calligonum* – in Annex 2

5.1. Fixed sands (sandy desert)

As noted in the springtime report, this is natural habitat and main habitat type of the project area. Almost all SPP construction site is occupied with shallow fixed hilly, ridge-hilly and wavy sands, slightly saline near the channel. In the southern and south-western part of the area, sandy hills and ridges are 2–5 m high. The vegetation of sandy desert is represented with native psammophilous woodlands typical for south-western Kyzylkum. The level of anthropogenic disturbance of this habitat type is low, it is connected mainly with grazing and collection of fuel wood by local people. The canopy cover was 30 to 50%. Dominant species are *Haloxylon ammodendron, Haloxylon persicum, Calligonum sp., Xylosalsola arbuscula, Xylosalsola richteri*. The stock density is 0.3–0.5, 800–1500 shrubs per 1 hectare. Black and white saxaul (*Haloxylon ammodendron, Haloxylon persicum*) are up to 2.5–3 m tall, *Calligonum sp., Xylosalsola arbuscula* and *Xylosalsola richteri* are 1–1.5(1.7) m tall. In the northern part of project site and on the eastern surroundings of the site, sandy hills are very low (about 1 m high). But it should be noted, that species of the genus *Calligonum* were not identified, because this year they did not bloom and did not bear fruit due to severe drought. One of the main features of the genus *Calligonum* is a weak differentiation of morphological features of vegetative organs and flowers; species can be reliably identified only by mature fruits.

The herbaceous cover within all surveyed territory of this habitat is more or less uniform and typical for sandy desert of south-western Kyzylkum (except for disturbed areas); it is formed by

desert sedge (*Carex physodes*), annual ephemers (*Ceratocephala falcata, Eremopyrum bonaepartis, E. distans, Holosteum umbellatum, Strigosella brevipes, Tetracme recurvata*), xerophytic perennials (*Acanthophyllum elatius, Alhagi pseudalhagi, Smirnowia turkestana*) and psammophilous semishrubs (*Convolvulus divaricatus, Mausolea eriocarpa*). Taking into account the seasonal rhythm of desert vegetation and severe drought of 2023, a summer survey in June provide rather poor data about flora, vegetation and habitats of the project area. Mostly perennials, semishrubs and shrubs were recorded because almost all herbaceous plants already have been dried (except for camel thorn and representatives of the family *Amaranthaceae*). In 2023, the vegetation of all plants was very weak due to climatic conditions.

Following vegetation communities (map units) were identified within the habitat type of sandy desert:

1. Psammophilous woodlands with the domination of saltworts (*Xylosalsola*) and *Calligonum.* In northern and eastern parts of the project site, as well as the area to the east of the SPP site (potential area of *Calligonum* relocation), they represented with ephemeral-*Astragalus-Convolvulus-Calligonum-Xylosalsola* community on fixed hilly and wavy shallow sands, in some areas with solitary black and white saxaul. Dominant species are *Xylosalsola arbuscula*, *Xylosalsola richteri, Calligonum sp.,* dwarf shrub *Astragalus villosissimus,* desert blindweed *Convolvulus divaricatus,* desert sedge *Carex physodes* and annuals (Tables 1–2, Figures 2-3). In June, *Carex physodes* and annuals already have been dried.

Table 1: Check-list of plants recorded for ephemeral-Astragalus-Convolvulus-Calligonum-Xylosalsola community on fixed hilly and wavy shallow sands (39.336456° N, 64.087666° E)

Species	Life form	Height, cm	Abundance		Phenol. Stage
			DACFOR	Braun-Blanquet	
Acanthophyllum elatius	perennial	40–50	O	+	Fruiting, dried
Agriophyllum latifolium	annual	20–25	F	+	vegetation
Astragalus unifoliolatus	dwarf shrub	40–50	O	+	vegetation
Astragalus villosissimus	dwarf shrub	40–50	C	1	vegetation
Bromus tectorum	annual	10–15	F	+	dried
Calligonum sp.	shrub	100–150	C	1	vegetation
Calligonum microcarpum	shrub	100–150	O	+	Vegetation, fruiting
Carex physodes	Perennial	15–17	O	+	dried
Ceratocarpus arenarius	annual	15–20	C	+	vegetation
Ceratocephala falcata	annual	5–7	R	+	dried
Convolvulus divaricatus	semishrub	30–40	A	1	Vegetation, flowering
Cousinia hamadae	perennial	25–35	R	+	vegetation dried
Eremopyrum bonaepartis	annual	7–10	R	+	dried
Eremopyrum distans	annual	7–10	R	+	dried
Euphorbia turczaninowii	annual	7–10	F	+	dried
Heliotropium arguzioides	perennial	15–20	O	+	Vegetation,

					flowering
Hordeum murinum subsp. leporinum (H. leporinum)	annual	10–15	R	+	dried
Hyalea pulchella	annual	15–20	R	+	dried
Hypecoum pendulum	annual	15–20	R	+	dried
Koelpinia linearis	annual	12–15	R	+	dried
Lomelosia olivieri (*Scabiosa olivierii*)	annual	12–15	R	+	dried
Mausolea eriocarpa	semishrub	40–50	O	+	Vegetation, fruiting
Meniocus linifolius	annual	5–7	R	+	dried
Peganum harmala	perennial	20–25	R	+	fruiting
Salsola paulsenii	annual	20–30	O	+	Vegetation, flowering
Smirnowia turkestana	Perennial	30–40	R	+	Fruiting
Stipagrostis karelinii	perennial	40–50	O	+	fruiting
Tetracme recurvata	annual	15–20	F	+	dried
Xylosalsola arbuscula (Salsola arbuscula)	shrub	100–150	A	2	vegetation
Xylosalsola richteri (Salsola richteri)	shrub	100–150	C	1	vegetation

Table 2: Check-list of plants recorded for ephemeral-Astragalus-Convolvulus-Calligonum-Xylosalsola community on fixed hilly and wavy shallow sands (39.33299° N, 64.10597° E, potential area of Calligonum relocation)

Species	Life form	Height, cm	Abundance		Phenol. Stage
			DACFOR	Braun-Blanquet	
Acanthophyllum elatius	perennial	40–50	R	+	Fruiting, dried
Alyssum desertorum	annual	5–7	R	+	dried
Agriophyllum latifolium	annual	20–25	O	+	vegetation
Astragalus unifoliolatus	dwarf shrub	40–50	O	+	Vegetation, fruiting
Astragalus villosissimus	dwarf shrub	40–50	A	1	Vegetation, fruiting
Bromus tectorum	annual	10–15	F	+	dried
Calligonum sp.	shrub	100–150	C	1	vegetation
Calligonum microcarpum	shrub	100–150	O	+	Vegetation, fruiting
Carex physodes	Perennial	15–17	O	+	dried
Ceratocarpus arenarius	annual	15–20	F	+	vegetation
Ceratocephala falcata	annual	5–7	R	+	dried
Convolvulus divaricatus	semishrub	30–40	A	1	Vegetation, flowering
Cousinia sogdiana	biennial	25–35	R	+	dried
Eremopyrum bonaepartis	annual	7–10	R	+	dried
Eremopyrum distans	annual	7–10	R	+	dried
Euphorbia turczaninowii	annual	7–10	O	+	dried
Heliotropium arguzioides	perennial	15–20	O	+	Vegetation,

					flowering
Hordeum murinum subsp. leporinum (H. leporinum)	annual	10–15	R	+	dried
Hyalea pulchella	annual	10–20	O	+	dried
Hypecoum pendulum	annual	15–20	R	+	dried
Koelpinia linearis	annual	12–15	R	+	dried
Lomelosia olivieri (*Scabiosa olivierii*)	annual	12–15	R	+	dried
Mausolea eriocarpa	semishrub	40–50	R	+	Vegetation, fruiting
Meniocus linifolius	annual	5–7	O	+	dried
Peganum harmala	perennial	20–25	R	+	fruiting
Salsola paulsenii	annual	20–30	R	+	Vegetation, flowering
Smirnowia turkestana	Perennial	30–40	R	+	fruiting
Stipagrostis karelinii	perennial	40–50	O	+	fruiting
Tetracme recurvata	annual	15–20	F	+	dried
Xylosalsola arbuscula (Salsola arbuscula)	shrub	100–150	A	2	vegetation
Xylosalsola richteri (Salsola richteri)	shrub	100–150	F	1	vegetation

Figure 2: Fixed shallow sands in the northern part of the project site with ephemeral-Astragalus-Convolvulus-Calligonum-Xylosalsola community (39.336456° N, 64.087666° E)

Figure 3: Fixed shallow sands in the northern part of the project site with ephemeral-Astragalus-Convolvulus-Calligonum-Xylosalsola community. Potential site for relocation of threatened species of Calligonum, about 0.5 km to the east of the project site (39.332

2. Psammophilous woodlands with the domination of black and white saxaul (*Haloxylon ammodendron, Haloxylon persicum*), represented with ephemeral-*Convolvulus-Calligonum-Xylosalsola-Haloxylon* community, which occurs on slightly saline fixed ridge-hilly shallow sands in south-western and eastern part of the project site (Table 3, Figure 4).

Table 3: Check-list of plants recorded for camel thorn-Convolvulus-Calligonum-Xylosalsola-Haloxylon community on slightly saline fixed ridge-hilly shallow sands (39.330292° N, 64.094551°

Species	Life form	Height, cm	Abundance		Phenol. Stage
			DACFOR	Braun-Blanquet	
Acanthophyllum elatius	perennial	40–50	O	+	Fruiting, dried
Agriophyllum latifolium	annual	20–25	F	+	vegetation
Alhagi pseudalhagi	perennial	30–40	R	+	flowering
Alyssum desertorum	annual	5–7	O	+	dried
Astragalus unifoliolatus	dwarf shrub	40–50	O	+	Vegetation, fruiting
Astragalus villosissimus	dwarf shrub	40–50	C	1	Vegetation, fruiting
Bassia eriophora	annual	10–15	O	+	fruiting
Bromus tectorum	annual	10–15	F	+	dried
Calligonum sp.	shrub	100–150	F	1	vegetation
Calligonum microcarpum	shrub	100–150	O	+	Vegetation, fruiting
Carex physodes	Perennial	15–17	C	+	dried
Ceratocarpus arenarius	annual	15–20	F	+	vegetation
Ceratocephala falcata	annual	5–7	O	+	dried

Convolvulus divaricatus	semishrub	30–40	C	1	Vegetation, flowering
Convolvulus hamadae	semishrub	25–30	O	+	vegetation
Eremopyrum bonaepartis	annual	7–10	O	+	dried
Eremopyrum distans	annual	7–10	O	+	dried
Euphorbia turczaninowii	annual	7–10	F	+	dried
Halothamnus subaphyllus	semishrub	30–40	R	+	vegetation
Haloxylon ammodendron	Small tree	180–250	O	1	vegetation
Haloxylon persicum	Small tree	180–200	A	2	vegetation
Heliotropium arguzioides	perennial	15–20	O	+	Vegetation, flowering
Hordeum murinum subsp. leporinum (H. leporinum)	annual	10–15	O	+	dried
Hyalea pulchella	annual	15–25	F	+	dried
Hypecoum pendulum	annual	15–20	O	+	dried
Koelpinia linearis	annual	12–15	O	+	dried
Lomelosia olivieri (*Scabiosa olivierii*)	annual	12–15	R	+	dried
Mausolea eriocarpa	semishrub	40–50	O	+	Vegetation, fruiting
Meniocus linifolius	annual	5–7	F	+	dried
Peganum harmala	perennial	20–25	R	+	fruiting
Salsola paulsenii	annual	20–30	O	+	Vegetation, flowering
Stipagrostis karelinii	perennial	40–50	O	+	vegetation
Strigosella brevipes	annual	15–20	O	+	dried
Tetracme recurvata	annual	15–20	F	+	dried
Xylosalsola arbuscula (Salsola arbuscula)	shrub	100–150	F	1	vegetation
Xylosalsola richteri (Salsola richteri)	shrub	100–150	O	1	vegetation

Figure 4: Psammophilous shrublands in the eastern part of the project site with domination of black and white saxaul (Haloxylon ammodendron, H.persicum), Xylosalsola richteri and Calligonum species (39.330292° N, 64.094551° E)

3. Psammophilous woodlands with the domination of white saxaul (*Haloxylon persicum*) and *Calligonum sp.* This plant community is located in central and western part of the SPP site (Table 4, Figure 5).

Figure 5: Psammophilous shrublands in the western part of the project site with domination of white saxaul (Haloxylon persicum) and Calligonum species (39.314833° N, 64.062062° E)

Table 4: Check-list of plants recorded for ephemeral-Astragalus-Convolvulus-Calligonum-white saxaul community on fixed ridge-hilly shallow sands (39.314833° N, 64.062062° E)

Species	Life form	Height, cm	Abundance		Phenol. Stage
			DACFOR	Braun-Blanquet	
Acanthophyllum elatius	perennial	40–50	F	+	Fruiting, dried
Agriophyllum latifolium	annual	20–25	F	+	vegetation
Agriophyllum minus	annual	20–25	R	+	vegetation
Alhagi pseudalhagi	perennial	30–40	R	+	flowering
Alyssum desertorum	annual	5–7	O	+	dried
Astragalus unifoliolatus	dwarf shrub	40–50	O	+	Vegetation, fruiting
Astragalus villosissimus	dwarf shrub	40–50	F	1	Vegetation, fruiting
Atriplex dimorphostegia	annual	10–15	R	+	dried
Bassia eriophora	annual	10–15	R	+	fruiting
Bromus tectorum	annual	10–15	F	+	dried
Calligonum sp.	shrub	100–150	A	1	vegetation
Calligonum microcarpum	shrub	100–150	R	+	Vegetation, fruiting
Carex physodes	Perennial	15–17	O	+	dried
Ceratocarpus arenarius	annual	10–20	F	+	vegetation
Ceratocephala falcata	annual	5–7	O	+	dried
Convolvulus divaricatus	semishrub	30–40	C	1	Vegetation, flowering
Convolvulus hamadae	semishrub	25–30	O	+	vegetation
Corispermum lehmannianum	annual	10–15	O	+	Vegetation, flowering
Eremopyrum bonaepartis	annual	7–10	O	+	dried
Eremopyrum distans	annual	7–10	O	+	dried
Euphorbia turczaninowii	annual	7–10	F	+	dried
Haloxylon persicum	Small tree	150–200	A	2	vegetation
Heliotropium arguzioides	perennial	15–20	O	+	Vegetation, flowering
Heliotropium dasycarpum	perennial	10–15	O	+	Vegetation, flowering
Hordeum murinum subsp. leporinum (H. leporinum)	annual	10–15	R	+	dried
Hyalea pulchella	annual	10–20	O	+	dried
Hypecoum pendulum	annual	15–20	O	+	dried
Koelpinia linearis	annual	12–15	O	+	dried
Lomelosia olivieri (*Scabiosa olivierii*)	annual	12–15	R	+	dried
Mausolea eriocarpa	semishrub	40–50	O	+	Vegetation, fruiting
Meniocus linifolius	annual	5–7	O	+	dried
Salsola paulsenii	annual	20–30	R	+	Vegetation, flowering
Stipagrostis karelinii	perennial	40–50	R	+	Vegetation,

					fruiting
Streptoloma desertorum	annual	10–15	R	+	dried
Strigosella brevipes	annual	15–20	O	+	dried
Tetracme recurvata	annual	15–20	O	+	dried
Xylosalsola arbuscula (Salsola arbuscula)	shrub	100–150	O	+	vegetation
Xylosalsola richteri (Salsola richteri)	shrub	100–150	O	+	vegetation

In total, 61 species were recorded for the natural habitat type of sandy desert in 2023 (Annex 1).

Psammophilous vegetation, particularly desert woodlands, plays an important ecological role forming a unique landscape of sandy deserts of Central Asia (Melnikova, 1973; Korovin, 1934, 1961, 1962; Rachkovskaya et al, 2003). The roots of plants, especially, desert sedge (*Carex physodes*) and psammophilous shrubs form a dense network fixing sands. The formation of moving sands in Kyzylkum desert is the result of human impact (injurious felling of shrubs for fuel, excessive grazing and technological disturbance). Therefore, moving sands always occur around settlements, farmsteads, wells, developed mineral deposits, along roads, railways, pipelines, electric lines and other technologically disturbed areas. The broken sands are susceptible to deflation and tend to fill cultural landscapes and infrastructure. In this connection, special measures (phytomelioration, fences, mechanical dune stabilization, etc.) are applied for fixation of sands and combat deflation along roads, railways and in surroundings of settlements in sandy deserts of the World, including Central Asia (Melnikova, 1973; Babayev, 1986; Di & Zhang, 1998).

5.2. Banks of Amu-Bukhara channel

This habitat is located outside of SPP construction site, but in the adjacent areas (50-200 m from the border of SPP site), and construction works can affect this habitat. As shown in the springtime report, along the banks of the northern branch of Amu-Bukhara channel, the vegetation is composed with poplars (*Populus euphratica, P. pruinosa*), reeds (*Phragmites australis, Typha sp.*), solitary specimens of willow (*Salix wilhelmsiana*), Ravenna grass (*Tripidium (Erianthus) ravennae*), and other species typical for floodplains of major Central Asian rivers (*Alhagi pseudalhagi, Atriplex micrantha, Cynanchum acutum subsp. sibiricum, Tamarix ramosissima, Trachomitum lancifolium, Zygophyllum oxianum*), and annuals (*Erodium oxyrrhynchum*, *Hordeum murinum subsp. leporinum*). Poplar trees are up to 7–8 m tall. Banks of the south-eastern branch of the channel are covered with sparse vegetation (Figure 6). There are only solitary specimens of poplars, willow, tamarisk and black saxaul trees. In total, 21 species were recorded for this habitat, which should be regarded as semi-natural (Annex 1).

Table 5: Check-list of plants recorded for riparian vegetation along the banks of the south-eastern branch of Amu-Bukhara channel (39.311376° N, 64.078523° E)

Species	Life form	Height, cm	Abundance		Phenol. Stage
			DACFOR	Braun-Blanquet	
Alhagi pseudalhagi	perennial	30–50	O	+	Vegetation,

					flowering
Atriplex micrantha	annual	25–30	R	+	Vegetation, flowering
Bassia eriophora	annual	10–15	R	+	fruiting
Bromus tectorum	annual	10–15	O	+	dried
Cynanchum acutum subsp. sibiricum	Perennial, liana	50–60	R	+	Vegetation, flowering
Haloxylon ammodendron	Small tree	180–250	O	1	vegetation
Hordeum murinum subsp. leporinum (H. leporinum)	annual	10–15	R	+	dried
Juncus inflexus	perennial	30–50	F	1	Vegetation, flowering
Koelpinia linearis	annual	12–15	O	+	dried
Peganum harmala	perennial	20–25	R	+	fruiting
Phragmites australis	perennial	100–120	R	+	vegetation
Populus euphratica	tree	5–6 m	R	1	vegetation
Tamarix ramosissima	shrub	100–150	R	+	Vegetation, flowering
Tripidium (Erianthus) ravennae	perennial	100–150	R	+	vegetation
Typha sp.	perennial	70–100	R	+	vegetation
Zygophyllum oxianum	perennial	20–30	O	+	Fruiting, dried

Figure 6:Sparse vegetation along the south-eastern branch of Amu-Bukhara channel

5.3. Modified (anthropogenic) habitats

The only modified habitat within the project site is represented with the quarry about almost devoid of vegetation, except of solitary specimens of camel thorn (*Alhagi pseudalhagi),* wild rue

(Peganum harmala) and annuals (*Agriophyllum latifolium, Bromus tectorum, Ceratocarpus arenarius, Ceratocephala falcata, Eremopyrum bonaepartis, E. distans, Salsola paulsenii, Tetracme recurvata, Tribulus terrestris*), 16 species in total (Annex 1). The quarry 300x400 m is located in the northern part of the project site, about 1 km to the east of the village Khamza (39.337252° N, 64.087025° E, Figure 7). Another quarry, 100x100 m, is located near the southern edge of SPP site (39.316277° N, 64.080925° E).

Modified habitats outside of the project site, but in adjacent areas, are represented with a small village, asphalt roads, irrigation channels, two electric substations, two pump stations and small-scale croplands. Near the south-western edge of the project site (39.302488° N, 64.065436° E), there are small irrigated fields with wheat crops and fallow lands with very sparse vegetation represented with young black saxaul (*Haloxylon ammodendron*), solitary specimens of camel thorn (*Alhagi pseudalhagi),* wild rue *(Peganum harmala), Zygophyllum oxianum* and annuals (*Agriophyllum latifolium, A. minus, Alyssum desertorum, Atriplex dimorphostegia, A.micrantha, Bassia eriantha, Bromus tectorum, Ceratocarpus arenarius, Ceratocephala falcata, Eremopyrum bonaepartis, E. distans, Hypecoum pendulum, Meniocus linifolius, Salsola praecox, S. paulsenii,* etc.), 25 species in total (Annex 1). These fields occupy an area of about 1 km x 300 m (Figure 8). Sparse communities of the same species occur along roadsides and near the village Khamza, pump stations and electric substations.

At the present, the human impact within the project site is connected with economical activities of local people inhabiting a small village and several farmsteads (livestock farming, collection of fuel wood, pollution of the territory with household waste). In surroundings of the project site, additional anthropogenic factors are infrastructure (roads, power lines, irrigation channels, 2 pump stations, 2 electric sub-stations), small quarries and small-scale agriculture. In general, the level of anthropogenic disturbance is medium (on the edges of the site) to low (in the center of the site).

During the April and June field surveys, 84 plant species of 25 families were recorded in total (Annex 1), threatened species red-listed at the national or global level were not found. Representatives of the genus *Calligonum* in the checklist are reported on the basis of the previous (2021) survey. Taking into account the seasonal rhythm of desert vegetation and severe drought of 2023, a summer survey in June provide rather poor data about flora, vegetation and habitats of the project area. Mostly perennials, semishrubs and shrubs were recorded because almost all herbaceous plants already have been dried (except for camel thorn and representatives of the family Amaranthaceae). In 2023, the vegetation of all plants was very weak due to drought. Most of recorded species are typical for south-western part of Kyzylkum Desert and more or less common and widely spread. *Peganum garmala*, a plant species which is an indicator of overgrazing and degradation of pastures, has been found everywhere within the project site, and its abundance varies from low (center of the site) to rather high (along roads and near the village Khamza). Alien species, *Sinapis arvensis* and *Strigosella africana,* recorded in modified habitat of irrigated croplands in April, were not observed in June. Only one alien species, *Tribulus terrestris*, was recorded in June in modified habitats.

Figure 7: Small sand quarry in northern part of project site, near the village Khamza (39.337252° N, 64.087025° E). The vegetation is almost completely destroyed

Figure 8: Small irrigated wheat fields near the south-western edge of the project site (39.302488° N, 64.065436° E)

5.4. Population survey and relocation of threatened species of Calligonum

According to the data of the previous (2021) survey, three nationally and globally redlisted species of *Calligonum* (*Calligonum matteianum, Calligonum molle* and *Calligonum paletzkianum*) occur in following locations in the project area:

1. 39.33036° N, 64.083207° E. 10–15 specimens of *Calligonum matteianum,* 5–7 specimens of *Calligonum molle,* and 5–7 specimens of *Calligonum paletzkianum* per 1 hectare.

2. 39.316089° N, 64.062692° E. 10–15 specimens of *Calligonum matteianum* per 1 hectare.

3. 39.320667° N, 64.063822° E. 10–15 specimens of *Calligonum matteianum* per 1 hectare (this point is situated outside of the SPP construction site, but in the adjacent area, about 100 m from the border of SPP site).

Photographs of these threatened species are represented in Annex 2.

The field survey in June 2023 showed that species of *Calligonum* in the project area and proposed relocation site did not bloom and did not bear fruit in 2023 due to severe drought. Some specimens of *Calligonum* did not even vegetate. In addition, we observed a high number of insects (locusts, beetles *Julodis variolaris*) eating shoots of *Calligonum*, saxaul and other shrubs (Annex 2). A very small amount of fruits was noted only on some specimens of *Calligonum microcarpum*. Therefore, it was not possible to identify representatives of the genus *Calligonum*, to carry out a count of populations of rare species included in the IUCN Red List and Red Data Book of Uzbekistan, as well as to collect and relocate their seeds. In this connection, during the June survey, we carried out a count of all *Calligonum* shrubs on 100 x 100 m sample squares (1 hectare) in above mentioned locations. 47 individuals of *Calligonum* (all species) were recorded in the point 1, 31 in the point 2, and 24 in the point 3.

6. Conclusion

Results of the field surveys conducted in the project site in April and June, 2023 showed that the vegetation of this site is represented with native plant communities typical for south-western Kyzylkum. The territory of planned solar power plant currently is used mainly as a rangeland. The level of anthropogenic disturbance is medium (on the edges of the site) to low (in the center of the site), and connected mainly with economical activities of local people (grazing, collection of fuel wood, pollution of the territory with household waste, small-scale agriculture), as well as with development of small quarries and infrastructure (roads, power lines, pump stations, electric substations, irrigation channels).

Three types of habitats were identified in study area:

1. Fixed sands (sandy desert) – natural habitat with native psammophilous woodlands composed of *Haloxylon ammodendron, Haloxylon persicum, Calligonum sp., Xylosalsola arbuscula* and *Xylosalsola richteri*.

2. Banks of Amu-Bukhara channel – semi-natural habitat with native riparian (tugay) vegetation composed of poplars, reeds and other species typical for floodplains of Central Asian rivers. This habitat is located outside of SPP construction site, but in the adjacent areas (50-200 m from the border of SPP site).

3. Modified (anthropogenic) habitats – small irrigated fields and fallow lands with agricultural crops and sparse communities of wild rue, camel thorn and annuals, small quarries almost

devoid of vegetation, only with solitary specimens of wild rue, camel thorn and annuals. This habitat also is located mainly outside of SPP construction site, but in the adjacent areas.

A check-list of the flora of the project site composed on the basis of the springtime and summer surveys includes 84 species of 25 families (Annex 1). Most of species recorded for the project site are typical and more or less common for south-western part of Kyzylkum Desert. Three species are alien (*Sinapis arvensis, Strigosella africana, Tribulus terrestris),* they were recorded in modified habitats, near the edges of the SPP site. Nationally and globally red-listed species *Calligonum matteianum, Calligonum molle* and *Calligonum paletzkianum*, recorded in this area in 2021, as well as other representatives of the genus *Calligonum,* were not identified during this survey because they did not bloom and did not bear fruit in 2023 due to severe drought. The main feature of the genus is a weak differentiation of morphological features of vegetative organs and flowers; species can be reliably distinguished and identified only by fruits. Therefore, it was not possible to carry out a count of populations of rare species included in the IUCN Red List and Red Data Book of Uzbekistan, as well as to collect and relocate their seeds.

Results of the field studies show that construction of solar power plant will not have significant negative impact on the flora and vegetation of the region, but special measures (relocation of seeds and plants) should be taken to minimize damage to threatened species of *Calligonum*. Taking into account the severe drought of 2023, phenology of *Calligonum*, it is recommended to survey populations of rare *Calligonum* again next summer (late June – early July), a season of fruiting, when *Calligonum* species can be reliably identified, for complete inventory of the flora, detailed survey of populations of red-listed *Calligonum* species, and for collection their seeds for relocation. Also, it is recommended to collect and relocate seeds of threatened *Calligonum* species next year.

Special measures should be taken for fixation of sands and combat deflation (phytomelioration, fences, mechanical dune stabilization, etc.) in the project site of SPP construction and its surroundings.

In accordance with the legislation of the Republic of Uzbekistan, compensation must be paid for damage caused to flora and vegetation (including damage caused for populations of redlisted species) as a result of the construction of a solar power plant and power line in the Khazarasp District of the Khorezm Region. The amounts of payments are established by the Decree of the Cabinet of Ministers of the Republic of Uzbekistan “On the regulation of the use of biological resources and on the licensing procedures in the field of nature management” No. 290 dated October 20, 2014 (https://lex.uz/docs/2485767). For rare plants included in the national Red Data Book, the compensation must be paid for each specimen. For destruction of vegetation by construction works, geological exploration, pollution, etc., the compensation must be paid for each hectare. For clear-cutting and damaging saxaul and other desert shrubs, the compensation must be paid for each cubic meter.

7. References

1. A Global Standard for the Identification of Key Biodiversity Areas. Version 1.0. (2016) IUCN, Gland, Switzerland. 37 p.

2. Babayev A.G. (ed.) (1986) Principles and methods of shifting sands fixation. Centre for international projects GKNT, Moskow. 131 p.
3. Brauneder K.M., Montes C., Blyth S., Bennun L., Butchart S.H., Hoffmann M., Burgess N.D., Cuttelod A., Jones M.I., Kapos V., Pilgrim J., Tolley M.J., Underwood E.C., Weatherdon L.V., Brooks S.E. (2018) Global screening for Critical Habitat in the terrestrial realm. PloS one, 13(3), p.e0193102. doi:10.1371/journal.pone.0193102
4. CABI (2017) Invasive Species Compendium. CAB International, Wallingford, UK. Available from: www.cabi.org/isc.
5. Conspectus Florae Asiae Mediae. In 11 vol. (1963–2015) Fan Publishers, Tashkent. (In Russian).
6. Decree of the Cabinet of Ministers of the Republic of Uzbekistan "On the regulation of the use of biological resources and on the licensing procedures in the field of nature management" No. 290 dated October 20, 2014. Available from: https://lex.uz/docs/2485767 (in Uzbek and Russian)
7. Di Y., Zhang K. (1998) Sand Damage to Railway Lines and its Prevention in China. China Environment Science Press, Beijing, 164 p.
8. Drobow V.P. (1953) *Calligonum* L. In: Flora of Uzbekistan, vol. 2. Academy of Sciences of the Uzbek SSR, Tashkent (In Russian).
9. Field geobotany. In 4 vol. (1959–1976) Academy of Sciences of the USSR, Moscow & Leningrad. (In Russian).
10. Flora of the U.S.S.R. In 30 vol. (1934–1964) Academy of Sciences of the USSR, Moscow & Leningrad. (In Russian).
11. Flora of Uzbekistan. In 6 vol. (1941–1963) Academy of Sciences of the Uzbek SSR, Tashkent. (In Russian).
12. GBIF (2023). Global Biodiversity Information Facility. Available from: https://www.gbif.org/
13. Granitov A.I. (ed.) (1980) Methodological guidelines for geobotanical survey of natural rangelands in Uzbekistan. Uzgiprozem, Tashkent. 170 pp. (In Russian)
14. IFC (International Finance Corporation) (January 1, 2012, updated June 27, 2019) Guidance Note 6: Biodiversity Conservation and Sustainable Management of Living Natural Resources. Word Bank Group, Washington, DC. 69 p.
15. International Plant Names Index (2023) Available from: http://www.ipni.org.
16. IUCN Red List of Threatened species (2023) Available from: http://www.iucnredlist.org.
17. IUCN/SSC Invasive Species Specialist Group (ISSG) (2014) Global Invasive Species Database version 2014-2. Available from: http://193.206.192.138/gisd/
18. Kent M. (2011) Vegetation Description and Data Analysis: A Practical Approach, 2nd Edition. Wiley-Blackwell. 428 pp.
19. Korovin E.P. (1934) Vegetation of Middle Asia and South Kazakhstan. Moscow & Tashkent. 479 p. (In Russian).
20. Korovin E.P. (1961) Vegetation of Middle Asia and South Kazakhstan. Vol. 1. Tashkent. 452 p. (In Russian).
21. Korovin E.P. (1962) Vegetation of Middle Asia and South Kazakhstan. Vol. 2. Tashkent. 547 p. (In Russian).
22. Melnikova R.D. (1973) Psammophilous vegetation – Psammophyta. In: Vegetation cover of Uzbekistan and the ways of its practical use. Vol. 2. Fan Publishers, Tashkent. Pp. 4–80 (In Russian).
23. Nabiev M.M. (1971) *Calligonum* L. In: Conspectus Florae Asiae Mediae, vol. 2. Fan Publishers, Tashkent. Pp. 182–201 (In Russian).
24. Nikitin V.V. (1983) Weeds of the flora of the USSR. Science Publishers, Leningrad. 454 p. (In Russian).

25. Pavlov N.V. (1936) *Calligonum* L. In: Flora of U.S.S.R., vol. 5. Academy of Sciences of the USSR, Moscow & Leningrad. Pp. 527–594 (In Russian)
26. Pavlov N.V. (1937) *Calligonum* L. In: Flora of Turkmenistan, vol. 2. Turkmen branch of Academy of Sciences of the USSR, Ashkhabad. Pp. 55–79 (In Russian)
27. POWO (2023). Plants of the World Online. Available from: www.plantsoftheworldonline.org/)
28. Rachkovskaya E. I., Volkova E. A. & Khramtsov V. N. (eds.) (2003) Botanical geography of Kazakhstan and Middle Asia. Leningrad. 425 p. (In Russian and Engl.).
29. Red Data Book of the Uzbek SSR (1984) Vol. 2. Plants. Tashkent. 150 p. (in Uzbek and Russian).
30. Red Data Book of the Republic of Uzbekistan (1998) Vol. 1. Plants. Chinor ENK, Tashkent. 335 p. (in Uzbek and Russian).
31. Red Data Book of the Republic of Uzbekistan (2006) Vol. 1. Plants and Fungi. Chinor ENK, Tashkent. 250 p. (in Uzbek, Russian and English).
32. Red Data Book of the Republic of Uzbekistan (2009) Vol. 1. Plants and Fungi. Chinor ENK, Tashkent. 360 p. (in Uzbek, Russian and English).
33. Red Data Book of the Republic of Uzbekistan (2019) Vol. 1. Plants. Tasvir, Tashkent. 356 p. (in Uzbek, Russian and English).
34. Sennikov A.N. (ed.) (2016) Flora of Uzbekistan, 2nd Edition. Vol. 1. Amaryllidaceae. Navroʻz Publishers, Tashkent. Xxviii + 173 p. (In Russian).
35. Sennikov A.N. (ed.) (2017) Flora of Uzbekistan, 2nd Edition. Vol. 2. Navroʻz Publishers, Tashkent. Xii + 200 pp. (In Russian)
36. Sennikov A.N. (ed.) (2019) Flora of Uzbekistan, 2nd Edition. Vol. 3. Ma'naviat Publishers, Tashkent. Xii + 201 pp. (In Russian)
37. Sennikov A.N. (ed.) (2022) Flora of Uzbekistan, 2nd Edition. Vol. 4. FAN Publishers, Tashkent. xviii + 238 pp. (In Russian)
38. Sennikov A.N., Tojibaev K.Sh., Beshko N.Yu., Esanov H.K., Jenna Wong L. & Pagad S. (2018) Global Register of Introduced and Invasive Species – Uzbekistan. Version 1.3. Invasive Species Specialist Group ISSG. Available from: https://doi.org/10.15468/m5vdwk.
39. Soskov Yu.D. (1968) *Calligonum* L. In: Flora of Tajik SSR, vol. 3. Academy of Sciences of the USSR, Moscow & Leningrad. Pp. 224–242 (In Russian)
40. Soskov Yu.D. (2011) Genus *Calligonum* L. (taxonomy, geography, evolution, introduction). Novosibirsk, 362 p. (In Russian)
41. Tojibaev K.Sh., Beshko N.Yu., Popov V.A., Jang C.G. & Chang K.S. (2017) Botanical Geography of Uzbekistan. Korea National Arboretum, Pocheon, Republic of Korea. 250 p.
42. Tojibaev K.Sh., Beshko N.Yu., Shomurodov Kh.F. & al. (2020) Inventory of the flora of Uzbekistan: Bukhara Province. O'kituvchi Publishers, Tashkent. 128 p. (In Russian).
43. Vegetation cover of Uzbekistan and the ways of its practical use (1971–1984) In 4 vol. Fan Publishers, Tashkent. (In Russian).
44. Vernik R.S., Rakhimova T. (1982) Natural vegetation and pastures of foothills of the Namangan region. Tashkent. 90 p. (In Russian).
45. Zakirov K.Z. (1955) Flora and vegetation of the Zeravschan river basin. Vol. 1. Fan Publishers, Tashkent. 205 p. (In Russian).
46. Zakirov K.Z. (1961) Flora and vegetation of the Zeravschan river basin. Vol. 2. Fan Publishers, Tashkent. 446 p. (In Russian).

Annex 1. Check-list of flora

Annex 1. Table 1: Check-list of flora

Species	Life form	Distribution	Habitat type	Abundance	IUCN status	National status
Ephedraceae						
1. Ephedra strobilacea	shrub	Regional	Fixed sands	R	Least Concern (LC)	none
Araceae						
2. Eminium lehmanii	perennial	Regional	Fixed sands	O–R	Not Evaluated (NE)	none
Juncaceae						
3. *Juncus inflexus*	Perennial	Transcontinental	Banks of channel	O–R	Least Concern (LC)	none
Cyperaceae						
4. *Carex physodes*	Perennial	Regional	Fixed sands	O–A	Not Evaluated (NE)	none
Poaceae						
5. Bromus tectorum	annual	Transcontinental	All types	A–O	Not Evaluated (NE)	none
6. Cutandia memphitica	annual	Regional	Fixed sands	R–O	Not Evaluated (NE)	none
7. Eremopyrum bonaepartis	annual	Regional	All types	O	Not Evaluated (NE)	none
8. Eremopyrum distans	annual	Regional	All types	O	Not Evaluated (NE)	none
9. Hordeum murinum subsp. leporinum (H. leporinum)	annual	Transcontinental	All types	O–C	Not Evaluated (NE)	none
10. Phragmites australis	Perennial	Transcontinental	Banks of channel	F	Least Concern (LC)	none
11. Schismus arabicus	annual	Regional	Fixed sands	R	Not Evaluated (NE)	none
12. Stipagrostis karelinii	Perennial	Regional	Fixed sands	O	Not Evaluated (NE)	none
13. Tripidium ravennae (Erianthus ravennae)	perennial	Transcontinental	Banks of channel	O	Least Concern (LC)	none

Papaveraceae						
14. Hypecoum pendulum	annual	Regional	Fixed sands, modified habitats	R–O	Not Evaluated (NE)	none
Ranunculaceae						
15. Ceratocephala falcata	annual	Regional	Fixed sands, modified habitats	R–O	Not Evaluated (NE)	none
16. Delphinium camptocarpum	annual	Regional	Fixed sands	R	Not Evaluated (NE)	none
Zygophyllaceae						
17. Tribulus terrestris	annual	Transcontinental	modified habitats	R	Alien, Least Concern (LC)	None, alien weed
18. Zygophyllum oxianum	perennial	Regional	Banks of channel, modified habitats	R-O	Not Evaluated (NE)	none
Fabaceae						
19. Alhagi pseudalhagi	perennial	Regional	All types	O–A	Not Evaluated (NE)	none
20. Astragalus flexus	perennial	Regional	Fixed sands	R	Not Evaluated (NE)	none
21. Astragalus harpilobus	annual	Regional	Fixed sands	R	Not Evaluated (NE)	none
22. Astragalus unifoliolatus	dwarf shrub	Regional	Fixed sands	O–R	Not Evaluated (NE)	none
23. Astragalus villosissimus	dwarf shrub	Regional	Fixed sands	C–O	Not Evaluated (NE)	none
24. Smirnowia turkestana	Perennial	Regional	Fixed sands	R–O	Not Evaluated (NE)	none
Salicaceae						
25. Populus euphratica	Tree	Regional	Banks of channel	A	Least Concern (LC)	none
26. Populus pruinosa	Tree	Regional	Banks of channel	O	Near Threatened (NT)	none
27. Salix wilhelmsiana	shrub	Regional	Banks of channel	O	Least Concern (LC)	none
Euphorbiaceae						

28. Euphorbia turczaninowii	annual	Regional	Fixed sands	R–O	Not Evaluated (NE)	none
Geraniaceae						
29. Erodium oxyrrhynchum	annual	Regional	All types	R	Not Evaluated (NE)	none
Nitrariaceae						
30. Peganum garmala	Perennial	Regional	Fixed sands, modified habitats	R–C	Not Evaluated (NE)	None. Weed – indicator of overgrazing
Rutaceae						
31. Haplophyllum robustum	Perennial	Regional	Fixed sands	R	Not Evaluated (NE)	none
Brassicaceae						
32. Alyssum desertorum	annual	Regional	All types	O–C	Not Evaluated (NE)	none
33. Isatis emarginata	annual	Regional	Fixed sands	R–O	Not Evaluated (NE)	none
34. Isatis minima	annual	Regional	Fixed sands	O–C	Not Evaluated (NE)	none
35. Meniocus linifolius	annual	Regional	Fixed sands, modified habitats	R–O	Not Evaluated (NE)	none
36. Sinapis arvensis	annual	Transcontinental	modified habitats	R	Alien, Not Evaluated (NE)	None, alien weed
37. Streptoloma desertorum	annual	Regional	Fixed sands	R	Not Evaluated (NE)	none
38. Strigosella africana	annual	Regional	modified habitats	R	Alien, Not Evaluated (NE)	None, alien weed
39. Strigosella brevipes	annual	Regional	Fixed sands	R–C	Least Concern (LC)	none
40. Tetracme recurvata	annual	Regional	Fixed sands, modified habitats	A–R	Least Concern (LC)	none
Tamaricaceae						
41. Tamarix ramosissima	shrub	Transcontinental	Banks of channel	O	Least Concern (LC)	none
Polygonaceae						

42. Calligonum eriopodum	shrub	Regional	Fixed sands	R-O	Least Concern (LC)	none
43. Calligonum litwinowii	shrub	Regional	Fixed sands	R-O	Not Evaluated (NE)	none
44. Calligonum matteianum	shrub	Regional	Fixed sands	R	Endangered (EN B2ab(iii,v))	2 (rare species)
45. Calligonum microcarpum	shrub	Regional	Fixed sands	O-A	Not Evaluated (NE)	none
46. Calligonum molle	shrub	Regional	Fixed sands	R	Endangered (EN B2ab(iii,v))	2 (rare species)
47. Calligonum paletzkianum	shrub	Regional	Fixed sands	R	Vulnerable (VU B2ab(iii,v))	3 (vulnerable, declining species)
48. Calligonum setosum	shrub	Regional	Fixed sands	O-A	Not Evaluated (NE)	none
Caryophyllaceae						
49. Acanthophyllum elatius	perennial	Regional	Fixed sands	O–R	Not Evaluated (NE)	none
50. Holosteum umbellatum	annual	Regional	Fixed sands	R–O	Not Evaluated (NE)	none
Amaranthaceae						
51. Agriophyllum lateriflorum	annual	Regional	Fixed sands, modified habitats	O–R	Not Evaluated (NE)	none
52. Agriophyllum latifolium	annual	Regional	Fixed sands, modified habitats	F–R	Not Evaluated (NE)	none
53. Agriophyllum minus	annual	Regional	Fixed sands, modified habitats	O–R	Not Evaluated (NE)	none
54. Atriplex dimorphostegia	annual	Regional	Fixed sands, modified habitats	O–R	Not Evaluated (NE)	none
55. Atriplex micrantha	annual	Transcontinental	Banks of channel, modified habitats	R	Not Evaluated (NE)	none
56. Bassia	annual	Regional	Fixed	O–R	Not	none

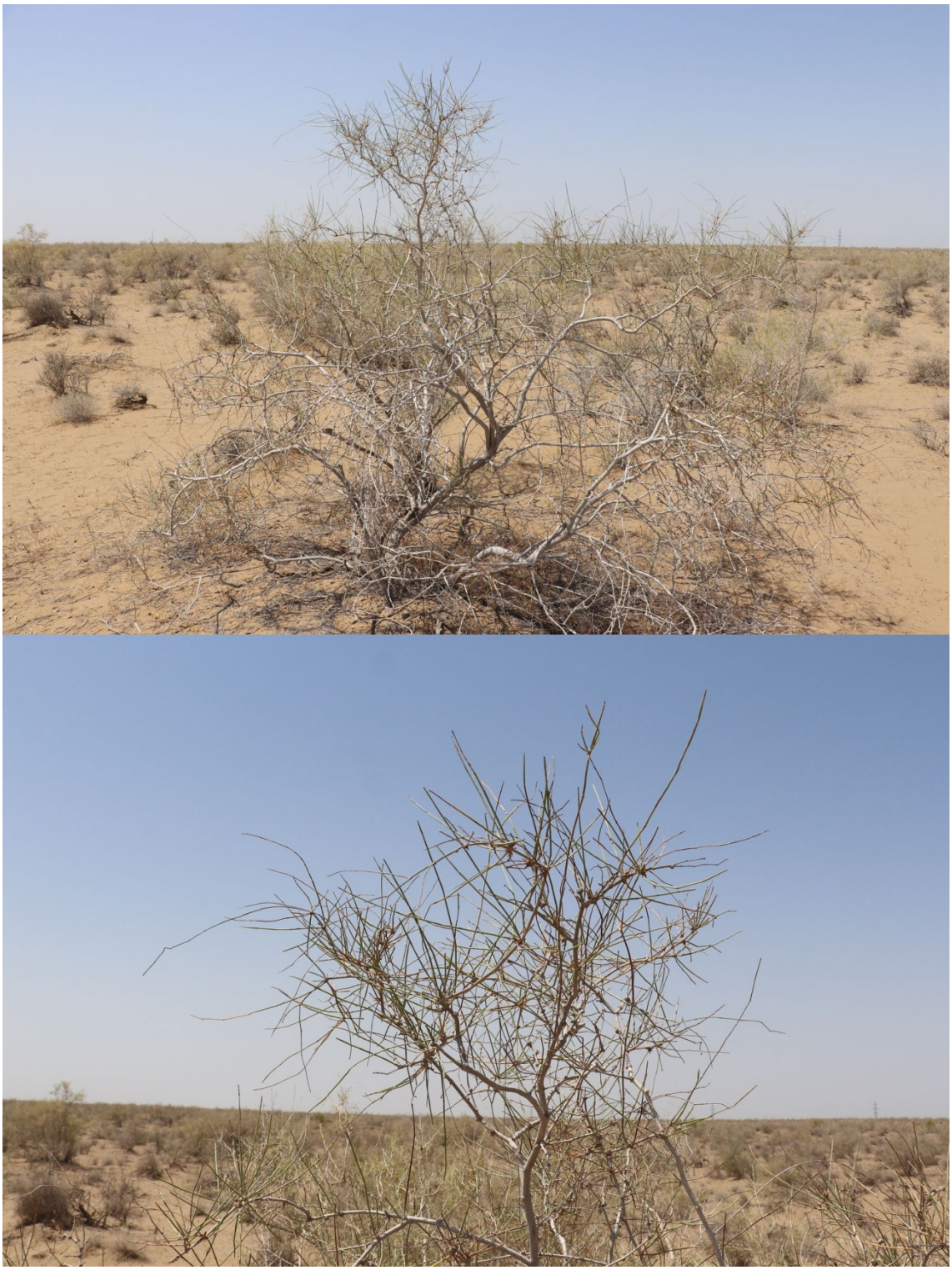
eriophora			sands, modified habitats		Evaluated (NE)	
57. Ceratocarpus arenarius	annual	Regional	Fixed sands, modified habitats	O–C	Not Evaluated (NE)	none
58. Corispermum lehmannianum	annual	Regional	Fixed sands, modified habitats	O–R	Not Evaluated (NE)	none
59. Halothamnus subaphyllus	shrub	Regional	Fixed sands	R	Not Evaluated (NE)	none
60. Haloxylon ammodendron	Small tree	Regional	All types	O–A	Not Evaluated (NE)	none
61. Haloxylon persicum	Small tree	Regional	Fixed sands	O–A	Least Concern (LC)	none
62. Salsola paulsenii	annual	Regional	All types	F–R	Not Evaluated (NE)	none
63. Salsola praecox	annual	Regional	modified habitats	O	Not Evaluated (NE)	none
64. Xylosalsola arbuscula (Salsola arbuscula)	shrub	Regional	Fixed sands	O	Not Evaluated (NE)	none
65. Xylosalsola richteri (Salsola richteri)	shrub	Regional	Fixed sands	O–D	Least Concern (LC)	none
Apocynaceae						
66. Cynanchum acutum subsp. sibiricum	*Cynanchum acutum subsp. sibiricum*	Regional	Banks of channel	R	Least Concern (LC)	none
67. Trachomitum lancifolium	Perennial	Regional	Banks of channel	R	Not Evaluated (NE)	none
Boraginaceae						
68. Arnebia decumbens	annual	Regional	Fixed sands	R	Not Evaluated (NE)	none
69. Heliotropium arguzioides	perennial	Regional	Fixed sands	O	Not Evaluated (NE)	none
70. Heliotropium dasycarpum	perennial	Regional	Fixed sands	O–R	Not Evaluated (NE)	none
71. Heterocaryum	annual	Regional	Fixed	R	Not	none

szovitsianum			sands		Evaluated (NE)	
Convolvulaceae						
72. Convolvulus divaricatus	semishrub	Regional	Fixed sands	O–A	Not Evaluated (NE)	none
73. Convolvulus hamadae	semishrub	Regional	Fixed sands	O–C	Not Evaluated (NE)	none
Lamiaceae						
74. Chamaesphacos ilicifolius	annual	Regional	Fixed sands	R	Not Evaluated (NE)	none
Asteraceae						
75. Cousinia hamadae	Perennial	Regional	Fixed sands	R	Not Evaluated (NE)	none
76. Cousinia sogdiana	Biennial	Regional	Fixed sands	R	Not Evaluated (NE)	none
77. Hyalea pulchella	annual	Regional	Fixed sands	R-O	Not Evaluated (NE)	none
78. Koelpinia linearis	annual	Regional	Fixed sands	R-O	Not Evaluated (NE)	none
79. Mausolea eriocarpa	semishrub	Regional	Fixed sands	R–O	Not Evaluated (NE)	none
80. Senecio subdentatus	annual	Regional	Fixed sands	R–O	Not Evaluated (NE)	none
Caprifoliaceae						
81. Lomelosia olivieri (Scabiosa olivierii)	annual	Regional	Fixed sands	R	Not Evaluated (NE)	none
82. Valerianella leiocarpa (V. dufresnia)	annual	Regional	Fixed sands	R	Not Evaluated (NE)	none
Apiaceae						
83. Dorema sabulosum	perennial	Regional	Fixed sands	R	Not Evaluated (NE)	none
84. Ferula karelinii	perennial	Regional	Fixed sands	R	Not Evaluated (NE)	none

Note: Representatives of the genus *Calligonum* in the checklist are reported on the basis of the previous (2021) survey

Annex 2. Figures:

Annex 2. Figure 1: Due to severe drought in 2023, it was not possible to identify representatives of the genus Calligonum because this year they vegetate very weakly, did not bloom and did not bear fruit



Annex 2. Figure 2: Due to severe drought in 2023, it was not possible to identify representatives of the genus Calligonum because this year they vegetate very weakly, did not bloom and did not bear fruit

Annex 2. Figure 3: Due to severe drought in 2023, it was not possible to identify representatives of the genus Calligonum because this year they vegetate very weakly, did not bloom and did not bear fruit

Annex 2. Figure 4:Small amount of fruits was observed only on some specimens of Calligonum microcarpum

Annex 2. Figure 5: A locust (subfam. Acrididae) on Xylosalsola arbuscula

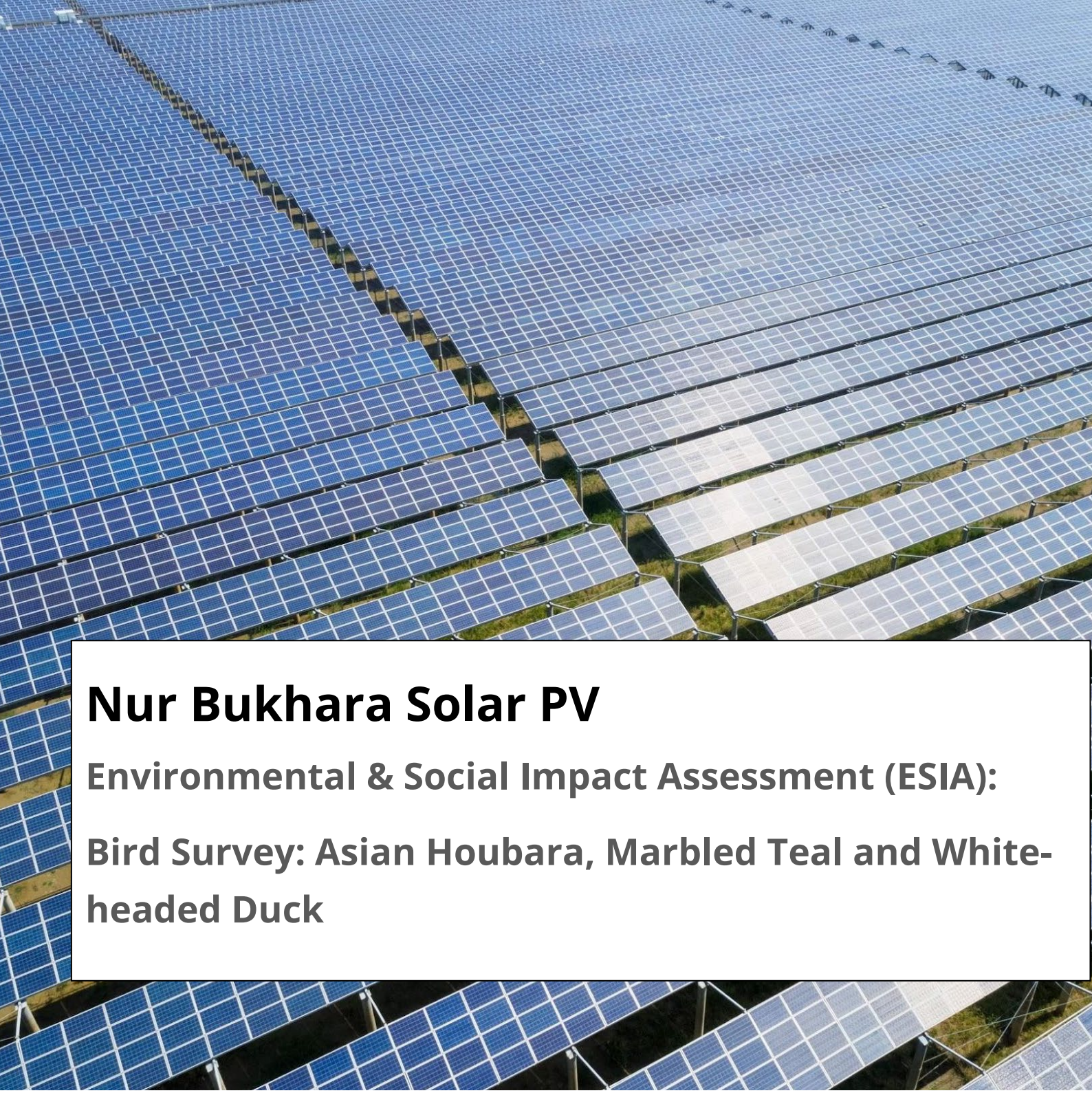
Annex 2. Figure 6: Julodis variolaris beetle on Calligonum sp.

Annex 2. Figure 7: Calligonum matteianum Drobow. A general view of the plant (above), and its fruits (below). Photographs by N.Yu. Beshko, taken in the project site, 26.06.2021.

Annex 2. Figure 8: Calligonum molle Litv. A general view of the plant (above), and its fruit (below). Photographs by N.Yu. Beshko, taken in the project site, 26.06.2021.

Annex 2. Figure 9:Calligonum paletzkianum Litv. A general view of the plant (above), and its fruits (below). Photographs by N.Yu. Beshko, taken in the project site, 26.06.2021.

Technical appendix 11:
Bird Survey report



Nur Bukhara Solar PV

Environmental & Social Impact Assessment (ESIA):

Bird Survey: Asian Houbara, Marbled Teal and White-headed Duck

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1	25/05/2023	Final Draft Bird Survey report: Asian Houbara, Marbled Teal and White-headed Duck	Anna Ten	Caleb Gordon	Nicola Davies

Disclaimer

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Abbreviations

Acronym	Term
ABIS	Amu-Bukhara Irrigation system
BAP	Biodiversity Action Plan
CR	Critical endangered species
CH	Critical Habitat
EAAA	Ecologically Appropriate Areas of Analysis
EN	Endangered species
IBA	Important Bird Area
IBAT	Integrated Biodiversity Assessment Tool
IFC	International Finance Corporation
IUCN Red List	International Union for Conservation of Nature's Red List of Threatened Species
NT	Near threatened species
Ramsar	Ramsar Convention on Wetlands of International Importance
UzRBD	Uzbekistan Red data book 2019
VU	Vulnerable species
VU:D	Vulnerable species with decreasing population
VU:R	Naturally rare vulnerable species

1 Introduction

The Nur Bukhara PV project (the "Project") site is located in a part of the Kyzylkum Desert known as Sundukli Sands. The botanical survey showed that the main habitat in the project area consists of fixed sands (sandy desert) with native psammophilous vegetation. The lake Dengizkul, located 10 km from the project site, is important for migrating and wintering bird species (IBA and Ramsar site, ornithological state zakaznik). The project site is surrounded by the Amu-Bukhara Irrigation system (ABIS) canal on three sides (north, east, and south) and small drainage channel and ponds formed by drainage ditches on the fourth side (approximately one kilometer to the west). Additionally, two more habitats in the adjacent area are associated with the ABIS canal and small water ponds - the banks of

the ABIS canal with native riparian (tugay) vegetation, and salt marsh vegetation near the drainage ponds.

The focus of this survey report is to understand the ecological importance of the drainage channels and ponds located in very close proximity to the site with specific focus on birds, including waterbirds consider the outputs of the avifauna scoping performed during the scoping phase. The analyses of avifauna based on IBAT[1] in scoping report identified the following species of conservation importance (IUCN[2] VU[3] or above):

- Five water-affiliated species:
    - Pallas's Fish-Eagle *Haliaeetus leucoryphus* (UzRBD EN, IUCN VU)
    - Dalmatian Pelican *Pelecanus crispus* (UzRBD EN, IUCN VU)
    - Sociable Lapwing *Vanellus gregarious* (UzRBD VU, IUCN CR)
    - White-headed Duck *Oxyura leucocephala* (UzRBD EN, IUCN EN)
    - Marbled Teal *Marmaronetta angustirostris* (UzRBD EN, IUCN VU)
- Two raptors and One vulture
    - Egyptian vulture *Neophron percnopterus* (UzRBD VU, IUCN EN)
    - Saker Falcon *Falco cherrug* (UzRBD EN, IUCN EN)
    - Steppe Eagle *Aquila nipalensis* (UzRBD VU, IUCN EN)
- One landbird
    - Asian Houbara *Chlamydotis macqueenii* (UzRBD VU, IUCN VU)

The lake Dengizkul and species related to this large waterbody (Pallas's Fish-Eagle, Dalmatian Pelican, Sociable Lapwing, wintering group of the White-headed Duck) were excluded from the survey because the project site is located more than 10 km away from Dengizkul Lake. Significant impacts to the IBA or the bird species it protects from the project are unlikely, and the lake is effectively not included in the project's EAAA for such species.

The IBAT report has identified three CR/EN bird species include two raptors (Saker Falcon and Steppe Eagle) and a vulture (Egyptian Vulture) are known to occur within the Project region (Ten 2022, see Table 1) as breeders and/or migrants. The scoping studies conducted have indicated that there are no suitable breeding habitats for these bird species either on the project site or within a 10 km buffer zone. Additionally, none of these species are likely to meet the threshold criteria of ≥0.5% of their global population plus ≥5 reproductive units (nesting pairs) required for a Critical Habitat (CH) determination under criterion 2a (IFC performance standard 6[4]). This is due to their low densities in the region, as well as their wide geographic distributions and large estimated global population sizes.[5]

[1] Integrated Biodiversity Assessment Report (IBAT) - https://www.ibat-alliance.org/
[2] The International Union for Conservation of Nature (IUCN) Red List of Threatened Species, also known as the IUCN Red List
[3] Vulnerable (VU) - meets one of the 5 Red List criteria and thus considered to be at high risk of unnatural (human-caused) extinction without further human intervention
[4] https://www.ifc.org/wps/wcm/connect/topics_ext_content/ifc_external_corporate_site/sustainability-at-ifc/policies-standards/performance-standards/ps6
[5] A complete critical habitat assessment is presented in the Nur Bukhara Environmental and Social Impact Assessment (ESIA), June 2023.

The bird baseline studies focused on three bird species: Asian Houbara (Figure 1), White-headed Duck, and Marbled Teal (Figure 2). The purpose of these studies is to validate or confirm the preliminary conclusions of the (CH) screening analysis performed during the scoping phase. This report presents the results of the Asian Houbara breeding survey (completed), and preliminary results of the White-headed Duck and Marbled Teal breeding survey.[6]

2 Literature review

The avifauna of Uzbekistan includes 477 species of birds, among them 332 species were included in the Bukhara province checklist by M. Turaev with coauthors (2015). In recent years, Lukoil Operating company (an oil and gas mining company) has been conducting regular bird monitoring on Dengizkul Lake as part of the Biodiversity Action Plan (BAP), but the data is currently unavailable. The list of potential breeding species was based on birds nesting in similar habitats at Ecocenter Djeyran and Khodzha-Davlet.

The potential list of birds inhabiting the study area comprises 200 species, of which 17 species are included in the IUCN Red List, 28 in the Red Data Book of Uzbekistan (2019) (Table 1). The survey conducted during the scoping site visit and bird survey revealed that the habitat of the project area is quite homogeneous. The project area itself has a lot of shrubs, while the water bodies located nearby to the west are very small in size. This combination of habitats and it's relationship to the potential list of threatened species can be summarized as follows (Table 1):

- Unsuitable habitat - 10 species.
- Species may visit or pass through the area during migration or wintering -17 species.
- Potential for nesting - 3 species.

However, the bird baseline studies focused on three bird species: Asian Houbara (Figure 1), White-headed Duck, and Marbled Teal (Figure 2).

[6] This survey is still ongoing and will be completed by the end of May/beginning of June)

Table 1: Potential list of the threatened species and relevance to Project site

ID	Scientific name	English name	IUCN Red list	UzRDB (2019)	Relevance for this site
1	*Phasianus colchicus*	Common Pheasant		NT	Resident in banks of Amu-Bukhara channel
2	*Cygnus olor*	Mute Swan		NT	Unsuitable habitat due to small water bodies in the western area.
3	*Cygnus cygnus*	Whooper Swan		VU:R	Unsuitable habitat due to small water bodies in the western area.
4	*Marmaronetta angustirostris*	Marbled Teal	VU	EN	Breeding and migrating species (potentially could nest in small waterbody located to the east)
5	*Aythya ferina*	Common Pochard	VU		Unsuitable breeding habitat due to small water bodies in the western area. However, could visit on migration
6	*Aythya nyroca*	Ferruginous Duck	NT	VU:D	Unsuitable breeding habitat due to small water bodies in the western area. However, could visit on migration
7	*Oxyura leucocephala*	White-headed Duck	EN	EN	Unsuitable breeding habitat due to small water bodies in the western area. However, could visit on migration
8	*Pelecanus onocrotalus*	Great White Pelican		VU:D	Unsuitable habitat due to small water bodies in the western area.
9	*Pelecanus crispus*	Dalmatian Pelican	NT	EN	Unsuitable habitat due to small water bodies in the western area.
10	*Phalacrocorax pygmeus*	Pygmy Cormorant		NT	Unsuitable breeding habitat due to small water bodies in the western area. However, could visit on migration
11	*Ciconia nigra*	Black Stork		VU:R	Unsuitable habitat due to small water bodies in the western area.
12	*Plegadis falcinellus*	Glossy Ibis		VU:D	Unsuitable breeding habitat due to small water bodies in the western area. However, could visit on migration
13	*Platalea leucorodia*	Eurasian Spoonbill		VU:D	Unsuitable habitat due to small water bodies in the western area.
14	*Falco naumanni*	Lesser Kestrel		NT	There is no breeding habitat, could visit on migration
15	*Falco cherrug*	Saker Falcon	EN	EN	There is no breeding habitat, could visit on migration
16	*Pandion haliaetus*	Osprey		VU:R	Unsuitable habitat due to small water bodies in the western area.
17	*Haliaeetus albicilla*	White-tailed Sea-eagle		VU:R	Unsuitable habitat due to small water bodies in the western area.
18	*Aegypius monachus*	Cinereous Vulture	NT	NT	There is no breeding habitat, could visit on migration
19	*Neophron percnopterus*	Egyptian Vulture	EN	VU:D	There is no breeding habitat, could visit on migration
20	*Circaetus gallicus*	Short-toed Snake-eagle		VU:D	There is no breeding habitat, could visit on migration

ID	Scientific name	English name	IUCN Red list	UzRDB (2019)	Relevance for this site
21	*Circus macrourus*	Pallid Harrier	NT	NT	There is no breeding habitat, could visit on migration
22	*Aquila clanga*	Greater Spotted Eagle	VU	VU:R	There is no breeding habitat, could visit on migration
23	*Aquila nipalensis*	Steppe Eagle	EN	VU:D	There is no breeding habitat, could visit on migration
24	*Aquila heliaca*	Eastern Imperial Eagle	VU	VU:D	There is no breeding habitat, could visit on migration
25	*Chlamydotis macqueenii*	Asian Houbara	VU	VU:D	Species nests in the vicinity of the Dengizkul lake. But conducted surveys showed that this species doesn't breed on project area due to the unsuitable habitat.
26	*Tetrax tetrax*	Little Bustard	NT	VU:D	There is no breeding habitat, could visit on migration
27	*Vanellus vanellus*	Northern Lapwing	NT		Unsuitable breeding habitat due to small water bodies in the western area. However, could visit on migration
28	*Chettusia gregaria*	Sociable Lapwing	CR	VU:R	Unsuitable breeding habitat due to small water bodies in the western area. However, could visit on migration
29	*Pterocles alchata*	Pin-tailed Sandgrouse		VU:D	The habitat of the project area is densely covered with shrubs and is unsuitable for this species.
30	*Streptopelia turtur*	European Turtle-dove	VU	VU:D	It is unlikely that the species nests in Tugai, as the vegetation of Tugai is very narrow.
			17	28	

3 Materials and methods

An Asian Houbara survey was conducted 11 April 2023, (following a preliminary scoping survey on 02 March 2023. During preliminary survey the potential five survey points were identified (mainly elevated as the observation was difficult because of the shrubs) (Table 2, Figure 1). The weather conditions during each observation were suitable for survey. The distance between points was 1.5 km or 700 m due to limited visibility caused by dense shrubs covering the entire area. A thirty minute count was conducted at each survey point with using binocular 10x40 and telescope.

Table 2: Asian Houbara survey points

No	Survey Points	Data	N (DD)	E (DD)	Habitat
1	AH1	2.03.2023 and 11.04.2023	39.339038°	64.080713°	Fixed sands, top of the dune
2	AH2	2.03.2023 and 11.04.2023	39.326120°	64.078554°	Fixed sands
3	AH3	2.03.2023 and 11.04.2023	39.332861°	64.073047°	Fixed sands
4	AH4	2.03.2023 and 11.04.2023	39.307703°	64.069734°	Fixed sands
5	AH5	2.03.2023 and 11.04.2023	39.305085°	64.061057°	Fixed sands, top of the hill

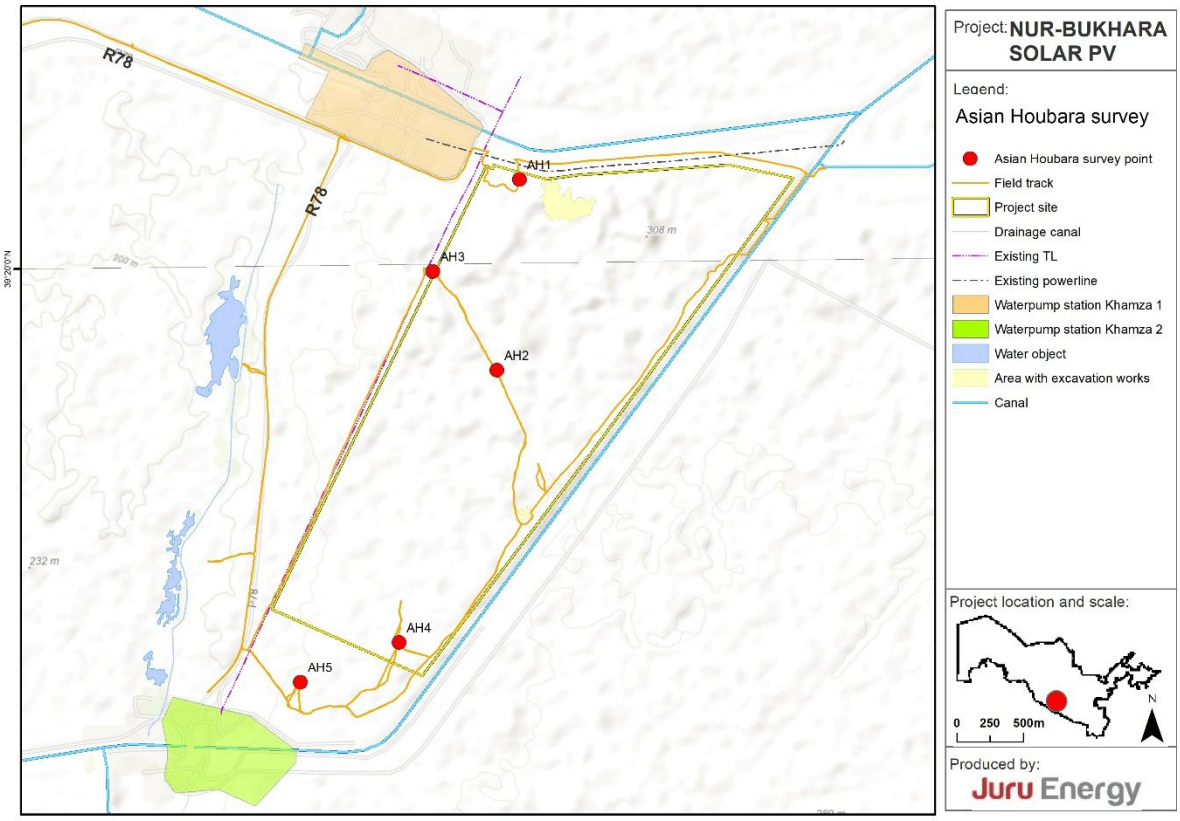

Figure 1: Asian Houbara survey points

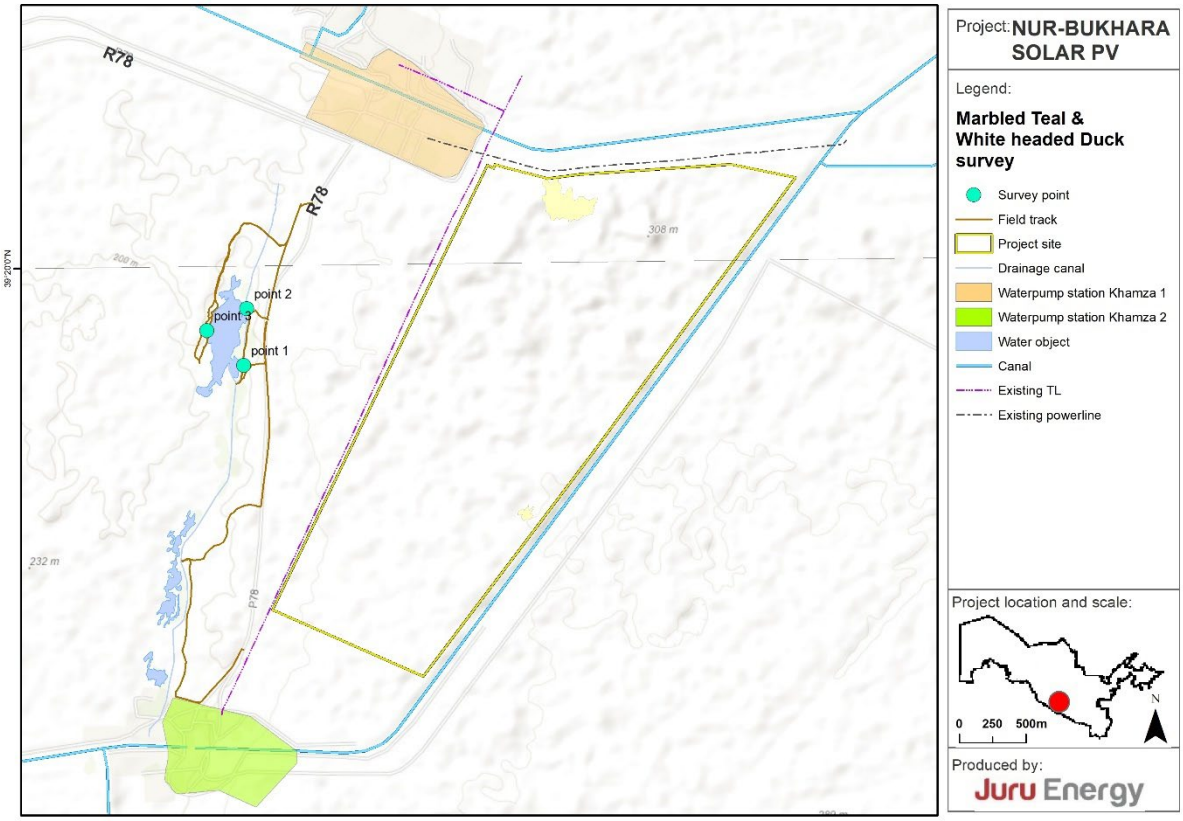

Figure 2: Marbled Teal and White-Headed Duck survey points

The following data is recorded on the survey forms:

- The location of the survey point (VP) used
- Date of survey
- Start and end time of the VP session (7:00-10:00, 16:00-18:00)
- Weather condition: wind (0-4), wind haze (0-4)
- Surveyor name
- Biotope
- Group size of Houbaras (sex – male, female, unknown)
- Distance (m) for each group
- Bearing (°) for each group
- Behavior (displaying, flying, standing, et al.)
- Notes

The equipment utilized to complete these surveys included:

- Field note book and writing implements;
- Field survey sheets;
- Weatherproof clipboard;
- Compass / GPS unit;
- Lazer rangefinder;
- Binocular Nikon x10;
- Laptop computer with Excel.

The Marbled teal and White-headed Duck survey was conducted on 15 April 2023 and 24.06.2023. The weather conditions were favorable for the count. The survey used the walkover with point observation method. There were two small waterbodies, and one of them, located to the south, is very shallow and unsuitable for breeding Marbled Teal. The main observation was conducted on second waterbody (Figure 2 and Table 3). The habitat is not suitable for the breeding White-headed Duck due to the sparse development of reeds.

Table 3: Marbled Teal and White-Headed Duck survey

No	Survey Points	Data	N	E	Habitat
1	Point 1	15.04.2023	39.326640°	64.056384°	Small waterbody potentially suitable for breeding Marbled teal
2	Point 2	15.04.2023	39.330464°	64.056698°	Small waterbody potentially suitable for breeding Marbled teal
3	Point 3	15.04.2023	39.329013	64.053198	Small waterbody potentially suitable for breeding Marbled teal

4 RESULTS

Twenty three (23) bird species were observed during specific species survey. Please note that this list is not exhaustive and other bird species may also be present in the project territory.

Table 4: The list of bird species

No	Species name	Data	Number	Nature conservation status			Habitat
				UzRDB	IUCN	CITES	
1	Steppe Eagle *Aquila nipalensis*	2.03.2023	2	VU	EN	II	2 birds soared in 6 km from project site N39.34226 E64.00116
2	Crested Lark *Alauda cristata*	2.03.2023		-	-	-	Dominant breeding species on fixed sands
3	Magpie *Pica pica*	2.03.2023	4	-	-	-	Single birds observed in several points on bushed in fixed sands
4	Marsh harrier *Circus aeruginosus*	2.03.2023	3			II	1 bird observed in fixed sands, and 2 birds near salty small wetland (drainage channel and small shallow waterbodies)
5	White wagtail *Motacilla alba*	2.03.2023	1				Salty small wetland (drainage channel and small shallow waterbodies)
6	Crested Lark *Alauda cristata*	10.04.2023					Dominant breeding species on fixed sands
7	Great Grey (Desert) Shrike *Lanius excubitor meridionalis*	10.04.2023	3				Breeding species on fixed sands
8	Desert Warbler *Curruca nana*	10.04.2023	2				Breeding species on fixed sands
9	Streaked scrub warbler *Scotocerca inquieta*	10.04.2023	6				Breeding species on fixed sands
10	Magpie *Pica pica*	10.04.2023	4	-	-	-	Breeding species on fixed sands

No	Species name	Data	Number	Nature conservation status			Habitat
				UzRDB	IUCN	CITES	
11	Lesser whitethroat *Sylvia curruca*	10.04.2023	40				Numerous migrating species in the desert habitats
12	White-tailed lapwing *Vanellus leucurus*	15.04.2023	4				Breeding in salty small wetland (drainage channel and small shallow waterbodies)
13	Black-winged stilt *Himantopus himantopus*	15.04.2023	5				Breeding in salty small wetland (drainage channel and small shallow waterbodies)
14	Marsh harrier *Circus aeruginosus*	15.04.2023	2			II	Breeding in salty small wetland (drainage channel and small shallow waterbodies)
15	Little tern *Sternula albifrons*	15.04.2023	2				Breeding in salty small wetland (drainage channel and small shallow waterbodies)
16	Common tern *Sterna hirundo*	15.04.2023	3				Breeding in salty small wetland (drainage channel and small shallow waterbodies)
17	Rufous-tailed scrub robin *Cercotrichas galactotes*	15.04.2023	1				Breeding in salty small wetland (drainage channel and small shallow waterbodies)
18	Bluethroat *Luscinia svecica*	15.04.2023	2				Breeding in salty small wetland (drainage channel and small shallow waterbodies)
19	Masked wagtail *Motacilla personata*	15.04.2023	7				Migrating in salty small wetland (drainage channel and small shallow waterbodies)

No	Species name	Data	Number	Nature conservation status			Habitat
				UzRDB	IUCN	CITES	
20	Yellow Wagtail *Motacilla flava*	15.04.2023	6				Migrating in salty small wetland (drainage channel and small shallow waterbodies)
21	Lesser whitethroat *Sylvia curruca*	15.04.2023	7				Migrating in salty small wetland (drainage channel and small shallow waterbodies)
22	Mallard *Anas platyrhynchos*	15.04.2023	3				The status unknown
23	Little ringed plover *Charadrius dubius*	15.04.2023	3				Breeding in salty small wetland (drainage channel and small shallow waterbodies)
24	White-tailed lapwing *Vanellus leucurus*	24.06.2023	8				Breeding in salty small wetland (drainage channel and small shallow waterbodies)
25	Black-winged stilt *Himantopus himantopus*	24.06.2023	14				Breeding in salty small wetland (drainage channel and small shallow waterbodies)
26	Purple heron *Ardea purpurea*	24.06.2023	1				Breeds in the region
27	Little Grebe *Tachybaptus ruficollis*	24.06.2023	4				Breeds in the region
28	Pygmy Cormorant *Phalacrocorax pygmaeus*	24.06.2023	2				Breeds in the region
29	Red-crested Pochard Netta rufina	24.06.2023	2				Breeding in salty small wetland (drainage channel and small shallow waterbodies)

5 Asian Houbara survey results

Detailed survey of the Asian Houbara confirmed the absence of this species for breeding due to unsuitable habitat. The project territory is densely covered with shrubs, which do not provide sufficient visibility for the houbaras that prefer open habitats for nesting. However, migrating individuals have been observed in such habitat (oral data V. Soldatov).

According to M. Koshkin and etc. [7], in which the authors identified a prevalence of males of the Asian Houbara in shorter vegetation and flatter terrain may have several explanations, not necessarily mutually exclusive. Probably most important are the needs to be visible to females and to have enough open ground in which to conduct their display, which involves a fast run, sometimes for long distances[8]. Apparent selection for gravel is likely a consequence of the sparse short-statured shrub vegetation in such areas. Moreover, an unhindered view of the surrounding terrain allows the detection of both predators and approaching/passing females, but it is also possible that flat terrain also reduces the locomotion cost for these large cursorial birds. The combination of medium to short shrubs and flat terrain seems to be the most favorable habitat for male houbara.

[7] Koshkin, M.A., Burnside, R.J., Collar, N.J. et al. Effects of habitat and land use on breeding season density of male Asian Houbara Chlamydotis macqueenii . J Ornithol 157, 811–823 (2016). https://doi.org/10.1007/s10336-015-1320-4

[8] Gaucher P, Paillat P, Chappuis C, Saint Jalme M, Lotfikhah F, Wink M (1996) Taxonomy of the houbara bustard Chlamydotis undulata subspecies considered on the basis of sexual display and genetic divergence. Ibis 138:273–282

Figure 3: Common view of the fixed sands on project area

6 Marbled teal and White-headed duck survey results

The breeding survey of Marbled Teal and White-headed duck was conducted by observation of the potential nesting site (pond) at different times of breeding cycle in the beginning of breeding and targeting broods will be conducted at the end of May/ June.

On April 15 and June 24, no Marbled Teal and White-headed duck individuals were found during the survey.

7 Conclusions

The Asian Houbara survey reported the absence of breeding individuals on the project area.

The survey for Marbled Teal and White-headed Duck, conducted April 15 and June 24, reported the absence of breeding individuals on the project area.

8 Bibliography

1. BirdLife International (2022) Important Bird Areas factsheet: Dengizkul Lake. Downloaded from http://www.birdlife.org on 04/01/2022.
2. BirdLife International (2022) Important Bird Areas factsheet: Dzheiran Ecocentre. Downloaded from http://www.birdlife.org on 04/01/2022.
3. BirdLife International (2022) Important Bird Areas factsheet: Khodzha-Davlet. Downloaded from http://www.birdlife.org on 04/01/2022.
4. E.A. Koblik & V.Yu. Arkhipov. 2014. Avifauna of the States of Northern Eurasia (former USSR): Checklists. — Zoologicheskie Issledovania, No 14. 171 p.
5. Filatova E.A., Lanovenko E.N. On the current state of the avifauna of the important ornithological territory "Khodja-Davlet" // Modern Issues of Conservation of Rare, Endangered, and Little-Studied Animals of Uzbekistan. Proceedings of the Republican Scientific-Practical Conference, September 9-10, 2016. Tashkent, 2016. pp. 24-27.
6. Gaucher P, Paillat P, Chappuis C, Saint Jalme M, Lotfikhah F, Wink M (1996) Taxonomy of the houbara bustard Chlamydotis undulata subspecies considered on the basis of sexual display and genetic divergence. Ibis 138:273–282
7. Important Bird Areas in Uzbekistan – Priority sites for conservation / R. Kashkarov R.D., Welch G.R., Brombacher M. eds. Tashkent, Uzbekistan: Uzbekistan Society for the protection of birds (UzSPB), 2008, 188 p.
8. Kashkarov D.Yu. Anseriformes // Birds of Uzbekistan. Vol.1. Tashkent: “FAN”, 1987. 57-121 pp.
9. Koshkin, M.A., Burnside, R.J., Collar, N.J. et al. Effects of habitat and land use on breeding season density of male Asian Houbara Chlamydotis macqueenii . J Ornithol 157, 811–823 (2016). https://doi.org/10.1007/s10336-015-1320-4
10. Mitropolskiy O.V., Fotteler E.R., Tretyakov G.F. Accipitriformes // Birds of Uzbekistan. – Tashkent, 1987. - Vol. 1. – p. 126-229.
11. Sagitov A.K. Owls // Birds of Uzbekistan, vol. 2. – Tashkent, 1990. – p. 225-238.
12. Soldatov V.A., Ten A.G., Nuridjanov A.S. The new records of Sociable Lapwing Chettusia gregaria (Pallas, 1771) in Uzbekistan // Selevinia, 2009. 239p. [in Russian]
13. Ten, A., Dobrev, V., Soldatov V., Burnside, R.J. 2021. Migration routes and wintering sites of Egyptian Vulture Neophron percnopterus breeding in Central Asia: first results from satellite tracking three juveniles tagged in Uzbekistan // 11th Annual Meeting of Saving Asia’s Vultures from Extinction. Virtual event – December 2021.
14. The IUCN Red List of Threatened Species. Version 2020-1. www.iucnredlist.org
15. Turaev M.M., Kholboev F.R., Rayimov A.R., Rakhmonov R.R. Birds of Bukhara Province. Tashkent: Navruz, 2015. 91 p.
16. Uzbekistan Red data book. Vol.2. Animals. Tashkent: Chinor ENK, 2019 – 374 p.

Technical appendix 12:
Archaeological Baseline report

O‘ZBEKISTON RESPUBLIKASI FANLAR AKADEMIYASI

MILLIY ARXEOLOGIYA MARKAZI

UO‘K:

Davlat qaydi:

№ shifr

BUXORO VILOYATI OLOT TUMANI QIRLISHON MFY HUDUDILARIDA ARXEOLOGIK YODGORLIKLARNI ANIQLASH BO‘YICHA OLIB BORILGAN (2023 YIL APREL-MAY) ARXEOLOGIK-QIDIRUV ISHLARINING

HISOBOTI

Toshkent – 2023

O‘ZBEKISTON RESPUBLIKASI FANLAR AKADEMIYASI

MILLIY ARXEOLOGIYA MARKAZI

«TASDIQLAYMAN»

O‘zR FA Milliy arxeologiya markazi direktori

_____ F. A. Maqsudov

«15» 05 2023 y.

BUXORO VILOYATI OLOT TUMANI QIRLISHON MFY HUDUDILARIDA ARXEOLOGIK YODGORLIKLARNI ANIQLASH BO‘YICHA OLIB BORILGAN (2023 YIL APREL-MAY) ARXEOLOGIK-QIDIRUV ISHLARINING

HISOBOTI

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PhD, katta ilmiy xodim Z. Raxmanov

kichik ilmiy xodim A. Muxammadiev

kichik ilmiy xodim A. Omonov

kichik ilmiy xodim O. Mamirov

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Toshkent – 2023

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Madaniy meros agentligining madaniy meros boshqarmalarida qayd etilmasa haqiqiy emas

"Tasdiqlayman"
Madaniy meros agentligi direktori
B. Abdikarimov
" " 2023-y.

RUXSATNOMA № 248

Ushbu **RUXSATNOMA** Milliy arxeologiya markazining 07.04.2023-yildagi 01-118-sonli xatiga binoan

Arxeolog **Z. Raxmonovga**
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O'zbekiston Respublikasi Madaniy meros agentligida qayd etildi.
Bosh arxeolog _____

Buxoro viloyat Madaniy meros boshqarmasi da qayd etildi.
(Hududiy madaniy meros boshqarmasi)
Sharofiddinov Sh. X. 17.04.2023y.
(boshqarma boshlig'i familiyasi, ismi, sharifi, sana)

Arxeologik qazishmalarni asrashga _____ sanada

Topshirdim _____

Qabul qildim _____

Tadqiqotlar natijasida chiqqan arxeologik ashyolarning pasporti, nomi, davri, surati, holati ko'rsatilgan holdagi ro'yxati hisobotga ilova qilinadi

“Tasdiqlayman”
Madaniy meros agentligi direktori

B. Abdikarimov

2023-y.

O‘zbekiston Respublikasi
Madaniy meros agentligi

Pochta manzili: 10029, Toshkent shahar,
Taras Shevchenko ko‘chasi, 1-uy

Kerakli shakl tagiga chiziladi:
Arxeologiya qazishmalarini amalga oshirish huquqini beruvchi **1-shakldagi**
Uncha katta bo‘lmagan maydonlarni (bir arxeologiya obyektida 20 kv.metrgacha) qazib ochgan holda arxeologiya qidiruvlarini amalga oshirish va arxeologiya merosi obyektlarining tarixiy-madaniy ekspertizasini o‘tkazish hamda arxeologiya nazoratini amalga oshirish doirasida yer uchastkalarini tadqiq etish huquqini beruvchi **2-shakldagi**
Arxeologiya obyektida biror-bir yer qazish ishlarini bajarmagan holda, arxeologiya qidiruvlarini amalga oshirish (bundan ochilib qolgan joylarda cheklangan tozalash ishlari mustasno) huquqini beruvchi **3-shakldagi**
Yer qazish, qurilish ishlari chog‘ida yemirilayotgan yoki avariya holatida bo‘lgan arxeologiya obyektida uning yemirilishi xavfini bartaraf etish maqsadidagi muhofaza-qutqaruv qazishmalarini amalga oshirish huquqini beruvchi **4-shakldagi**

Ochiq varaq T/P: 0183

Arxeolog **Z. Raxmonovga**
(Ism-sharifi, familiyasi)

Buxoro viloyati, Olot tumanida arxeologiya qidiruv ishlarini amalga oshirish uchun.

O‘ZBEKISTON RESPUBLIKASI QONUNI ARXEOLOGIYA MEROSI OBYEKTLARINI MUHOFAZA QILISH VA ULARDAN FOYDALANISH TO‘G‘RISIDA

25-modda. Ochiq varaq va ruxsatnoma olgan arxeologning majburiyatlari

Ochiq varaq va ruxsatnoma olgan arxeolog:

ruxsatnomani madaniy meros obyektlarini muhofaza qilish va ulardan foydalanish sohasidagi davlat boshqaruvini amalga oshiruvchi tegishli organda ro‘yxatdan o‘tkazishi;

arxeologiya qidiruvlari, arxeologiya qazishmalari va arxeologiya nazoratini ochiq varaqda belgilangan doirada amalga oshirish tartibiga rioya qilishi;

arxeologiya qidiruvlari va arxeologiya nazoratini amalga oshirishda arxeologiya obyektida aniqlangan yemirilishlar to‘g‘risida madaniy meros obyektlarini muhofaza qilish va ulardan foydalanish sohasidagi davlat boshqaruvini amalga oshiruvchi tegishli organga bir haftalik muddatda yozma shaklda xabar berishi;

arxeologiya qidiruvlari, arxeologiya qazishmalari va arxeologiya nazoratini amalga oshirishda aniqlangan ilgari noma’lum bo‘lgan arxeologiya obyektlari va arxeologiya ashyolari to‘g‘risida madaniy meros obyektlarini muhofaza qilish va ulardan foydalanish sohasidagi davlat boshqaruvini amalga oshiruvchi tegishli organga yozma shaklda xabar berishi;

batafsil tavsifi (materiali, o‘lchamlari, sanasi va boshqalar) bilan har bir arxeologiya ashyosining ro‘yxatini tuzishi;

arxeologiya obyektining birlamchi konservatsiyasi va but saqlanishini ta’minlashi;

arxeologiya qidiruvlari, arxeologiya qazishmalari va arxeologiya nazoratini amalga oshirishda aniqlangan arxeologiya ashyolarini O‘zbekiston Respublikasi Vazirlar Mahkamasi tomonidan belgilangan tartibda davlatga topshirishi;

ochiq varaqning amal qilish muddati tugaganidan so‘ng, biroq kelgusi kalendar yilning birinchi choragi tugashidan kechiktirmasdan tegishlicha maxsus vakolatli muassasaga ilmiy hisobot taqdim etishi shart;

Ochiq varaq va ruxsatnoma olgan arxeolog zimmasida qonun hujjatlariga muvofiq boshqa majburiyatlar ham bo‘lishi mumkin.

Berilgan vaqti: 11.04.2023
Amal qilish muddati: 31.12.2023

Madaniy meros agentligi huzuridagi
Arxeologiya sohasida ilmiy jamoatchilik
Kengashi kotibi: _____

Buxoro viloyat madaniy meros boshqarmasi da qayd etildi.
(hududiy madaniy meros boshqarmasi)

Arxeologiya obyektlarini asrashga 17.04.2023y.
topshirdim _____

Qabul qildim _____

I. Umumiy ma’lumotlar

1.1. Arxeologik tadqiqot asosi

Buxoro viloyati Olot tumanida joylashgan “Nur-Buxoro quyosh fotoelktrik stansiyasini” loyihalash, qurish rejalashtirilgan hududda (perimetr: 12 km, maydon; 669 ga qurilish maydoni) arxeologiya qidiruv-tekshiruv ishlari “Juru Energy Consulting” MChJ bilan 27.03.2023 yilda tuzilgan 2-sonli shartnomaga muvofiq 2023-yil aprel-may oylarida o‘tkazildi.

1.2. Huquqiy-normativ hujjat

O‘zbekiston Respublikasi Madaniy meros agentligidan Buxoro viloyati Olot tumani hududida arxeologik qidiruv ishlarini amalga oshrish uchun olingan 2-shakldagi Ochiq varaq T/R:0183 va Ruxsatnoma №248.

1.3. Tadqiqot ob’ekti

Buxoro viloyati, Olot tumani, Qirlishon MFY, Hamza-1 va 2- posyolkalari hududi atrofidagi 669 ga yer maydoni.

1.4. Ishning maqsadi

Ilmiy jihatdan to‘liq o‘rganilmagan ushbu hududda kuzatuv va sinov-qazuv ishlarini olib borish, hududning o‘zlashtirish bosqichlari va sabablarini aniqlash va ilmiy o‘rganish.

Buning uchun bir necha vazifalar, jumladan:

- “Abu Dabi Future Energy kompaniyasi DAJ (Masdar)” tomonidan Nur-Buxoro quyosh fotoelektrik stansiyasini loyihalash, qurish oldidan “Juru Energy Consulting” MChJ tomonidan belgilab berilgan hududni arxeologik jihatdan o‘rganish va aniqlashtirish;
- Hududda arxeologik yodgorliklar borligiga aniqlik kiritish;
- Hududda aniqlangan arxeologik buyumlar va osori-atiqalarni o‘rganish;
- Hududda aniqlangan yangi arxeologik topilmajoylarni koordinatalarini belgilash va bufer zonasini belgilash;
- Dala qidiruv ishlarida qo‘lga kiritilgan materiallar tahlili asosida tarixiy voqealikni qayta tiklash va o‘sha vaqtdagi boshqa tarixiy-madaniy

jarayonlar bilan solishtirish orqali yangi xulosalar chiqarish vazifalari belgilab olindi.

1.5. Tadqiqot usullari

Arxeologik kuzatuv va sinov-qazuv usullaridan foydalanildi. Shuningdek, qidiruv-tekshiruv ishlari jarayonida GPS uskunasi va Locus Map dasturidan foydalanildi. Locus Map – bu Android qurilmalariga ilg‘or onlayn va oflayn GPS imkoniyatlarini qo‘shadigan boy navigatsiya ilovasi.

1.6. Tadqiqotning natijalari

Belgilangan hududda qidiruv-tekshiruv va kuzatuv ishlari natijasida oltita nuqtada er sathi yuza qismida sochilib yotgan sopol buyumlar aniqlandi, 6 ta nuqtada shurf qazildi, erning yuza qismi qumli qatlam va qattiq gips qatlam bo‘lganligi aniqlandi.

1.7. Ijrochilar va ma’lumotlarning to’g’riligi uchun mas’uliyat

Arxeologik qidiruv-tekshiruv ishlari O‘zbekiston Respublikasi Fanlar akademiyasi Milliy arxeologiya markazi xodimlari tomonidan amalga oshirildi.

Ekspert guruhi xulosa matnida ko‘rsatilgan ma’lumotlarning to‘g‘riligi uchun mas’uldir.

Arxeologik tekshiruv ishlari bo‘yicha ekspert guruhi a’zolari:

1. B. Sayfullaev – bosh ilmiy xodim, t.f.d.;
2. Z. Raxmanov – katta ilmiy xodimi, t.f.f.d (PhD);
3. A. Muhammadiyev – kichik ilmiy xodim;
4. A. Omonov – kichik ilmiy xodim;
5. O. Ma’mirov – kichik ilmiy xodim;
6. B. Elmuratov – kichik ilmiy xodim.

Referat

Hisobot 31 bet matn, 2 ta jadval, 11 ta rasm va chizmadan iborat.

Kalit so‘zlar: Buxoro, Olot tumani, Mohandaryo, Dengizko‘l, neolit, bronza, Tillatepa, ilk o‘rta asrlar, suv ko‘zalar, qozonlar.

2023 yilda Buxoro viloyati Olot tumani Qirlishon MFY (Xamza-1-2 posyolkalari atrofi) hududilarida olib borilgan tadqiqotlarning maqsadi sifatida quyidagilar amalga oshirilishi rejalashtirilgan edi:

Amu-Buxoro kanalidan olinadigan suv Xamaza-1-2 nasos stansiyalari hududi yaqinida “Abu Dabi Future Energy kompaniyasi DAJ (Masdar)” tomonidan Nur-Buxoro quyosh fotoelektrik stansiyasini loyihalash, qurish oldidan “Juru Energy Consulting” MChJ tomonidan belgilab berilgan hududni arxeologik jihatdan o‘rganish va aniqlashtirish;

Belgilangan hududda aniqlangan arxeologik yodgorliklar topografiyasiga aniqlik kiritish;

Belgilangan hududda aniqlangan arxeologik buyumlar va osori-atiqalarni o‘rganish;

Belgilangan hududda aniqlangan yangi arxeologik topilmajoylarni koordinatalarini belgilash va bufer zonasini belgilash;

Dala qidiruv ishlarida qo‘lga kiritilgan materiallar tahlili asosida tarixiy voqealikni qayta tiklash va o‘sha vaqtdagi boshqa tarixiy-madaniy jarayonlar bilan solishtirish orqali yangi xulosalar chiqarish.

Mundarija

KIRISH

Mustaqillik yillarida arxeologik yodgorliklarini ilmiy o‘rganish va shu asosda ularni muhofaza qilish, asrash, targ‘ib qilish va ulardan oqilona foydalanish kabi masalalarga katta e’tibor qaratilmoqda. Xususan, mamlakatimiz Prezidenti tomonidan, qolaversa hukumatimiz tomonidan madaniy merosni asrashga doir chiqarilayotgan qarorlar va farmoyishlar bugungi kunda davlat siyosatining bu borada amalga oshirayotgan ijobiy ishlaridan biri hisoblanadi.

Yurtimizda moddiy va ma’naviy madaniyatni asrab-avaylash, tarig‘ib qilish, mamlakatimiz turistik salohiyatini oshirish davlat siyosati darajasiga ko‘tarilgan. Qayd etilishicha bugungi kunda yurtimiz hududida 4500 dan ziyod arxeologik yodgorliklar mavjud. O‘tgan yillar davomida ularning soni albatta ko‘p bo‘lgan. Yangi tadqiqotlar natijasida bu kabi yodgorliklar aniqlanmoqda va o‘z navbatida Milliy ro‘yxatga kiritib borilmoqda.

Madaniy meros ob’ektlarining ajralmas qismi bo‘lgan ushbu arxeologik yodgorliklar qadimgi va o‘rta asrlar davrining ijtimoiy-iqtisodiy va moddiy madaniyatini o‘rganishda asosiy manba hisoblanadi. Shu jihatdan boshqa hududlar singari Buxoro viloyati Olot tumani qadimda Zarafshon daryosining bir oqimi hisoblangan Mohandaryo quyi oqimlariga to‘g‘ri keluvchi hududlarda joylashgan. Bu hududga yaqin joyda o‘z davrida mashhur eng qadimgi dehqon jamoalari manzilgohi hisoblangan Zomonbobo manzilgohi aniqlangan. Qizilqum tarkibiga kiruvchi ushbu hududlarda tosh davri, bronza asri, ilk va rivojlangan o‘rta asrlarga oid turli ko‘rinishdagi manzilgohlar aniqlanishi ehtimoldan holi emas. Shu jihatdan ushbu belgilangan hududda “yodgorliklarni aniqlash bo‘yicha arxeologik qidiruv ishlarini amalga oshirish” kun tartibidagi dolzarb vazifalardan biri hisoblanadi.

QIDIRUV-TEKSHIRUV VA QAZISHMA ISHLARI TASNIFI

O‘rganilish tarixi.

Qizilqum hududlari moddiy-madaniy meros boyliklariga ega bo‘lgan boy hududlardan biridir. Mazkur hududning arxeologik yodgorliklari XX asrning o‘rtalaridan boshlab tadqiq etila boshlangan. Natijada, Uzboy bo‘ylari[1], Sariqamish[2], Xorazm hududi[3], Qizilqum[4] va Zarafshonning quyi oqimida[5] ushbu madaniyatga oid ko‘plab yodgorliklar ochilgan va o‘rganilgan. Bu tadqiqotlar tufayli Kaltaminor madaniyati sohiblari Markaziy Osiyo va janubi-g‘arbiy Qozog‘iston hududlarida tarqalib yashaganliklari ilmiy isbotlangan va kaltaminorliklar egallagan hudud va tarixiy davr arxeologiya faniga “Kaltaminor tarixiy-madaniy jamoalari” nomi bilan kiritilgan[6].

Shuningdek, XX asrning 50-yillarida Ya.G‘ulomov rahbarligida olib borilgan Mohandaryo ekspeditsiyasi natijasida fanga bronza davri ilk dehqon jamoalari manzilgohi sifatida qabul qilingan Zamonbobo manzilgohi aniqlangan[7]. Shuningdek, Buxoro viloyatining turli hududlarida shu davr qabr-qo‘rg‘onlari[8] ham aniqlangan bo‘lib, bugungi kunda bu turdagi yodgorliklar yangi tadqiqotlar orqali fan olamiga ma’lum bo‘lishi mumkin.

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[1] Итина М.А. Памятники первобытной культуры верхнего Узбоя // ТХААЭЭ. Т. 2. М., 1958. -С. 37.

[2] Толстов С.П., Кесь А.-С., Итина М.А., Андрианов Б.В. Низовья Аму-Дарьи, Сары-Камыш, Узбой. История формирования и заселения // МХЭ. № 3. М., 1960. – С. 77.

[3] Виноградов А.В. Раннекельтеминарская стоянка Куняк 1 // КСИЭ. Вып. 30. М., 1958. -С.545; Виноградов А.В. Новые неолитические находки Хорезмской экспедиции АН СССР в 1957 г. // МХЭ. Вып. 4. М., 1960. – С.12; Виноградов А.В. Новые материалы для изучения кельтеминарской культуры // МХЭ. Вып. 6. М., 1963. – С. 36.

[4] Тереножкин А.И. Археологическая рекогносцировка в Западной части Узбекистана // ВДИ. № 2. М., 1947. - С. 134. Вактурская Н.Н. О поездке в Южные Кызылкумы в 1955 г. // МХЭ. Вып 1. М., 1959. – С. 165.

[5] Гулямов Я.Г. Археолгические работы к западу от Бухарского оазиса // ТИИА. Вып. 8. Т. 195. – С. 14.

[6] Виноградов А.В. Древние охотники и рыболовы Среднеазиатского междуречья // ТХАЭЭ. XIII. М., 1981. - С. 114; Виноградов А.В. Кельтеминарская культура. М., // Автореф. дисс. … канд. ист. наук. М., 1957. – С. 11; Виноградов А.В. К вопросу о южных связах кельтеминарской культуры // СЭ. 1957. № 1. – С. 44; Виноградов А.В. Древние охотники и рыболовы Среднеазиатского междуречья // ТХАЭЭ. XIII. М., 1981. – С. 118; Brunet F. Comment penser la néolithisation en Asie centrale (Xe-IVe millénaires) ? L’émergence de nouveaux modèles de sociétés entre sédentaires et nomades // Paléorient №37/1, Paris. 2011. – P. 187-204; Виноградов А.В. К вопросу о южных связах кельтеминарской культуры // СЭ. 1957. № 1. – С. 44.

[7] Гулямов Я.Г., Исламов У.И., Аскаров А.А. Первобытная культура и возникновение орошаемого земледелия в низовьях Зарафшана. – Ташкент. Фан, 1966. – 224 с.

[8] Аскаров А. Памятники андроновской культуры в низовьях Зеравшана // ИМКУ. Вып. 3. – Ташкент. Изд-во АН Уз ССР, 1962. – С. 28-41; Аскаров А. Низовья Зеравшана в эпоху бронзы // Автореф. дисс. на соис. учн. степ. канд. ист. наук. – Ленинград, 1962. – 19 с; Аскаров А. Поселение Заман-Баба // КСИА. Вып.93. – М. Изд-во АН СССР, 1963. – С. 86-92.

Hudud landshafti va arxeologik tadqiqotlar.

Loyiha amalga oshirilishi bo‘yicha belgilangan hudud (1-rasm) Zarafshon daryosining eng quyi qismida, Qorako‘l deltasidagi tekislikda joylashgan. Relefida keskinlik kam. Faqat Dengizko‘l rayonida Dengizko‘l botig‘i (160 m) va Dengizko‘l platosi o‘rtasidagi balandliklar farqlanadi. Hududning katta qismi qumli, gipsli, gilli, sho‘rxok cho‘llardir, atrofida bir qancha qoldiq ko‘llar tizimi bor. Ulardan eng kattalari – Dengizko‘l, Somonko‘l, Qorong‘iko‘l, Sho‘rko‘l, Xo‘jamsayod, Qarag‘anjida ko‘llaridar. Qorako‘l daryosining quyi oqimi va sobiq Moxondaryo o‘zani, asosan, tekislikdan iborat. Tuproqlari o‘tloqi bo‘z, qumloq bo‘z, taqir bo‘z tuproqlardir, janubida sho‘rxoklar katta maydonni egallaydi. Belgilangan hudud ayni sho‘rxok cho‘lli maydonda joylashgan[9].

Umuman olganda, Buxoro viloyati tipik cho‘l mintaqasidir. Katta qumliklardan biri – Qizilqum bu hududni ham qamrab olgan. Taniqli buxorolik cho‘lshunos olim I.K. Nazarov cho‘llarni, xo‘jalikda foydalanish nuqtai nazaridan, ikki qismga, ya’ni cho‘l-yaylovlar va cho‘l-vohalarga ajratadi[10]. Cho‘l-vohalar Buxoro viloyatining janubroq qismida Buxoro, Qorako‘l vohalarida joylashgan. Mintaqaning ayni shu qismidan asosiy transport infratuzilmalari o‘tgan va aholining ko‘pchiligi mujassamlashgan. Shu jihatdan G‘ijduvon – Olot yo‘nalishini viloyatning asosiy iqtisodiy mintaqasi, yo‘lagi yoki tarixiy-geografik “o‘qi”, deb baholash mumkin. U o‘tmishda bu yerdan oqib o‘tgan Zarafshon daryosining xavzasiga ham mos keladi. Bu “yo‘lakning” janubida ham, shimolida ham bepoyon cho‘llar yotadi.

Cho‘l sharoitida aholi va xo‘jalik joylashuvining bir-biridan keskin farq qiluvchi – 2 xil ko‘rinishi yaqqol ko‘zga tashlanadi. Ya’ni vohalarda aholi va xo‘jalik o‘ta g‘uj, cho‘llarda esa tarqoq holda joylashgan. Mamlakatimizda Buxoro, Xorazm, Qarshi, Turkmanistonda Mari, Ashxobod, Toshhovuz vohalarida, Misr va Sudanda Nil daryosi atroflarida aholi va xo‘jalik g‘uj holda vujudga kelgan. Aksincha bevosita cho‘lli hududlarda ko‘pincha yakka-yakka tarzda, tabiiy

[9] Олот тумани / Бухоро вилояти // Ўзбекистон Миллий Эенциклопедияси. Биринчи жилд. – Тошкент. 2000.
[10] Назаров И.К., Тошев Х.Р Чўл – яйлов ландшафтларини келгусида ривожланишининг асосий йўналишлари (Бухоро вилояти мисолида) // Фан ва техника тараққиѐти. – Самарқанд. 2007. 101 – 103 б.

resurslarni o‘zlashtirish asosida shakllanadi. Bunga misol qilib, O‘zbekistonning Muborak, Gazli, Qorovulbozor, Turkmanistonning Nebitdog‘, Darvoza, Qozog‘istonning Jezqazg‘an, Ekibastuz shaharlarini keltirish mumkin.

Hududdagi ba’zi chuqurliklar va tepaliklar sun’iy xosil qilingan bo‘lib, asosan uning qumsiz qattiq tuproq qatlamining yuzaga yaqin bo‘lgan joylaridan texnika vositasida tuproq olinib asfalt yo‘li qurish ishlarida foydalanilgan. Shu sababli sun’iy yo‘ldosh orqali olingan suratlarda tupoq uyumlari va chuqurliklar go‘yoki arxeologik ob’ektlar bordek tasavvur uyg‘otadi. Ushbu hududda koriz yoki boshqa suv keltirish uchun qurilgan ob’ektlar yo‘q. Chunki hududda dehqonchilik qilish uchun hosildor tuproqli yerlar uchramaydi. Cho‘ldan faqatgina chorva yetishtirishda foydalanish mumkin xolos.

Qadimgi qo‘lyozmalar va tarixiy madaniy yodgorliklarda Markaziy Osiyo vodiylari, vohalari, jumladan Buxoro vohasida Janubiy-G‘arbiy Osiyoning dehqonchilik madaniyati rivojlanganligi xususida fikr yuritilgan. V.G.Saakovning yozishicha, Zarafshon daryosining quyi qismida eramizdan oldingi II asr oxiri va I asrning boshlarida irrigatsion inshootlarning qurilishi tufayli yangi erlarni o‘zlashtirish ishlari olib borilgan. Bu ishlarning bajarilishi natijasida ko‘rinishi chiroyli manzaraga ega bo‘lgan Buxoro vohasi vujudga kelgan. Atoqli tarixchi Muhammad Narshaxiyning ta’kidlashicha, Buxoro vohasining bunday unumdor o‘lka bo‘lishiga asosiy sabab Zarafshon daryosining baland tog‘lardan boshlanib, suvining tarkibida juda ko‘p loyli oqizma (mineral)larning bo‘lishidir[11]. Akademik Ya.G‘ulomov (1974) arxeologik tadqiqotlari natijasida Buxoro shahrining Shohrud kanali o‘rta oqimida joylashganligini, uning eramizdan avvalgi birinchi ming yillikning o‘rtalarida vujudga kelganligini ilmiy asoslab berdi. Markaziy Osiyo, O‘zbekiston hududlari, shu jumladan Buxoro vohasi tuproqlar qoplamining sug‘orma dehqonchiligi turlicha antropogen evolyutsiyaga uchrashi natijasida ularning morfogenetik tuzilishi hamda geografik jihatdan o‘zgarishi masalalari bir qator ilmiy tadqiqotlarda o‘rganilgan. Buxoro vohasi sug‘oriladigan yerlari cho‘l hududida joylashgan bo‘lib, Qizilqumning markaziy qismini egallaydi. Okean va

[11] Сааков В. Г., Мадрахимов Х. С., Бадридинов С. Древняя и средневековая Бухара. – Москва. 1993.

ochiq dengizlardan minglab kilometr uzoqda bo‘lganligi tufayli Buxoro tipik qurg‘oqchil o‘lkalar qatoriga kiradi. Buxoro viloyati ichki havzaga kiradigan o‘lkalardan bo‘lib, mo‘tadil iqlim mintaqasidan, subtropik iqlim mintaqasiga o‘tish chegarasida joylashgan. Hududning geografik jihatdan bunday o‘rnashganligi iqlimga jiddiy ta’sir ko‘rsatadi. Ya’ni viloyat atmoferasi yozda quruq tropik havo ta’sirida, qishda esa shimoldan, mo‘tadil kengliklardan keladigan salqin havo ta’siri ostida shakllanadi.

Ta’kidlash joizki, qurilish ishlari belgilangan hududlar hozirgi Qizilqum cho‘lining janubiy-sharqiy sarhadlarida joylashgan.

Qizilqum cho‘li bundan 5-6 ming yillar muqaddam bepoyon vodiy bo‘lib, insoniyat ajdodlari juda zich yashagan *“ming ko‘llar mamlakati”* bo‘lgan. Darhaqiqat, hududda o‘nlab sersuv daryolar mavj urib oqqan, yuzlab yirik ko‘llar va shunga mos flora-fauna mavjud bo‘lgan. Kuzatuv hududida saksovul kabi butasimon cho‘l o‘simliklari ko‘p tarqalgan. Hududda arxeologik yodgorliklar kam sonli bo‘lib, asosan karvon yo‘lida zarur bo‘lgan kichik rabod yoki mahalliy cho‘ponlarning qishlash uchun qurgan bino qoldiqlari uchraydi.

Tadqiqot metodikasi.

Vizual qidiruvga qaraganda ancha ko‘p vaqt talab qiladigan narsa yer osti qismida joylashgan obektlarni o‘rganish bo‘lib, ular davomida arxeologik qoldiqlarni aniqlash uchun tuproq qatlamlari namunalari olinadi. Ham sirt, ham kuzatuv shurflari tadqiqotlarda arxeologdan qaysi hudud o‘rganilganligi va bir vaqtning o‘zida nima topilganligi yoki topilmaganligini diqqat bilan qayd etish talab qilinadi. Ushbu qoldiqlarni fiksatsiya qilish uchun odatda topografik xaritalardan foydalaniladi, ularda o‘rganilayotgan maydon chiziqlar yoki bir qator nuqta bilan ko‘rsatilgan. Ushbu xaritalarga qanday qidiruv usullaridan foydalanilganligi va qanday natijalarga erishilganligi, ba’zida alohida obektlar va aniqlangan yodgorliklarning qo‘lda tuzilgan rejalari ko‘rsatilgan tushuntirishlar qo‘shiladi. Kuzatuv shurfi jarayonida har bir shurf odatda ma’lum bir raqam beriladi va uning tarkibi va stratigrafiyasi (tuproq qatlamlarining joylashishi) qayd

etiladi. Barcha topilgan arxeologik topilmalar etiketli paketlarga joylashtiriladi va tozalash, inventarizatsiya qilish va tahlil qilish uchun laboratoriyaga olib kelinadi.

Arxeologik qidiruv ishlari.

Arxeologik qidiruv bu – qadimiy tarixiy yodgorliklarni o‘rganish, ularning joylashgan o‘rnini aniqlash, ilmiy jihatdan qayd etish. Shu jihatdan Buxoro viloyati Olot tumani Qirlishon MFY, Xamza-1, 2 nasos stansiyalari atrofiga yaqin belgilangan hududda qidiruv-tekshiruv ishlari olib borildi (2-rasm). Arxeologik qidiruv belgilangan hududning shimol-g‘arbiy qismida 4 nafar, shimoli-sharqiy qismida 3 nafar mutaxassislar tomonidan janubi-g‘arba va janubi-sharq yo‘nalishida ilon izi (zigzagsimon) ko‘rinishida har bir mutaxasis uchun 100 m^2 maydonda kuzatuv olib borildi. Qidiruv ishlari jarayonida har bir mutaxassis o‘z telefoniga onlayn va oflayn rejimda ishlovchi Locus Map dasturini o‘rnatgan holda treklarni amalga oshirdi (3-rasm).

Hududni tekshirish vaqtida 6 ta nuqtada sopol parchalari sochilib yotgan joylar (4-rasm) va bir qancha buzilib ketgan zamonvaiy qo‘y qo‘ralari (qo‘tonlar) aniqlandi. Sopollar aniqlangan joyda madaniy qatlam izlarini aniqlash maqsadida 6 ta shurf tushirildi.

Arxeologik qazuv ishlari.

1-maydonchada olib borilgan kuzatuv va sinov qazuv ishlari

1-shurf.

Tuproq qatlamini ko‘zdan kechirish uchun shurf qazish ishlari amalga oshirildi. Shurflar hududning turli nuqtalarida amalga oshirildi. 1-nuqta loyiha amalga oshirilishi rejalashtirilgan hududning shimoli-g‘arbiy burchagida chegaradan 500 m ichkarida tushirildi. Uning o‘lchami 1x1 m. Qazish ishlari boshlanishi bilan qumli qatlamning 50-60 sm chuqurlikkacha bo‘lgan qismi olib tashlandi. Shundan so‘ng gilli qattiq qatlam kuzatildi. Uning qattiqligi sabab qazish ishlari tugatildi. Ushbu shurf natijasida qumli qatlam qalinligi tekis joylarda 50-70 sm qalinlikda ekanligi aniqlandi va hech qanday madaniy qatlam izlari kuzatilmadi (5-rasm).

Hududning eng baland qismi g‘arbiy qismidagi tepaliklar atrofida mahalliy cho‘ponlarning mavsumiy chaylalari izlari saqlanib qolgan joylarda olib borilgan kuzatuv ishlarida bir qancha o‘rta asrlarga oid sopol idishlar qoldiqlari aniqlandi.

2-maydonchada olib borilgan kuzatuv va sinov qazuv ishlari

2-shurf.

2-nuqta loyiha amalga oshirilishi rejalashtirilgan hududning shimoli-sharqida 1-nuqtadan 1,7 km masofada joylashgan. Uning o‘lchami 1x1 m. Qazish ishlari boshlanishi bilan qumli qatlamning qattiq gilli qatlamgacha bo‘lgan qismi olib tashlandi. Shundan so‘ng gilli qattiq qatlam kuzatildi. Uning qattiqligi sabab qazish ishlari tugatildi. Ushbu shurf natijasida madaniy qatlam izlari kuzatilmadi (6-rasm).

3-maydonchada olib borilgan kuzatuv va sinov qazuv ishlari

3-shurf.

3-nuqta loyiha amalga oshirilishi rejalashtirilgan hududning janubi g‘arbida 1-nuqtadan 2,9 km masofada joylashgan. Uning o‘lchami 1x1 m. Qazish ishlari qumli qatlamning qattiq qatlamgacha bo‘lgan qismi olib tashlandi. Bu yerda ham qattiq gilli qatlam kuzatildi va uning qattiqligi sabab qazish ishlari tugatildi. Ushbu shurf natijasida hech qanday madaniy qatlam izlari kuzatilmadi va arxeologik topilmalar aniqlanmadi (7-rasm).

4-maydonchada olib borilgan kuzatuv va sinov qazuv ishlari

4-shurf.

4-nuqta loyiha amalga oshirilishi rejalashtirilgan hududning janubi-sharqida 1-nuqtadan 2,5 km masofada joylashgan. Uning o‘lchami 1x1 m. Qazish ishlari gilli qattiq qatlamgacha olib borildi va uning qattiqligi sabab qazish ishlari tugatildi. Ushbu shurf natijasida xech qanday madaniy qatlam izlari kuzatilmadi va arxeologik topilmalar aniqlanmadi (8-rasm).

5-maydonchada olib borilgan kuzatuv va sinov qazuv ishlari

5-shurf.

5-nuqta loyiha amalga oshirilishi rejalashtirilgan hududning markaziy qismidan sharqda 1-nuqtadan 1,4 km masofada joylashgan. Uning o‘lchami 2x1 m.

Qazish ishlari boshlanishi bilan qumli qatlamning 70 sm – 1 m chuqurlikkacha bo‘lgan qismi olib tashlandi. Shundan so‘ng gilli qattiq qatlam kuzatildi. Uning qattiqligi sabab qazish ishlari tugatildi. Ushbu shurf natijasida xech qanday madaniy qatlam izlari aniqlanmadi (9-rasm).

6-maydonchada olib borilgan kuzatuv va sinov qazuv ishlari

6-shurf.

6-nuqta loyiha amalga oshirilishi rejalashtirilgan hududning markaziy qismidan g‘arbda 1,4 km masofada joylashgan. Tuproq qatlamini ko‘zdan kechirish uchun shurf qazish ishlari amalga oshirildi. Shurf hududning markaziy qismida qazib tushirildi. Uning o‘lchami 2x1 m. Qazish ishlari boshlanishi bilan qumli qatlamning 50-60 sm chuqurlikkacha bo‘lgan qismi olib tashlandi. Shundan so‘ng gilli qattiq qatlam kuzatildi. Uning qattiqligi sabab qazish ishlari tugatildi. Ushbu shurf natijasida qumli qatlam qalinligi tepalik joylarda 70 sm – 1 m qalinlikda ekanligi aniqlandi. Xech qanday madaniy qatlam yoki inson faoliyati bilan bog‘liq izlar aniqlanmadi (10-rasm).

Topilmalar tavsifi.

Topilmalarning katta qismi sopol fragmentlardan iborat bo‘lib, asosan sirlanmagan idishlar hisoblanadi. Sirlanmagan sopol namunalari butun hudud bo‘ylab kam sonli tarqalgan. Ushbu sopol idishlar asosan flyaga (suvdon), ko‘za va xumchlar parchalari qayd qilindi. Shuni alohida ta’kidlash joizki, o‘rganilayotgan hudud kuchli sho‘rlangan bo‘lib, sopol mahsulotlari yoki qurilish mahsulotlari ishlab chiqarish uchun yaroqsiz hisoblanadi.

Buxoro vohasida sopol buyumlari ishlab chiqarish uchun yuqori sifatli loy Qarnab qishlog‘i Suqoyti konidan olingan (Raximov, 1961. S. 34).

Ko‘zalar asosan fragmentlardan iborat, tez aylanuvchi kulolchilik charxida yasalgan, tuxumsimon shaklda**,** kesmada qizg‘ish tusda, xamiri soz, tarkibida qum va mayda oxaktosh aralashmalari uchraydi. Ko‘zalarning tashqi tarafiga pishirilishidan oldin maxsus asbob bilan tasmasimon bezak berilgan. Dastasi yo‘g‘on qilib yasalgan va yelkasi va gardishiga biriktirilgan. Ko‘zalarning bu kabi turlari Buxoroning XVI-XIX asr oshxona idishlari majmuasida kuzatiladi.

Qozonlar kamsonli bo‘lib, asosan fragmentlardan iborat, qo‘lda yasalgan. shakli sharsimon, tagi tekis, uncha qalin bo‘lmagan uchburchaksimon poddon xosil qilingan. Kesmada qizil tusda, xamiri g‘ovakli, tarkibida yirik shamot, maydalangan oxaktosh va o‘simlik qo‘shimchalari bor. Qozonlar parchalari topilgan hudud atrofida manzilgohlar izlari aniqlanmaganligi sabab ulardan mavsumiy foydalanilgan degan xulosaga kelindi. Aytish mumkinki, mahalliy cho‘ponlar ko‘chib yurish vaqtida foydalanishga yaroqsiz bo‘lib qolganligi sababli idish parchalrini tashlab ketishgan bo‘lishi mumkin.

XULOSA

Buxoro viloyati Olot tumanida joylashgan “Nur-Buxoro quyosh fotoelktrik stansiyasini” loyihalash, qurish rejalashtirilgan hududda (perimetr: 12 km, maydon: 669 ga) arxeologiya qidiruv-tekshiruv ishlari natijasida quyidgi hulosaga kelindi:

1. Belgilangan hududda arxeologiya qidiruvlari orqali arxeologiya obektini aniqlash, xaritalashtirish, uning chegaralarini belgilash maqsadida amalga oshirilgan arxeologiya tadqiqoti jarayonida arxeologiya yodgorligi, arxeologiya obekti aniqlanmadi;
2. Belgilangan hududda arxeologiya qidiruvlari jarayonida milodiy XI-XII va XVIII-XIX asrlarga oid arxeologiya ashyolari aniqlandi (sopol parchalari to’plami). Lekin arxeologiya ashyolari aniqlangan joyda madaniy qatlamlar, me’moriy va boshqa moddiy qoldiqlarni o‘rganish maqsadida o‘tkazilgan arxeologiya qazishmalari vaqtida (tushirilgan shurflarda) madaniy qatlamlar, me’moriy va boshqa moddiy qoldiqlar aniqlanmadi;
3. Hudud kattaligi sababli loyihalash, qurish rejalashtirilgan hududda qurlish, yer qazish ishlari vaqtida arxeologlar doimiy nazorati ostida amalga oshirilshi lozim.

Yuqoridagi hulosalar asosi sifatida O’zbekiston Respublikasining “Arxeologiya merosi obyektlarini muhofaza qilish va ulardan foydalanish to‘g‘risida”gi O‘RQ-229-sonli Qonuni asos bo’lib hizmat qiladi[12].

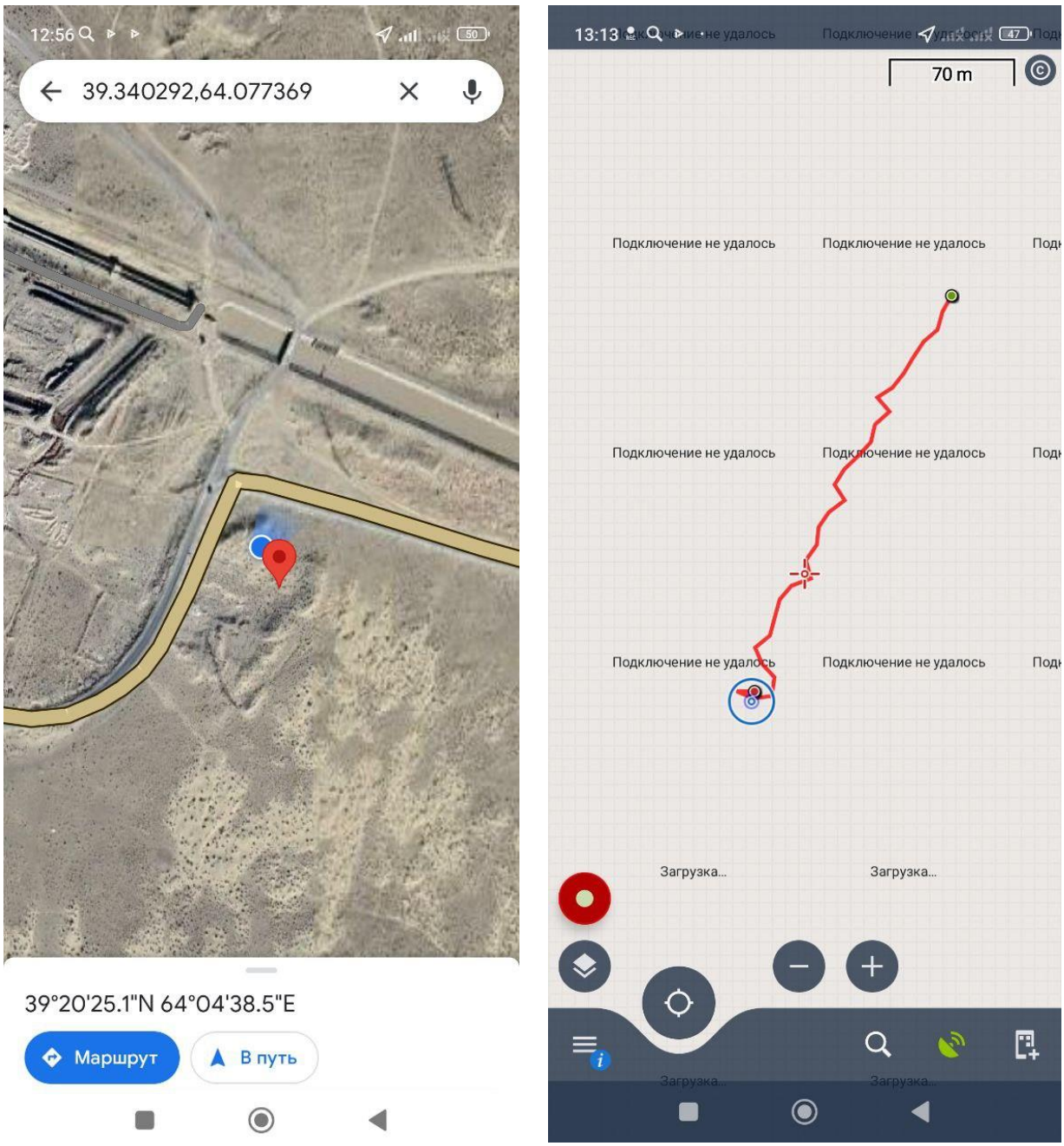
[12] O’zbekiston Respublikasining “Arxeologiya merosi obyektlarini muhofaza qilish va ulardan foydalanish to‘g‘risida”gi O‘RQ-229-sonli Qonuni 3-modda 4-xatboshi.

ARXEOLOGIK TADQIQOTLARGA ILOVA

1-rasm. O‘rganilishi belgilangan hudud (qizil chiziqda).

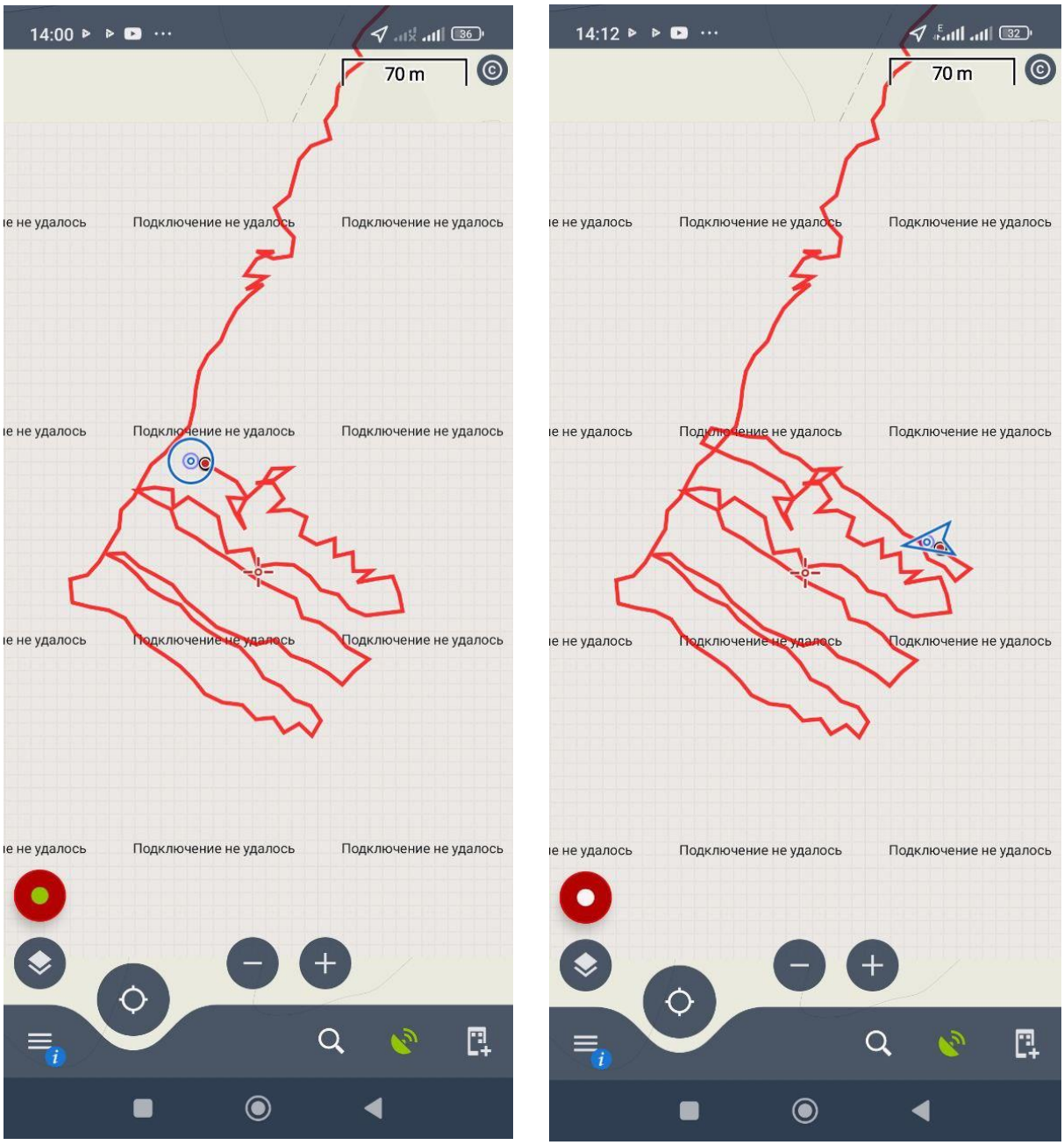
SHIMOLIY KENGLIK	SHARQIY UZUNLIK
Nur Buxoro QFS Loyihasi dastlabki koordinatalari	
39.341582°	64.065914°
39.338771°	64.074747°
39.340930°	64.077298°
39.339934°	64.082145°
39.340500°	64.098793°
39.339261°	64.105267°
39.301945°	64.068338°
39.300660°	64.065307°
39.300621°	64.062543°
39.301128°	64.060294°
39.302892°	64.056861°
39.303592°	64.053064°
39.306727°	64.056363°
39.328554°	64.058916°
39.338460°	64.062542°

2-rasm. Loyiha maydonining koordinatlari.



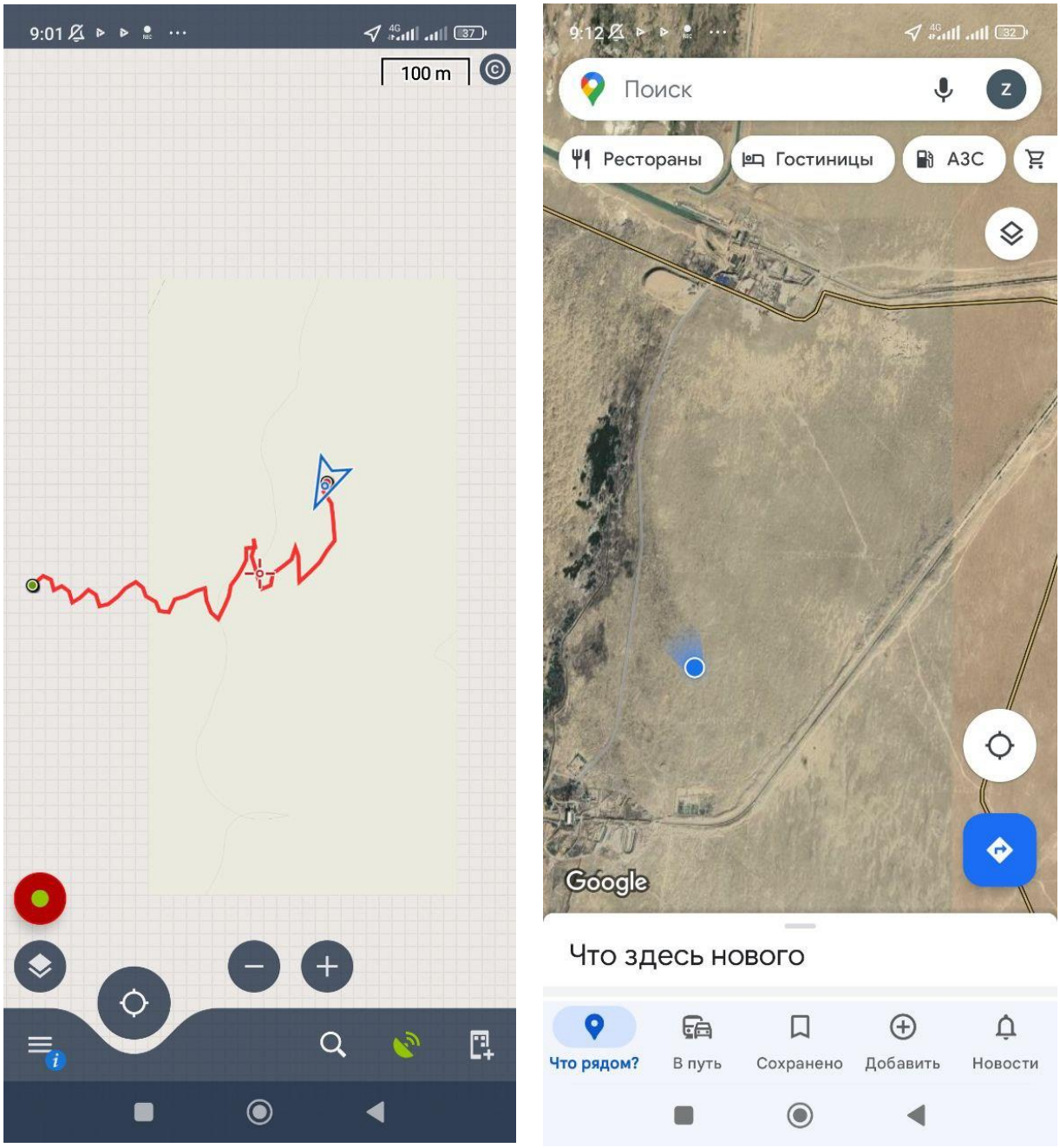
3-rasm. 1 va 2-treklar.

3-rasm. 1 va 2-treklar o’tkazilgan hudud fotosi.



3-rasm. 3 va 4-treklar.

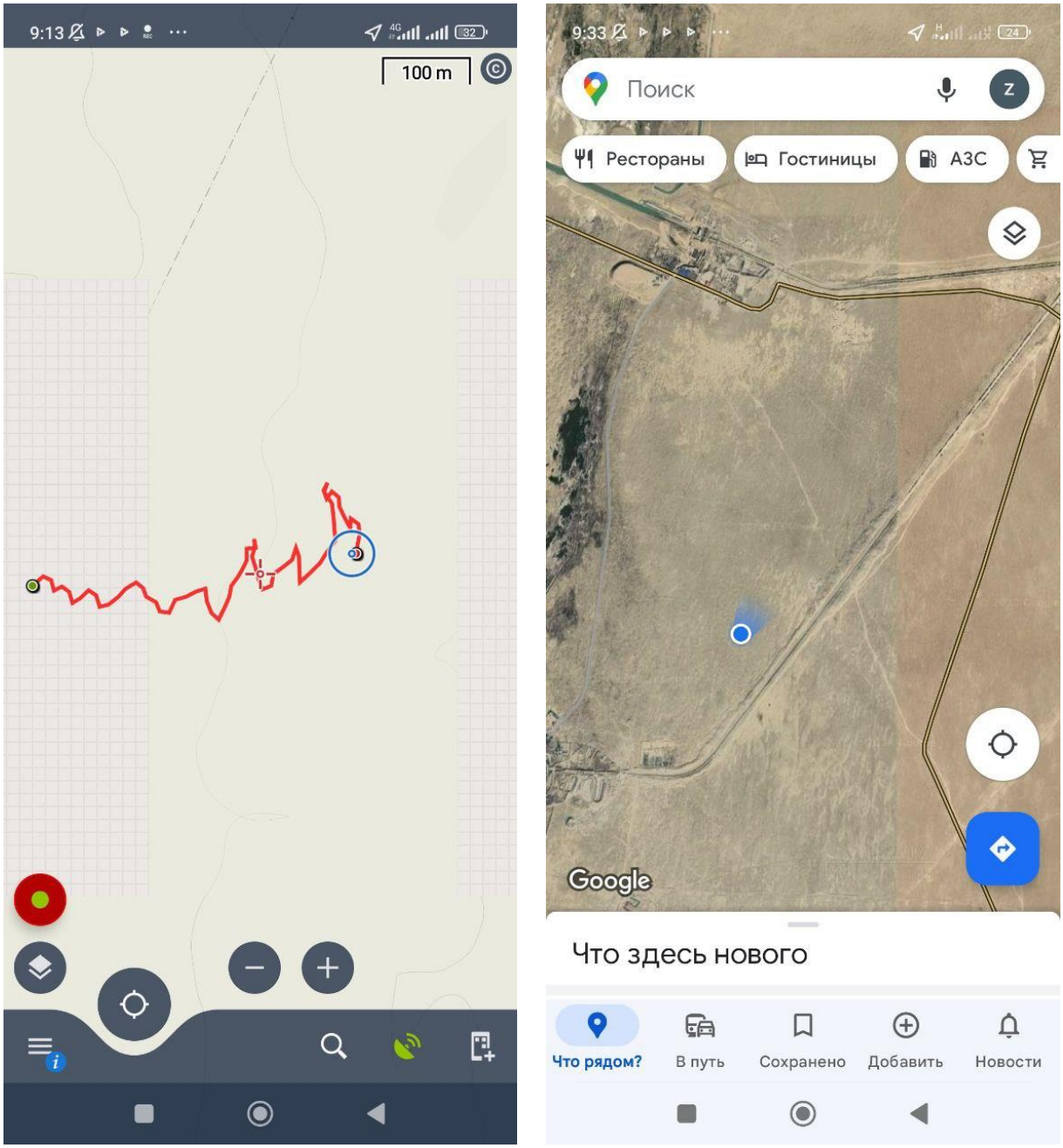
3-rasm. 3 va 4-treklar o’tkazilgan hudud fotosi.


9:01
100 m
9:12
Поиск
Рестораны
Гостиницы
АЗС
Google
Что здесь нового
Что рядом?
В путь
Сохранено
Добавить
Новости

3-rasm. 5-trek.

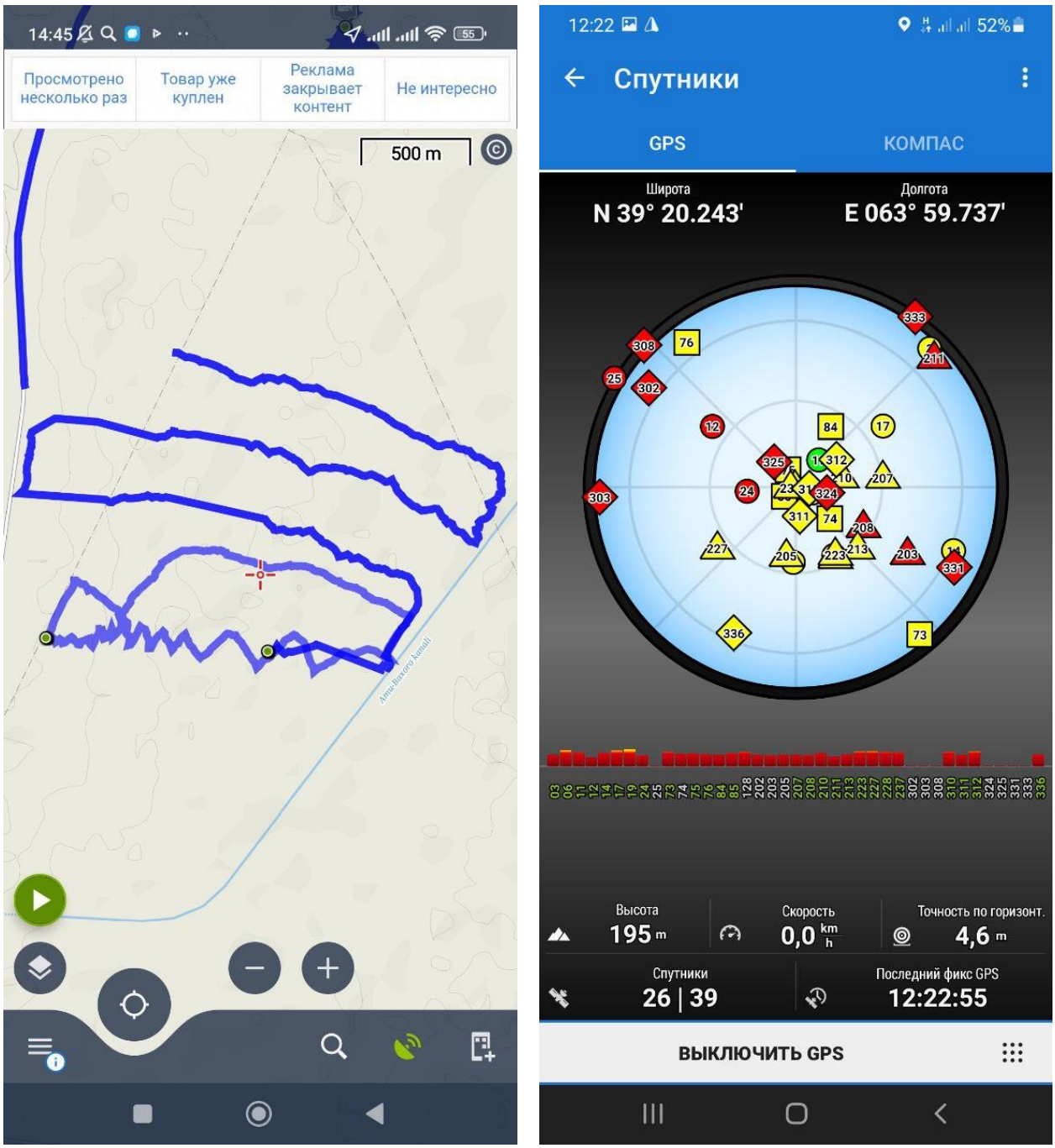
.

3-rasm. 5-trek o’tkazilgan hudud fotosi.


9:13
100 m
9:33
Поиск
Рестораны
Гостиницы
АЗС
Google
Что здесь нового
Что рядом?
В путь
Сохранено
Добавить
Новости

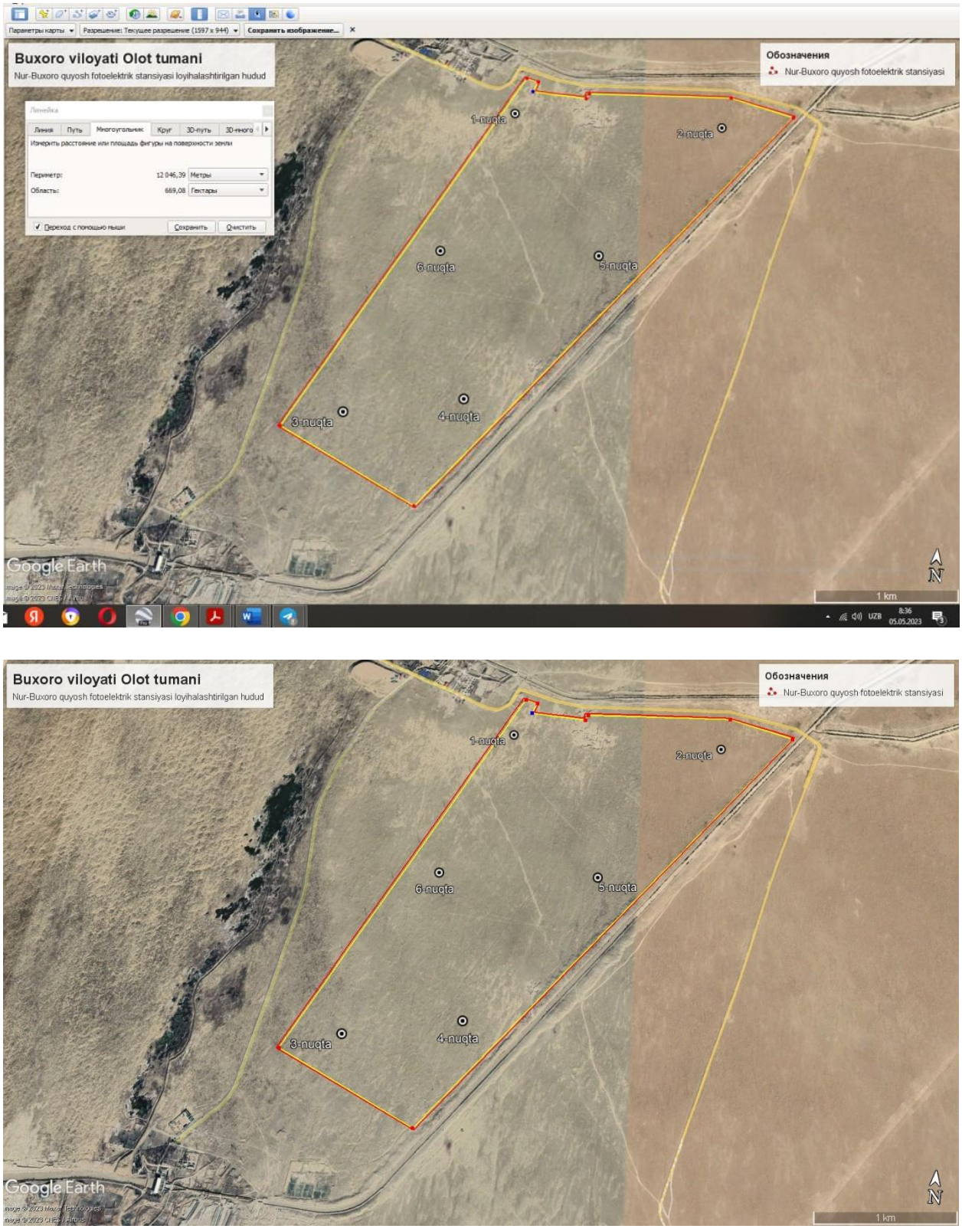
3-rasm. 6-trek

3-rasm. 6-trek o’tkazilgan hudud fotosi


14:45
Просмотрено несколько раз
Товар уже куплен
Реклама закрывает контент
Не интересно
500 m
12:22
52%
Спутники
GPS
КОМПАС
Широта
N 39° 20.243'
Долгота
E 063° 59.737'
Высота
195 m
Скорость
0,0 km/h
Точность по горизонт.
4,6 m
Спутники
26 | 39
Последний фикс GPS
12:22:55
ВЫКЛЮЧИТЬ GPS

3-rasm. 7-trek

3-rasm. 7-trek o’tkazilgan hudud fotosi



4-rasm. 6 ta nuqtada aniqlangan sopol parchalari sochilib yotgan joylar

5-rasm. 1-shurf joyi.

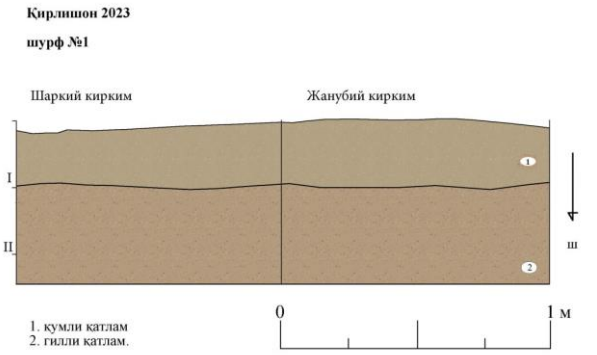
6-rasm. 2-shurf joyi.

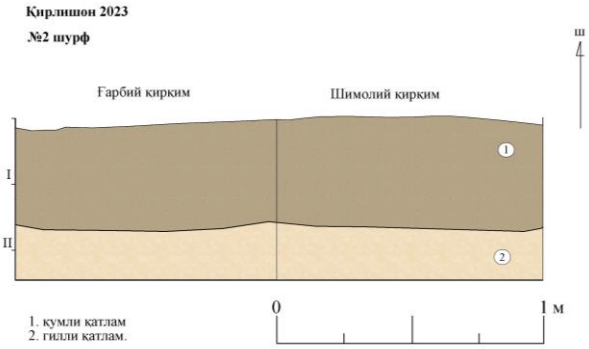
7-rasm. 3-shurf joyi.

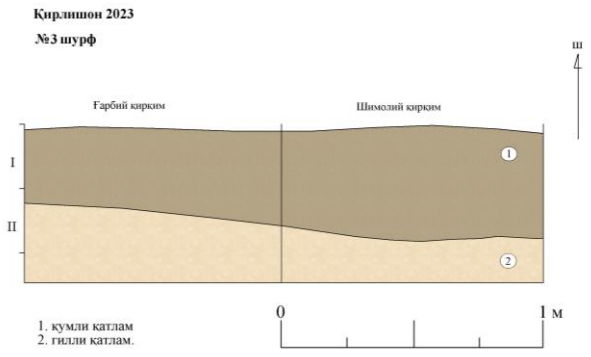
8-rasm. 4-shurf joyi.

9-rasm. 5-shurf joyi.

10-rasm. 6-shurf joyi.







11-rasm. Shurflar rasmi va kesmasi

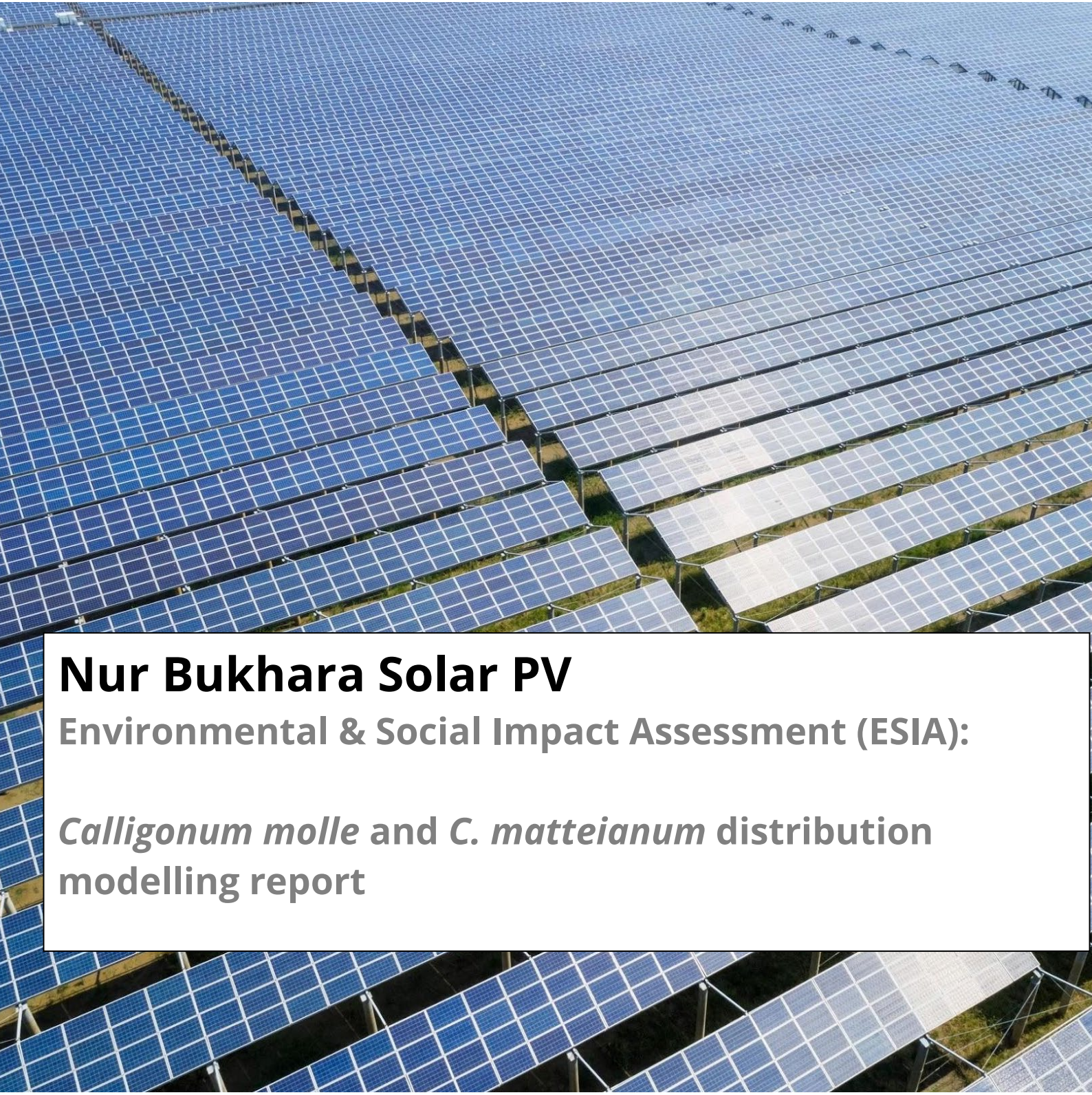
FOYDALANILGAN ADABIYOTLAR RO‘YXATI

1. Brunet F. Comment penser la néolithisation en Asie centrale (Xe-IVe millénaires) ? L’émergence de nouveaux modèles de sociétés entre sédentaires et nomades // Paléorient №37/1, Paris. 2011. – P. 187-204.
2. Аскаров А. Низовья Зеравшана в эпоху бронзы // Автореф. дисс. на соис. учн. степ. канд. ист. наук. – Ленинград, 1962. – 19 с.
3. Аскаров А. Памятники андроновской культуры в низовьях Зеравшана // ИМКУ. Вып. 3. – Ташкент. Изд-во АН Уз ССР, 1962. – С. 28-41.
4. Аскаров А. Поселение Заман-Баба // КСИА. Вып.93. – М. Изд-во АН СССР, 1963. – С. 86-92.
5. Виноградов А.В. Древние охотники и рыболовы Среднеазиатского междуречья // ТХАЭЭ. XIII. М., 1981. -С. 114.
6. Виноградов А.В. Древние охотники и рыболовы Среднеазиатского междуречья // ТХАЭЭ. XIII. М., 1981. – С. 118.
7. Виноградов А.В. К вопросу о южных связах кельтеминарской культуры // СЭ. 1957. № 1. – С. 44.
8. Виноградов А.В. К вопросу о южных связах кельтеминарской культуры // СЭ. 1957. № 1. – С. 44.
9. Виноградов А.В. Кельтеминарская культура. М., // Автореф. дисс. … канд. ист. наук. М., 1957. – С. 11.
10. Виноградов А.В. Новые материалы для изучения кельтеминарской культуры // МХЭ. Вып. 6. М., 1963. – С. 36.
11. Виноградов А.В. Раннекельтеминарская стоянка Куняк 1 // КСИЭ. Вып. 30. М., 1958. -С.545; Виноградов А.В. Новые неолитические находки Хорезмской экспедиции АН СССР в 1957 г. // МХЭ. Вып. 4. М., 1960. – С.12.
12. Гулямов Я.Г. Археолгические работы к западу от Бухарского оазиса // ТИИА. Вып. 8. Т. 195. – С. 14.
13. Гулямов Я.Г., Исламов У.И., Аскаров А.А. Первобытная культура и возникновение орошаемого земледелия в низовьях Зарафшана. – Ташкент. Фан, 1966. – 224 с.
14. Итина М.А. Памятники первобытной культуры верхнего Узбоя // ТХААЭЭ. Т. 2. М., 1958. -С. 37.
15. Назаров И.К., Тошев Х.Р Чўл – яйлов ландшафтларини келгусида ривожланишининг асосий йўналишлари (Бухоро вилояти мисолида) // Фан ва техника тараққиѐти. – Самарқанд. 2007. 101 – 103 б.
16. Тереножкин А.И. Археологическая рекогносцировка в Западной части Узбекистана // ВДИ. № 2. М., 1947. -С. 134. Вактурская Н.Н. О поездке в Южные Кызылкумы в 1955 г. // МХЭ. Вып 1. М., 1959. – С. 165.
17. Толстов С.П., Кесь А.-С., Итина М.А., Андрианов Б.В. Низовья Аму-Дарьи, Сары-Камыш, Узбой. История формирования и заселения // МХЭ. № 3. М., 1960. – С. 77.

Belgilangan hududda aniqlangan topilmalar pasporti

№	Buyumning nomi va fotosurati	Tavsifi	Saqlanish xolati	Topilgan joyi	Davri	Izox
1		sopol	fragment	1 maydon	O‘rta asrlar	12
2		sopol	fragment	2 maydon	O‘rta asrlar	14
3		sopol	fragment	3 maydon	O‘rta asrlar	14
4		sopol	fragment	4 maydon	O‘rta asrlar	16
5		sopol	fragment	5 maydon	O‘rta asrlar	11
6		sopol	fragment	6 maydon	O‘rta asrlar	18

Technical appendix 13:
Maxent modelling report



Nur Bukhara Solar PV

Environmental & Social Impact Assessment (ESIA):

Calligonum molle and *C. matteianum* distribution modelling report

Consulting Firm:

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Juru's Project Manager	Nicola Davies
Juru's Project Director	Jushkinbek Ismailov

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Version	Date	Description	Author	Reviewer	Approver
1	7/04/2023	Final Report	Bekhzod Adilov	Caleb Gordon	Nicola Davies

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1. Aims and objectives

In accordance with TOR, the main tasks of expert-botanist is following:

- MaxEnt modelling of the *Calligonum molle* and *Calligonum matteianum* distribution

2. Project site

The project area is situated in Alat District of the Bukhara Province of Uzbekistan, in the western part of the sandy desert called Sundukli Sands (south-western part of Kyzylkum Desert), about 10 km to the north of the lake Dengizkul (wildlife sanctuary/Ramsar site Dengizkul) and 25 km to the east of town Alat, between two branches of the Amu-Bukhara channel, near Khamza pump station (Figure 1). The elevations are 188–206 m a.s.l.

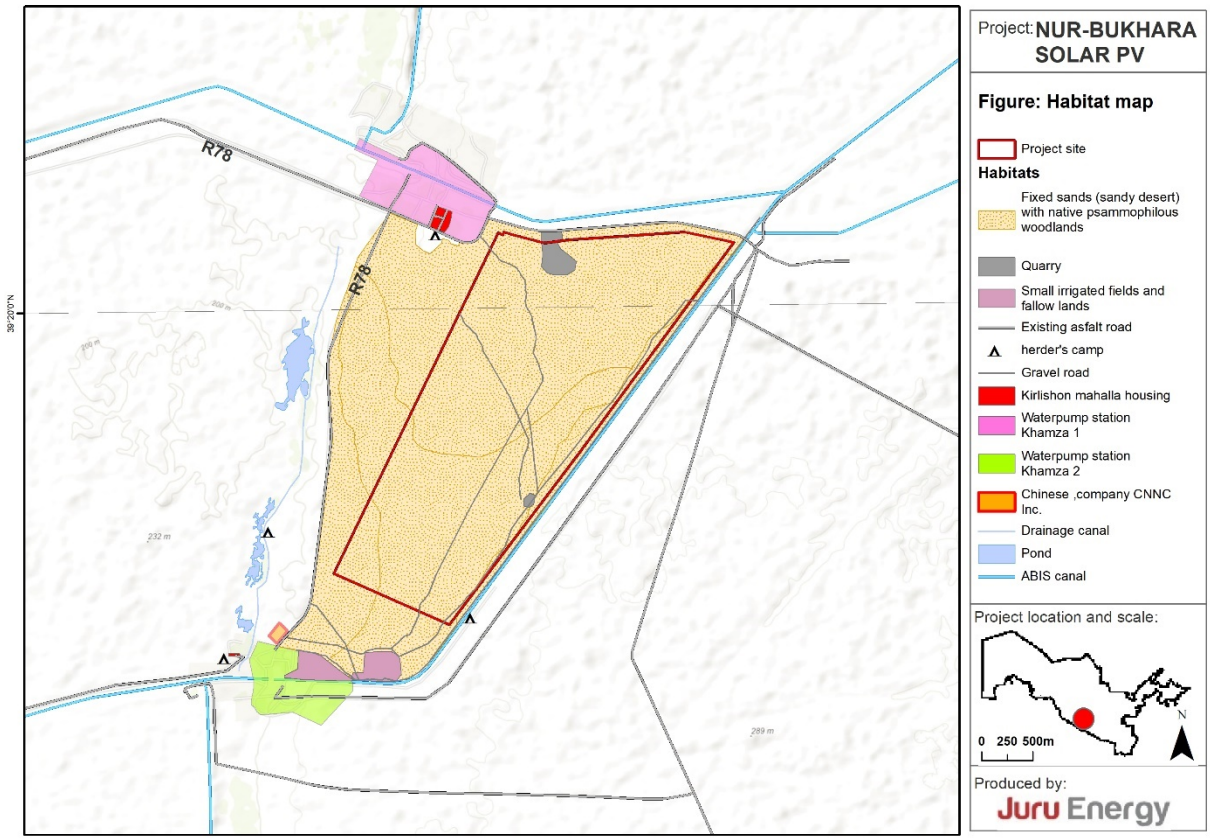


Figure 1: Project area.

3. Literature review

In 2021, as a result of the field surveys carried out within the framework of "Scaling Solar Uzbekistan Round 3" Project, 66 plant species were recorded in the project area, including 3 nationally and globally red-listed representatives of the genus *Calligonum* (*Calligonum matteianum, Calligonum molle* and *Calligonum paletzkianum*).

As other Central Asian representatives of *Calligonum*, these species bloom in April-May and bear fruits in May-June. The ripe fruits fall off, and remain under the mother plant or are carried by the

wind and spread over quite long distances. Much of *Calligonum* fruits is consumed by livestock and wild animals, the rest, under favorable conditions, can germinate next spring or even after 4-7 years. The feature of *Calligonum* seeds is a deep dormancy and low germination due to their hard, thickened shell. Seed germination depends on the amount of precipitation falling during autumn, winter and spring. During the first year, young plants of *Calligonum* can reach a height of 50 to 100-115 cm; however, due to the extra-arid conditions of sandy desert, overgrazing and other negative impact, 90% or more of seedlings die in summer. Individuals of *Calligonum* begin to bear flowers and fruits at 2-5 years of age, and their lifespan is 12-20 years (Parpiev, 1974; Soskov, 2011; Butnik et al., 2016). The species of *Calligonum* are shrubs or small trees 0.5-4 m tall; one of the main features of the genus is a weak differentiation of morphological features of vegetative organs and flowers; species can be reliably distinguished and identified only by fruits. The taxonomy of this genus is very complex and difficult.

Calligonum L. is a genus of the family *Polygonaceae* widespread in arid regions of Central and Western Asia, North Africa and SE Europe. It is an ancient genus of the desert flora and the only genus in *Polygonaceae* that contains C4 species (Soskov, 2011; Butnik et al., 2016). They can tolerate extreme drought conditions by the loss of leaves and branches during the dry and hot season.

According to the different estimations, the genus *Calligonum* contains 28 (Soskov, 2011), 41 (POWO, 2022) to 81 (GBIF, 2022) accepted species. The desert zone of Central Asia is the main center of origin and diversity of *Calligonum*. 45 species have been reported for this region by Nabiev in the "Conspectus Florae Asiae Mediae" (1971), six of them are included in the IUCN Red List as globally threatened (Eastwood et al., 2009; IUCN Red List, 2023).

The main aim of the survey was to model the distribution and habitat suitability of two species of the *Calligonum* genus, specifically *Calligonum molle* and *Calligonum matteianum*.

4. Materials and methods

The modelling was performed by the maximum entropy principle implemented in the MaxEnt program. At the same time, the territory of Central Asia, Iran and Afghanistan (6,400,000 km2) was chosen as the study area for *Calligonum molle* and *C. matteianum*.

The initial data for modelling was the presence-only data. The analysis included only those data (localities) that were confirmed by herbarium specimens and literature data. At the same time, 8 locations were selected for *C.molle*, 14 for *C.matteianum* from the territories of Uzbekistan, Turkmenistan, Afghanistan and Iran (Table 1 and Figure 1).

Table 1 Localities for Calligonum molle and C.matteianum

Species	Location	Latitude	Longitude
Calligonum molle	Railway station Repetek, thickets behind the station building, 24.05.1913, Buynitsky (type herbarium specimen LE)	38.5666	63.1813
Calligonum molle	Iran, Hormozgan, Bandar Abbas, 08.12.1955, Javanshir (Maassoumi, 2011)	27.2172	56.3002

Calligonum molle	Southern Tajikistan, near SW spurs of Koykitau Range, 10 km to NW of Aiwanj, fixed sands, 04.06.1962, Soskov, Shabkova, Ismatova (herbarium specimen TASH)	37.0747	68.027
Calligonum molle	Uzbekistan, Bukhara Province, hilly sands to the south of the lake Dengizkul, 03.06.2009, Gaziev, plantarium.ru	39.08334	64.1334
Calligonum molle	Turkmenistan, western part of Central Karakum, surroundings of the new Turkmen Lake, may 2014, Pavlenko, www.plantarium.ru	40.5126	56.7974
Calligonum molle	Turkmenistan, western part of Central Karakum, surroundings of the new Turkmen Lake, Calligonum-white saxaul community, semi-fixed sands, 10.05.2017, Pavlenko, www.plantarium.ru	40.5126	56.7974
Calligonum molle	Uzbekistan, Bukhara Province, Alat district, about 1.2 km from the western shore of Dengizkul Lake, 15.06.2019, Rakhimova et al., field studies	39.089167	64.13167
Calligonum molle	Uzbekistan, Bukhara Province, Alat district, near the Amu-Bukhara channel, "Bukhara" project site, in the northern part of project site, in surroundings of the quarry. June 2021, Beshko	39.33036	64.083207
Calligonum matteianum	Turkmenistan, Railway station Repetek, thickets behind the station building, 24.05.1913, Buynitsky (type herbarium specimen LE)	38.5666	63.1813
Calligonum matteianum	Turkmenistan, Right bank of Herirud, to the north of Puli-Khatun, 20.04.1916, Korovin (herbarium specimen TASH)	36.053	61.1888
Calligonum matteianum	Turkmenistan, Karakum, Unguz, near the village Takyr-Damly, 27.05.1916, Korovin (herbarium specimen TASH)	38.7976	59.7283
Calligonum matteianum	Turkmen SSR, Chardzhou Province, Deynau district, near the office of kolkhoz "Lenin", on sands, 05.06.1960, Ashirova, Osmanova (herbarium specimen TASH)	39.2187	63.1267
Calligonum matteianum	Uzbekistan, Sundukli Sands, fixed sands between wells Zevardy and Alan-kuduk, to the west of the village Pamuk, 22.06.1937, Gomolitsky (herbarium specimen TASH)	38.7749	64.9921
Calligonum matteianum	Uzbekistan, Southern Kyzylkum, Urtachul, 3 km to the NE of the well Shady, 09.06.1955, Momotov, Li (herbarium specimen TASH)	39.21417	64.18356
Calligonum matteianum	Uzbekistan, Southern Kyzylkum, Bukhara region, 5–6 km to the NW of the well Deukhana, 06.10.1956, Momotov, Li (herbarium specimen TASH)	39.29413	64.57358
Calligonum matteianum	Uzbekistan, Bukhara Province, Karakul forestry, Kandymli, 03.06.1987, Tursunov, Matyunina, Abdullaeva (herbarium specimen TASH)	39.604	63.438
Calligonum matteianum	Uzbekistan, Bukhara Province, Alat district, surroundings of Dengizkul Lake, Western Shady oil and gas field, 10.10.2015, Beshko, Golowtsov (herbarium specimen TASH)	39.19556	64.01
Calligonum matteianum	Uzbekistan, Bukhara Province, Alat district, surroundings of Dengizkul Lake, Khauzak oil and gas field, 10.10.2015, Beshko, Golowtsov (herbarium specimen TASH)	39.109	64.075
Calligonum matteianum	Uzbekistan, Bukhara Province, Alat district, about 1.2 km from the western shore of Dengizkul Lake, 15.06.2019, Rakhimova et al., (field studies, herbarium specimen TASH)	39.089167	64.13167
Calligonum matteianum	Uzbekistan, Bukhara Province, border of Karakul and Jondor districts, 15.06.2019, Rakhimova et al., (field studies, herbarium specimen TASH)	39.58472	64.02639

Calligonum matteianum	Uzbekistan, Bukhara Province, Alat district, near the Amu-Bukhara channel, "Bukhara" project site, in the northern part of project site, in surroundings of the quarry (field survey 2021)	39.33036	64.083207
Calligonum matteianum	Uzbekistan, Bukhara Province, Alat district, near the Amu-Bukhara channel, "Bukhara" project site, in the western part of project site, between the pump station and small village Khamza (field survey 2021)	39.31609	64.06269

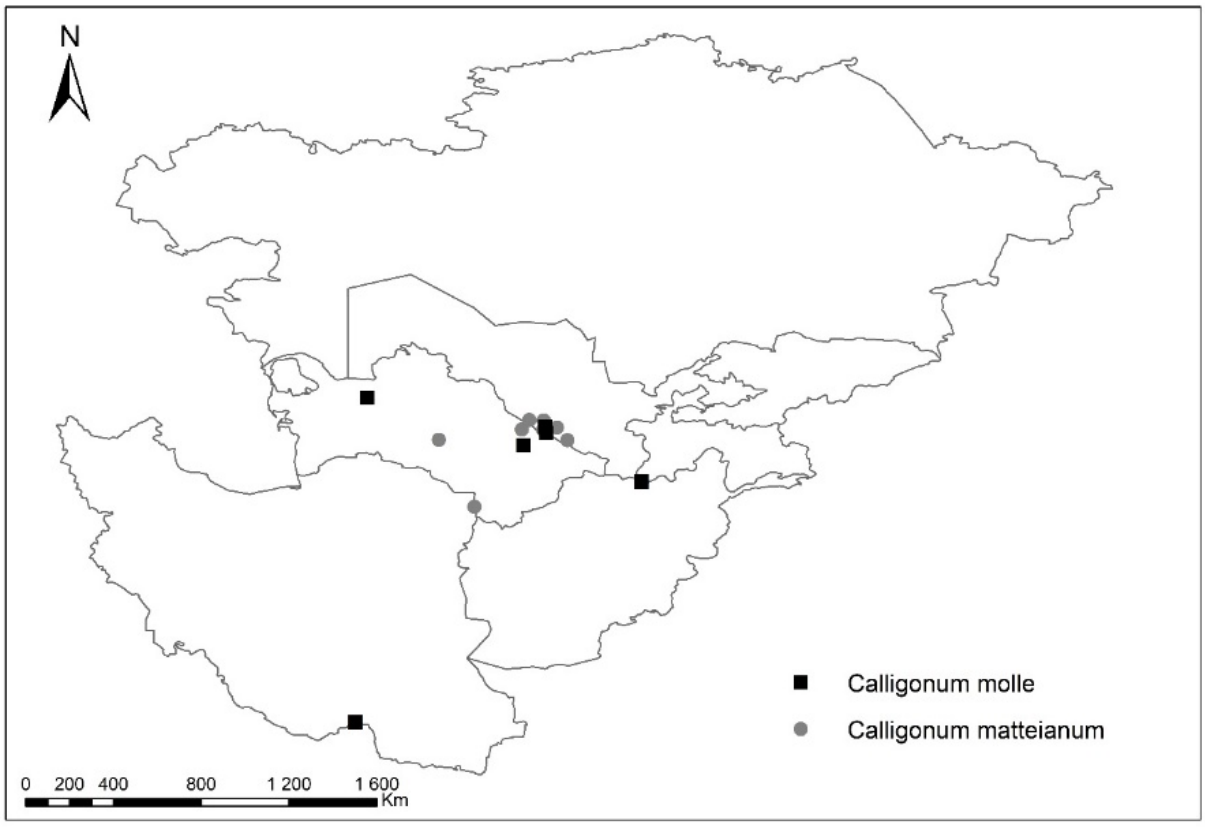


Figure 2 C.molle and C.matteianum localities location in the study area

During species distribution modelling, two models were built:

1. BE model. When building models, 19 bioclimatic parameters (Bioclim) were used, reflecting data on temperature and precipitation of the territory, which allow interpolation of current data from 1979 to 2013. Also, parameters for elevation data are included in the model. Bioclimatic information was obtained from the Worldclim (http://www.worldclime.org) database at a resolution of 30 arc/sec. Based on the Global Digital Elevation Model (SRTM, http://www.srtm.csi.cgiar.org), elevation data were constructed with a 90 m resolution.
2. BSE model. The model consists of 19 bioclimatic (Bioclim), 82 soil factors and elevation data. Soil data was based on the World Reference Base for Soil Resources (WRB) (http://www.fao.org) and included 4 soil horizon characteristics, 5 physical and 4 soil

chemical properties, and 69 soil classifications of the study area with a 250 m resolution. Soils were grouped based on their reference soil groups (WRB, 2015).

When building the MaxEnt model, the Bootstrap replication method was used to train data. To value the accuracy of the model, 25% of the points were used as a test set; a threshold of 10% was also set. As an output format, we chose a logistic format with gradations from 0 to 1 in order to estimate the probability of finding species.

When compiling species distribution maps, GIS packages ArcMap 10.8 and QGIS 3.10.2 were used.

5. Results of the MaxEnt modelling

For both models AUC ranged from 0.9 to 1.0, which was estimated as an excellent result. Including, the AUCtraining of BE was 0.97, and the AUCtest of BE was 0.94. However, the AUC of the BSE model was more acceptable than that of the BE model (AUCtraining = 0.99, AUCtest = 0.97). In addition, the 10th percentile threshold of the BSE model (0.564) was higher than that of the BE model (0.384).

The map of the potential distribution of both species was obtained on the basis of the BSE model (Figure 2 and Figure 3).

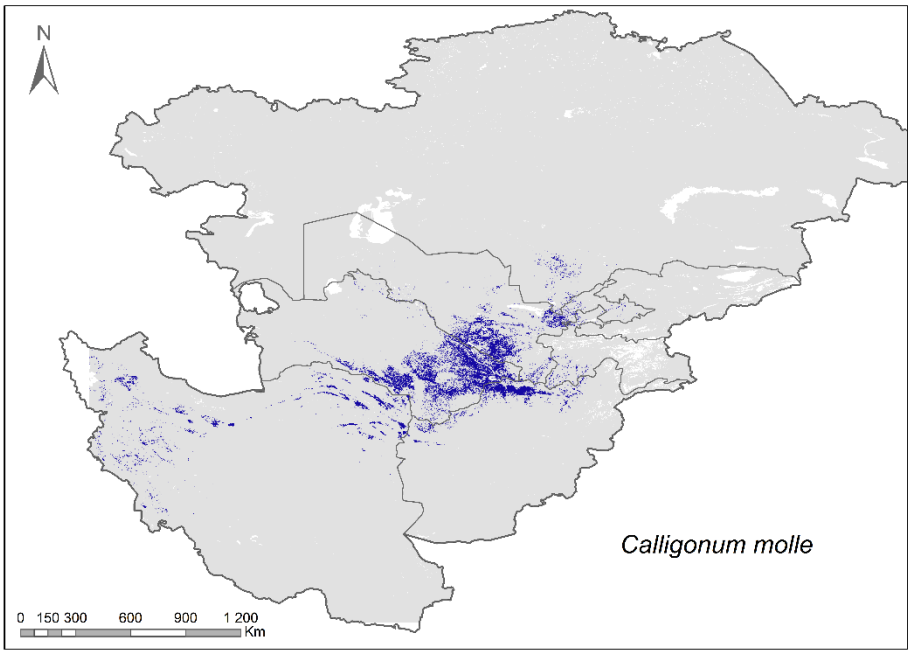


Figure 3 Potential C.molle habitat

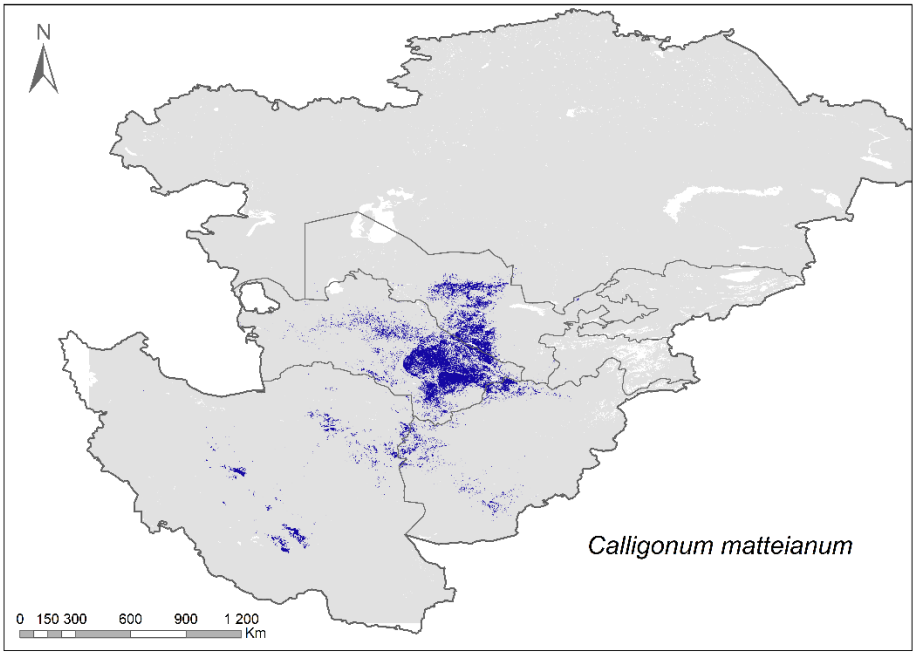


Figure 4 Potential C. matteianum habitat

6. Calligonum molle

For the BSE model, most of the variables have a high standard deviation (σ) for C.molle, as the values of the variables tended not to be close to the mean (M) and this indicates the distribution of the values of the variables over a wider range in the area.

The analyses showed that for modelling were used bio_09 (mean temperature of the driest quarter), bio_14 (precipitation of the driest month), S_25 (gray-brown soils with clay and carbonates (lime), S_52 (salt licks with clay horizon) and elevation data (Table 2). At the same time, it was determined that, for building a distribution model for C.molle, the most useful information contains variables bio_09 and S_25.

According to the obtained model (Figure 2), the potential distribution area of C.molle is narrow, lying within 38-410 north latitude and 57-670 east longitude. The main territory covers the sands of Sundukli (Karshi steppe, southwestern Uzbekistan), the northeastern part of the Karakum sands (Turkmenistan), the northern part of Afghanistan. According to the predictive model, the distribution area (accessible sites) for C.molle is 124,805.7 km2 (2%).

The construction area of the project is located in the zone of active species distribution.

Table 2 Variables contribution for species modelling

Variable	Percent contribution	Permutation importance
C.molle		
bio_09	26.6	13.8
S_25	18.8	9.7
bio_14	18.3	24.3
elevation	12.8	36.9

S_52	8.8	14.3
C.matteianum		
S_07	31.1	12.5
bio_11	23.9	39.5
bio_09	22.8	10.5
elevation	13	31.6
bio_08	9.2	5.

The potential habitat for *C. molle* in project area is 335.2 ha(Figure 4).

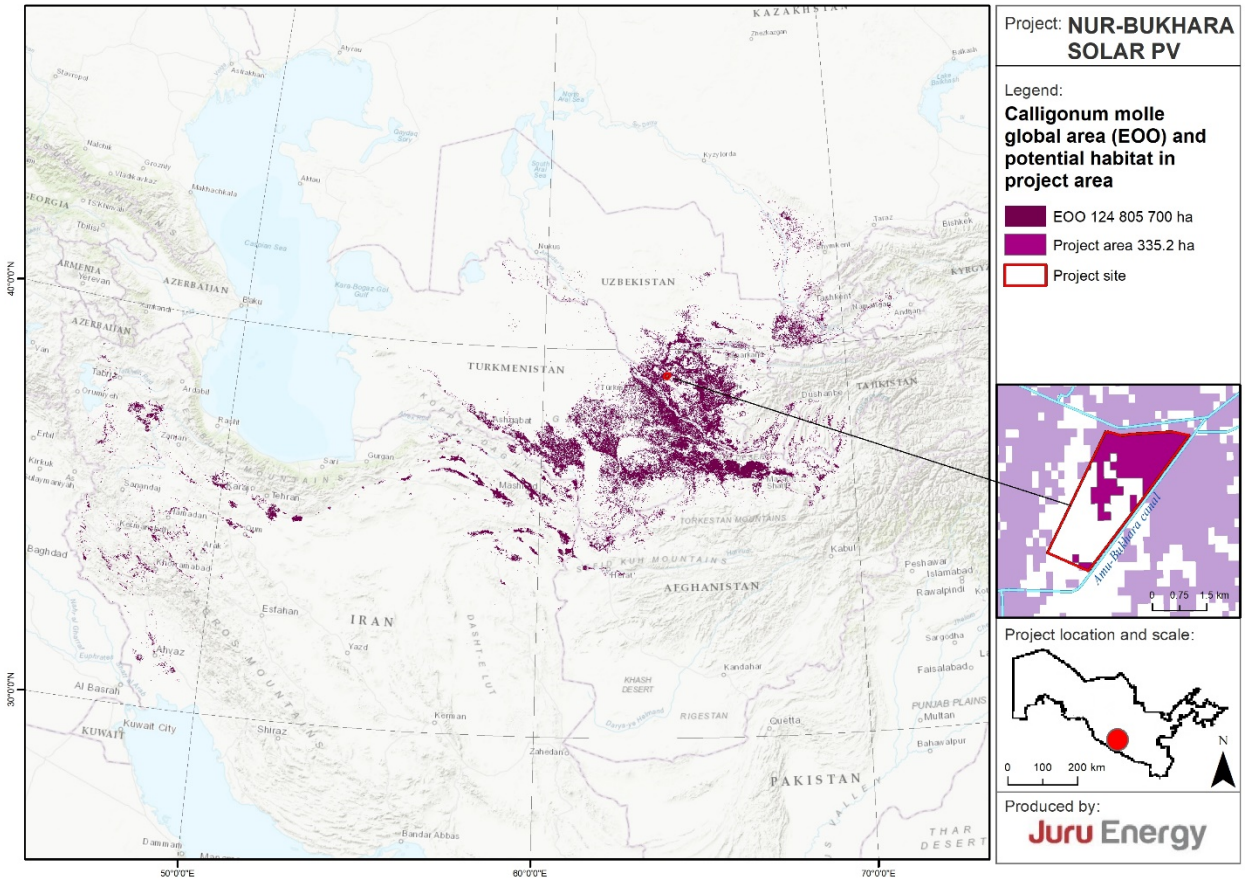


Figure 5 Calligonum mole global area (EOO) and potential habitat in project area

7. Calligonum matteianum.

More reliable statistical information was obtained from *C. matteianum* distribution model (AUC= 0.98), the 10% threshold of the BSE model (0.72) was higher than that of C. molle (0.64).

S_07 (soils with significant accumulation of secondary sulfate), bio_11 (mean temperature of the coldest quarter), bio_09 (mean temperature of the driest quarter), bio_08 (mean temperature of the wettest quarter) were actively used to build the distribution model. It was identified that predictors such as soils with a significant accumulation of secondary sulfate and the mean temperature of the coldest quarter were the most important factors for building the model.

As well as the *C.molle* main distribution area, the *C.matteianum* main distribution area (Figure 3) is located on the Sundukli sands and more concentrated on the northeastern part of the Karakum sands. Some part of the northern areas in a scattered form reaches the Central Kyzylkum. According to the predictive model, the *C. matteianum* distribution area is 96,004.4 km2 (1.5%).

The construction area of the project is located in the zone of active species distribution.

The potential habitat for *C. matteianum* in project area is 550.5 ha (Figure 5).

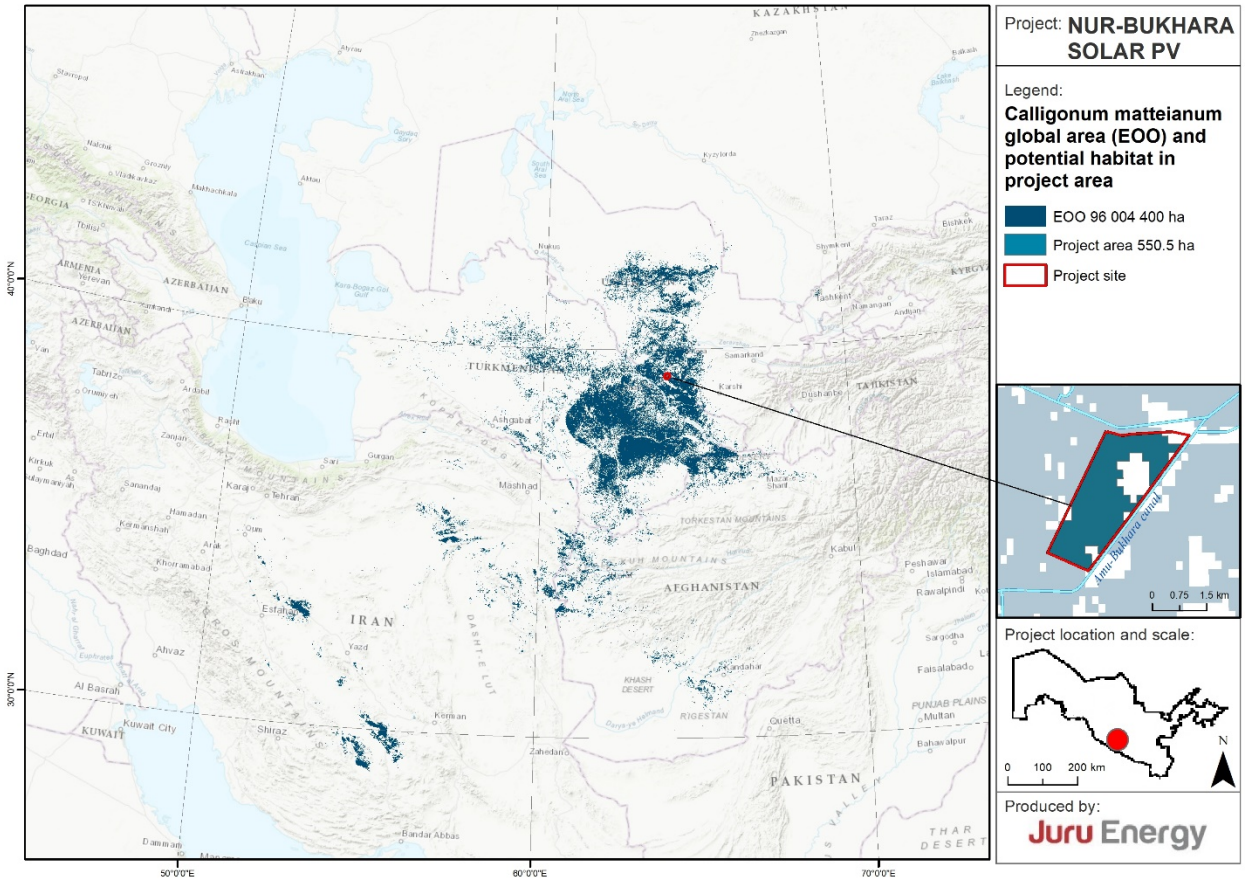


Figure 6 Calligonum matteianum global area (EOO) and potential habitat in project area

8. Conclusion

1. The limiting factor for *C.molle* and *C.matteianum* distribution is the soil one; this determines their narrow distribution.
2. According to the predictive model, the *C. matteianum* distribution area (accessible sites) is 96,004.4 km^2 (1.5% of the studied territory of Central Asia, Iran, Afghanistan); the *C.molle* distribution area is 124,805.7 km^2 (2%). The construction area of the project is located in the zone of active species distribution. However, it occupies an insignificant part of the species range.
3. The potential habitat for *C. molle* in project area is 335.2 ha., and for *C. matteianum* is 550.5 ha.

9. References

1. Butnik A.A., Toderich K.N., Matyunina T.E., Zhapakova U.N., Yusupova, D.M. (2016) Handbook of Fruit Morphology and Biology of Seed Germination of Desert Plants of Central Asia. Yangi Nashr, Tashkent, Uzbekistan, 320 p. (In Russian)
2. Conspectus Florae Asiae Mediae. In 11 vol. (1963–2015) Fan Publishers, Tashkent. (In Russian).
3. Eastwood A., Lazkov G., Newton A. (2009) The Red List of Trees of Central Asia. Fauna & Flora International, Cambridge, UK, 27 p.
4. GBIF (2023). Global Biodiversity Information Facility. Available from: https://www.gbif.org/
5. IUCN Red List of Threatened species (2021) Available from: http://www.iucnredlist.org.
6. Maassoumi A.A. 2011. A revision of the genus *Calligonum* (Polygonaceae) in Iran. Iranian Journal of Botany 17(1): 43-54
7. Nabiev M.M. (1971) *Calligonum* L. In: Conspectus Florae Asiae Mediae, vol. 2. Fan Publishers, Tashkent. Pp. 182–201 (In Russian).
8. Parpiev Yu.P. (1974) Biological and ecological characteristics of the representatives of Calligonum L. and their phylogenetic aspects: Abstract Dissertation, Doctor of Biological Sciences, Tashkent, Uzbekistan, 55 p. (In Russian)
9. Pavlov N.V. (1936) *Calligonum* L. In: Flora of U.S.S.R., vol. 5. Academy of Sciences of the USSR, Moscow & Leningrad. Pp. 527–594 (In Russian)
10. Pavlov N.V. (1937) *Calligonum* L. In: Flora of Turkmenistan, vol. 2. Turkmen branch of Academy of Sciences of the USSR, Ashkhabad. Pp. 55–79 (In Russian)
11. POWO (2023). Plants of the World Online. Available from: www.plantsoftheworldonline.org/)
12. Rakhimova N.K., Rakhimova T., Sharipova V.K., Beshko N.Yu., Esanov Kh.K. (2020) Current state of coenopopulations of some rare species of the genus *Calligonum* L. (Polygonaceae) in the Bukhara region, Uzbekistan. Asia Life Sciences, 2020, 29 (1): 365–378
13. Soskov Yu.D. (2011) Genus *Calligonum* L. (taxonomy, geography, evolution, introduction). Novosibirsk, 362 p. (In Russian)
14. Tojibaev K.Sh., Beshko N.Yu., Shomurodov Kh.F. & al. (2020) Inventory of the flora of Uzbekistan: Bukhara Province. O'kituvchi Publishers, Tashkent. 128 p. (In Russian).

Technical appendix 14:
Curriculum Vitae (CV)

Curriculum Vitae (CV)

Position Title and No.	Project Manager / International environmental expert
Name of Expert:	Nicola Davies
Date of Birth:	25 Nov 1975
Country of Citizenship/Residence	Uzbekistan

Education:

- NEBOSH (The National Examination Board in Occupational Safety and Health), National General Certificate (Level 3) in Occupational Health and Safety Credit, 2006
- Master of Science (MSc) Environmental Impact Assessment (EIA), Auditing and Management Systems, University of East Anglia, 2004;
- Bachelor of Science (BSc) (Hons) Environmental Science (Chemistry Option), The University of Leeds, 1997.

Employment record relevant to the assignment:

Period	**Employing organization and your title/position. Contact information for references**	**Country**	**Summary of activities performed relevant to the Assignment**
2019 – present	**Juru Energy Ltd.** Associate E&S Consultant Ref: Botir Gafurov, Managing Director b.gafurov@juruenergy.com	Uzbekistan, Central Asian countries	• Providing environmental and social advisory, due diligence, impact assessment in the energy (solar PV, wind, conventional power, T&D) and infrastructure sectors; • E&S Expert for an EBRD funded wind auction in Uzbekistan; • Environmental Specialist for a Regional Power Sector Masterplan in Central Asia; • E&S Expert for an IFC supported CCGT auction project in Uzbekistan; • Project manager of DFI's projects, including EBRD Best Practive Solar Guidelines - Uzbekistan/Regional, ESIA for Sarimay-Dzhankeldy 500 kV OHTL. • Owners Environmental advisor to "Enersok" Consortium for construction 1600MW Syrdarya II CCGT – support implementation up to financial close including closing Lender ESAP close (loans considered from IFC, JBIC, NEXI • Extensive experience undertaking construction and operations environmental, social, and labour monitoring, including on-site auditing, developing corrective action plans, providing training and toolbox talks • On-site experience conducting emissions to air, environmental noise, ambient air quality and odour monitoring. Broad technical understanding in assessing and managing air emissions, air quality, noise, shadow flicker, biodiversity, solid waste management, and water quality.
01/2018 – present	**NJD Advisory Services - Independent Consultant** Director / Environmental, Social, Governance (ESG) Specialist	UK	• Independent Environmental and Social Consultant with more than 15 'years' experience in environmental and social (E&S) consulting in the energy sector; • Extensive experience providing services on behalf of multilateral development agencies, private developers and governments; • ESIA Project Manager specialist in E&S requirements of multilateral development banks.; • ESG risk specialist to verify bankability and identification of significant risks (including climate, biodiversity and E&S governance • risks) and regulatory gap analysis; • Experienced in the integration of ESG into polices and develop and implement Environmental and Social

			Management Systems (ESMS) and supporting E&S management plans (ESMPs); • Transaction implementation services (review contractor schedules, develop E&S action plans, incorporate E&S conditions and warranties into finance documents, input ES management requirements into financial models); • Construction and operations compliance monitoring • Stakeholder analysis, develop communication programs and consultation and participation plans; • Capacity training (governments, developers / borrowers, contractors); • Experience in land acquisition and livelihood restoration.
01/2012 – 12/2017	**Mott MacDonald Inc.** Environmental and Social Team Leader - North and South America	USA	• Established and managed a team of E&S specialists to oversee the delivery of E&S sustainable financing services in North America and Latin America and Caribbean region; • Technical Director overseeing more than 1000MW of energy projects (and toll road projects at various stages in financing with an emphasis on early identification of risk and inclusion of enforceable actions in Lender E&S Action Plans for compliance with IFC Performance Standards 2012 and requirements of Equator Principles Financing Institutions; • ESIA Project Manager (including ESIA for 40MW solar PV plant, Kenya and Geothermal exploration phase drilling, Nicaragua); • Construction and 'operation's monitoring on behalf of international Lenders; • Contracts and tender document review • Mott MacDonald ESDD Practice Leader with a remit for technical leadership, technical • excellence, and quality control.
09/2004 – 12/2011	**Mott MacDonald Inc.** Environmental Specialist	UK	• ESIA Project Manager • ES due diligence (ESDD) specialist • Construction and operations monitoring specialist (environmental, social and labour) including on-site inspections and auditing, developing corrective action plans, providing • training and capacity building and toolbox talks.
09/2000 – 09/2003	**Casella Stangar (previously Stangar Science and Environment)** Air Emissions Testing Specialist	UK	• Scientific publications survey via EndNote software • Identification of top research topics and research laboratories in the following areas: • Translational Cereal Genomics • Plant Transformation Technologies III • Plant Gene Discovery & “Omics” Technologies • Applied Vegetable Genomics • Collecting information on leading scientists - potential invited speakers

Membership in Professional Associations and Publications: Full Member of Institute of Environmental Sciences (MIEnvSc)

Language Skills (indicate only languages in which you can work):

Language	Speaking	Writing	Reading
English	Native	Native	Native

Adequacy for the Assignment:

Detailed Tasks Assigned on Consultant’s Team of Experts:	**Reference to Prior Work/Assignments that Best Illustrates Capability to Handle the Assigned Tasks**

	Project: Support for the Implementation of Wind Auctions in Uzbekistan (Phase II) **Year:** 2021 – ongoing**; Location:** Uzbekistan **Client:** EBRD **Main project features:** The GoU has launched a 1 GW Wind Program, supported by EBRD for the development of wind power projects under PPP modality (the Program). The Consultant has already supported the phase 1 of the Program, a 100 MW wind power plant in Karakalpakstan, Uzbekistan. **Position:** International E&S expert **Activities performed:** • High level Environmental and Social Assessment of the selected site in relation to sensitive receptors, specifically availability of IBA, Ramsar sites, Emerald Sites and other protected areas etc. with particular focus on bird migration routes in the proposed location of the main and associated facilities; • Preparation of relevant E&S schedules to be included in the IPP documents; • Support bid evaluation and the rest of the transaction in relation to E&S aspects.
	Project: ESIA for 500 kV Sarimay-Dzhankeldy Transmission Line (Category A) **Year:** 2020 – ongoing**; Location:** Khorezm and Bukhara regions, Uzbekistan; **Client:** EBRD **Main project features:** The EBRD is supporting GoU in upgrading the national grid system by providing a loan to JS "National Electric Grid of Uzbekistan" (NEGU) for construction of a ca. 137 km of OHTL. According to EBRD ESP 2019, the Project is Category A project, due to the potential significant adverse impact to environment. EBRD intends to obtain bankable ESIA, ESAP as well as ESDD of NEGU's standards/policies highlighting gaps against the compliance requirements of the EBRD ESP 2019TDD, structuring and tendering support for a PPP transaction for the design, financing, construction, O&M of: (i) CCGT plant with a capacity of approx. 1,300 MW; (ii) Peaker plant for provision of peaking and regulating services with a capacity of up to 300 MW. **Position:** Project manager/ Environmental specialist **Activities performed:** • Overall Project management; • Prepare and submit ESIA package including: Scoping report, ESIA report, NTS, SEP, ESMP, ESAP, ESDD; • Assessment of Project site from environmental perspective; • Prepare gap analysis between national legislation and EBRD PR requirements; • Review of potential cumulative impacts, including air quality, noise, water use and waste-water discharges; • Preparation of ESDD of Project Developer against EBRD PR requirements;
	Project: Support for the WF country review and site selection (Phase III). **Year:** 2021 – 2022**; Location:** Uzbekistan **Client:** EBRD **Main project features:** The assignment involves review of a long list of locations to identify a shortlist of sites for further preliminary assessment and site selection work for up to 300MW wind farm in Uzbekistan **Position:** International E&S expert **Activities performed:** • Coordinated preliminary E&S site assessment of 6 shortlisted sites for review of environment, biodiversity, and social constraints and opportunities to feed into wider phase III site selection • Work included a review of noise, shadow flicker risks, the proximity of receptors, involuntary resettlement risks, potential grid connection, cultural heritage screening, IBAT review and critical habitat screening (based on local ecologist input) This work included a preliminary review of the Kushkent site and potential grid connection.
	Project: Uzbekistan: Case Study and Development of the Best Practice Guidelines on Management of Environmental and Social Impacts in Solar Energy Sector **Year:** 2020 – ongoing**; Location:** Countrywide; **Client:** EBRD **Main project features:** Over the last couple of years, through its involvement in a number of the power projects in Uzbekistan EBRD identified a number of issues associated with the development of solar project that need to be addressed in a systemic manner. These include land disturbance/land use impacts; potential impacts to specially designated areas; impacts to soil, water and air resources;

	impacts to vegetation, wildlife, habitat and sensitive species; visual, cultural, socioeconomic impacts, supply chain and community impacts and potential impacts from hazardous materials, labour, health and safety during construction and operation. EBRD hired JE to develop Best Practice Guidelines on Management of Environmental and Social Impacts in Solar Energy Sector that would be used by the government, existing and potential clients and other stakeholders in solar energy sector in Uzbekistan. As part of the assignment, JE will also conduct capacity building webinar for local governmental authorities **Position:** Project manager/ Environmental specialist **Activities performed:** • Overall project management (communication with Client, QA for prepared reports, submission of deliverables etc) • Review of EBRD policy/requirements in relation to the development of solar PVs; • Summary of national legislation in relation to development of solar PV panels from environmental, health & safety perspective; • Identifications of gaps between EBRD and national requirements; • Assessment of environmental risks in context of Uzbekistan while developing solar PVs; • Outlining best practices applicable for avoiding/minimizing environmental risks in Uzbekistan.
	Project: Gran Bara 30MW Solar PV Project and Battery Energy Storage System (BEES) **Year:** 2021**; Location:** Djibouti; **Client:** Confidential **Main project features:** proposed 30 MW solar PV and BESS with OHL connection **Position:** Environmental and Social Expert **Activities performed:** • Environmental and Social due diligence for potential asset acquisition • Key issues considered supply chain, IR risks, water resources and hydrological risks Identification of risks and opportunities
	Project: Malindi Solar project **Year:** 2018**; Location:** Kenya; **Client:** Globeleq Africa **Main project features:** Support for developing Contractor Environmental and Social Management System (ESMS) **Position:** Environmental and Social Expert **Activities performed:** Develop CESMP and supporting topic-specific plans
	Project: Support for the Implementation of Wind Auctions in Uzbekistan (Phase I) **Year:** 07/2019 – 2021**; Location:** Uzbekistan **Client:** JE/EBRD **Main project features:** The assignment involves (a) site assessment to develop a wind park of 100-200 MW capacity, (b) developing a detailed design for a competitive bidding process for a wind power tender, (c) preparation of all the auction related documentation, (d) support the implementation of wind auction, and (e) advise on the design of future competitive procurement schemes. **Position:** Environmental and Social Expert **Activities performed:** • High level Environmental and Social Assessment of the selected site in relation to sensitive receptors, specifically availability of IBA, Ramsar sites, Emerald Sites and other protected areas etc. with particular focus on bird migration routes in the proposed location of the main and associated facilities; • Preparation of relevant E&S schedules to be included in the IPP documents; • Support bid evaluation and the rest of the transaction in relation to E&S aspects.
	Project: Environmental and Social Impact Assessment (ESIA): Seven Forks 40MW Solar PV plant **Year:** 01/2017 – 12/2017**; Location:** Kenya; **Client:** Mott MacDonald / K&M Advisors **Main project features:** ESIA study for the proposed 40 MW grid-connected Solar Photovoltaic Plant in Kesses Division of Uasin Gishu County Republic of Kenya. The study has been undertaken to satisfy both the International Finance Corporation (IFC) requirements and Kenya Environmental Management and Coordination Act (EMCA). **Position:** Environmental and Social Expert /ESIA Project Manager **Activities performed:**Coordinated multidisciplinary team and worked to define the terms of reference and scope of work for the ESIA, led stakeholder consultation (community and government) including focus groups,

	• Author general sections ESIA and responsible for collating and overseeing ESIA production • Coordinate inputs from the local sub-consultant (EcoPlan Ltd) and feedback to the feasibility consultant (K&M Advisors); Key aspects for focus included: stakeholder engagement, community development and benefits, and biodiversity surveys.
	Project: IFC Syrdarya 1,300 MW CCGT PPP Project **Year:** 11/2019 – ongoing**; Location:** Uzbekistan; **Client:** GoU/IFC **Main project features:** TDD, structuring and tendering support for a PPP transaction for the design, financing, construction, O&M of: (i) CCGT plant with a capacity of approx. 1,300 MW; (ii) Peaker plant for provision of peaking and regulating services with a capacity of up to 300 MW. Expert's scope - detailed Environmental and Social scoping study. **Position:** Environmental and Social Expert **Activities performed:** • Regulatory and permit review; • Preliminary screening of social impacts including review of land ownership and formal and involuntary resettlement risks; • Qualitative screening of air quality impacts, noise impact and waste water discharges; • Screening of critical habitat / biodiversity risks including presence or absence of species or habitats of conservation importance; • Review of potential cumulative impacts, including air quality, noise, water use and waste-water discharges; • Preliminary mapping of stakeholders relative to the area of influence; • Prepare Terms of Reference for the full ESIA study; • Preparation of relevant E&S schedules to be included in the IPP/PPP documents; • Support bid evaluation and the rest of the transaction in relation to E&S aspects.
	Project: Feasibility Study and Tender Documents for SCADA/EMS/RTU and Telecommunications for National Dispatch Centre of Uzbekistan **Year:** 10/2020-03/2022**; Location:** Uzbekistan; **Client:** JSC National Power Networks of Uzbekistan **Main project features:** JSC National Power Networks of Uzbekistan (NES) plans to introduce new SCADA/EMS for NES' central and regional control centres (NDC/RDC) and install RTUs in key transmission substations and power plants **Position:** Environmental and Social Expert **Activities performed:** • International Environmental Specialist • Lead the preparation of environmental and social analysis (ESA), reviewing the risk and impacts of the proposed Works and the institutional capacity for E&S management within NES • Define the regulatory and institutional framework for national and international ESA
	Project: Bogoslovec 36MW wind farm **Year:** 2019**; Location:** Macedonia; **Client:** THOR Impex d.o.o.e.l **Main project features:** proposed 36 MW WF with OHL connection **Position:** Environmental and Social Expert **Activities performed:** • Prepare supplementary impact assessment reports to align with IFC PSs • Develop Environmental and Social Management Plans (ESMPs) • Prepare labour management plan documentation • Prepare a land acquisition impact assessment report. • Coordinate preparation of critical habitat assessment (against IFC PS6 and updated Guidance Note 6); • Update to Stakeholder engagement plan in line with PS1 • Prepare E&S schedule for construction contracts (BOP and TSA) and support to contract negotiation process. **Now providing OE E&S services for construction phase including Lender coordination.**
	Project: Latin America and Caribbean: Lender's advisor, renewable portfolio **Year:** 2014 – 2017**; Location:** The North and The South American countries; **Client:** Mott MacDonald / Various EPFIs and IFIs in the LAC region

	Main project features: Lead team of 5 E&S specialists for provision of Lenders advisory work for over 1000MW of renewable energy in Latin and North America, including: Wind: • Costa Rica (100MW), Uruguay (110MW), Mexico (50MW), Dominican Republic (50MW), • Argentina (100MW), • Honduras (175MW) • E&S Fatal Flaw Analysis (ESFFA) of a Wind portfolio target assets in Chile (totaling seven assets, 985.6MW Solar: • Technical lead for environmental, social and permitting fatal flaw review for solar portfolio Chile, Uruguay and Brazil • El Velero PV plant, including 13km OHL, Nicaragua • Honduras (50MW); Nicaragua (20MW) **Position:** Environmental and Social Expert **Activities performed:** • Oversee environmental and social due diligence (ESDD) portfolio for Mott MacDonald, overseeing multiple reviews of projects against IFC PSs and guidelines of other multi-laterals; • Preparation of numerous Environmental and Social Action Plans and oversight for closeout on behalf of Lenders; • Supported Lenders in developing bankable projects and incorporating E&S requirements into transaction and contract documentation; • Construction and operations monitoring • Coordinate with biodiversity and other specialists for review of specialist inputs • Prepare and review shadow flicker, noise and other specialist reports for compliance with World Bank EHS guidelines; • Identification of non-compliance and area of delivery risk • Review design specification and transaction documentation

Expert's contact information: n.davies@juruenergy.com

Certification:
I, the undersigned, certify that to the best of my knowledge and belief, this CV correctly describes myself, my qualifications, and my experience, and I am available, as and when necessary, to undertake the assignment in case of an award. I understand that any misstatement or misrepresentation described herein may lead to my disqualification or dismissal by the Client, and/or sanctions by the Bank.

Nicola Davies		15.01.2023
Name of Expert	Signature	Date
Hushnudjon Rahimberganov		15.01.2023
Name of authorized Representative of the Consultant (the same who signs the Proposal)	Signature	Date

CURRICULUM VITAE (INTERNATIONAL)

Position title and No:	Biodiversity Expert/IFS PS6 expert
Name of Expert:	Caleb Edward Gordon
Date of Birth:	10 July 1969
Citizenship:	USA

Education:

- Doctor of Philosophy (PhD) Department of Ecology and Evolutionary Biology, The University of Arizona, Tucson, AZ, USA. December, 1999.
- Bachelor of Arts (BA) Biology, Williams College, Williamstown, MA, USA. June, 1991.

Employment record:

Period	Employer/position	Country	Summary of activities
January 2019 - present	**Associated Environmental/biodiversity expert** JE Limited Botir Gafurov, Managing Director b.gafurov@juruenergy.com	UK	• Support firm's international power projects in relation to environmental/biodiversity assessment; • Lead bird monitoring and Critical habitat assessment expert for Bash 500 MW WF; • Lead bird monitoring and Critical habitat assessment expert for Dzhankeldy 500 MW WF
January 2018-present	**Xenops Environmental, LLC** Sole proprietor Independent consultant	USA	• Biodiversity technical expert consulting services. Focus on bird- and bat-related aspects of wind energy development in emerging market countries. • Design, execution, supervision, evaluation of biodiversity aspects of wind farms, particularly as it relates to compliance with IFC PS6
2016-present	**International Finance Corporation (IFC)** Short-term Consultant (STC)	USA	• Biodiversity technical expert consulting services. Focus on bird- and bat-related aspects of wind energy development in emerging market countries. • Supervision and evaluation of biodiversity aspects of wind farms, particularly as it relates to compliance with IFC PS6
2013-2018	**Western EcoSystems Technology (WEST), Inc.** Wildlife consultant and Texas branch manager	USA	• Wildlife consultant. Focus on biodiversity aspects of wind energy development in Texas-Oklahoma and Latin America. • Design, execution, supervision and evaluation of wind-wildlife studies. • Supervision of field coordinators, technicians, and junior project managers
2000-2001	**Instituto de Ecología, A. C. (INECOL)** US National Science Foundation International Postdoctoral Fellow.	USA	• Research on tropical forest bird and beetle biodiversity persistence within coffee agroecosystems.

Languages: (Working knowledge: Native, Excellent or Good)

	Speaking	Reading	Writing
English	Native	Native	Native
Spanish	Good	Excellent	Good

Adequacy for the Assignment:

Detailed Tasks Assigned	Assignments that Best Illustrate Capability to Handle the Assigned Tasks
	Project: Uzbekistan: Case Study and Development of the Best Practice Guidelines on Management of Environmental and Social Impacts in Solar Energy Sector **Year:** 2020 – ongoing**; Location:** Countrywide; **Client:** EBRD **Main project features:** Over the last couple of years, through its involvement in a number of the power projects in Uzbekistan EBRD identified a number of issues associated with the development of solar project that need to be addressed in a systemic manner. These include land disturbance/land use impacts; potential impacts to specially designated areas; impacts to soil, water and air resources; impacts to vegetation, wildlife, habitat and sensitive species; visual, cultural, socioeconomic impacts, supply chain and community impacts and potential impacts from hazardous materials, labour, health and safety during construction and operation. EBRD hired JE to develop Best Practice Guidelines on Management of Environmental and Social Impacts in Solar Energy Sector that would be used by the government, existing and potential clients and other stakeholders in solar energy sector in Uzbekistan. As part of the assignment, JE will also conduct capacity building webinar for local governmental authorities **Position:** Biodiversity Specialist **Activities performed:** • Review of EBRD biodiversity policy/requirements in relation to the development of solar PVs; • Preparation of biodiversity-related sections of the draft national guidance, including sections related to biodiversity monitoring and mitigation during all stages of projects' life cycles, aligned with international good practice
	Project: Bird and Bat monitoring for Karatau II Wind Energy Project **Year:** 2021-present; **Location:** Uzbekistan; **Client:** Juru Energy Consulting **Position:** Biodiversity specialist **Activities performed:** Designed a pre-construction set of bird and bat baseline studies in support of the proposed Karatau II Wind Energy Project, in the Republic of Karakalpakstan, Uzbekisan. **Project:** Bird monitoring for Karatau I Wind Energy Project **Year:** 2020-present; **Location:** Uzbekistan; **Client:** Juru Energy Consulting **Position:** Biodiversity specialist **Activities performed:** Designed a pre-construction set of bird baseline studies and performed CRM in support of the proposed Karatau I Wind Energy Project, in the Republic of Karakalpakstan, Uzbekisan. **Project:** Bird and Bat monitoring for Dzankeldy Wind Energy Project **Year:** 2020-present; **Location:** Uzbekistan; **Client:** Juru Energy Consulting **Position:** Biodiversity specialist **Activities performed:** Designed a pre-construction set of bird and bat baseline studies and performed CRM in support of the proposed Dzankeldy Wind Energy Project, in Bukhara region, Uzbekisan.

	Project: Bird and Bat monitoring for Bash Wind Energy Project **Year:** 2020-present; **Location:** Uzbekistan; **Client:** Juru Energy Consulting **Position:** Biodiversity specialist **Activities performed:** Designed a pre-construction set of bird and bat baseline studies and performed CRM in support of the proposed Bash Wind Energy Project, in Bukhara region, Uzbekisan. **Project**: Tuli and Helios Solar Energy Projects **Year:** 2018; **Location:** Zacatecas, Mexico. **Client:** CEMEX Energía **Position:** Biodiversity specialist. **Activities performed:** Prepared memorandum addressing listed species and other Critical Habitat classification issues for the Tuli and Helios Solar Energy Projects **Project:** Tuli and Helios Solar Energy Projects **Year:** 2018- present; **Location:** Mexico; **Client:** CMI Energía. **Position:** Biodiversity specialist **Activities performed:** Prepared memorandum addressing listed species and other Critical Habitat classification issues for the Tuli and Helios Solar Energy Projects, Zacatecas, Mexico. **Project:** Wind energy projects in Argentina (El Corti and La Castellana in Buenos Aires Province, Achiras in Córdoba Province) **Year:** 2016-present; **Location:** USA **Client:** Inter-American Development Bank (IDB, IDB-Invest) and International Finance Corporation (IFC, World Bank Group) **Position:** Short-term consultant. **Activities performed:** Technical lead on biodiversity issues for appraisal and supervision of wind energy projects **Project:** Review of wildlife issues at wind energy projects **Year:** 2016-present**; Location:** USA; **Client:** International Finance Corporation (IFC, World Bank Group) **Position:** Short-term consultant **Activities performed:** Conducted portfolio-level review of wildlife issues at wind energy projects with the objective of developing consistent standards and best practice recommendations to ensure compliance with IFC Performance Standard 6 and the IFC's 2015 Environmental, Health, and Safety (EHS) guidance document for wind energy projects worldwide. Ongoing assistance with appraisals and supervision for multiple projects throughout the Latin America and Caribbean (LAC) region. **Project:** Las Sierras Wind Energy Facility **Years:** 2017-2018; **Location:** Nicaragua; **Client:** Desarrollos Vientos Alisios, S. A. (A subsidiary of CMI Energía) **Position:** Project manager and lead scientist **Activities performed:**

	Designed wildlife baseline studies for the proposed Las Sierras Wind Energy Facility in Managua, Nicaragua. **Project:** CMI Energía. **Years:** 2017-2018; **Location:** **Client:** MBZ **Position:** Project manager and lead scientist. **Activities performed:** Design and conduct post-construction bird and bat fatality monitoring studies at four, 20-MW wind energy projects in Guanacaste, Costa Rica (the "Alisios" projects). **Project:** Wind-wildlife scientific best practices **Years:** 2017; **Location:** Argentina **Client:** Inter-American Investment Corporation (IIC, now IDB-Invest). **Position:** Project manager and lead scientist. **Activities performed:** Technical lead on international wind-wildlife scientific best practices for a strategic initiative intended to provide new insights, guidance, and tools for enhancing the environmental and social sustainability of the rapid growth in Argentina's renewable energy sector, spurred by the World Bank supported "RenovAr" program, and done in collaboration with Argentinian ornithologist, Pablo Petracci. Co-organizer and presenter at workshop in Buenos Aires, Argentina in March, 2017, and co-author of issues paper synthesizing current knowledge and gaps regarding wind-wildlife issues in Argentina. **Project**: Grand Vent Wind Project; **Years:** 2016-2018; **Location:** Uzbekistan **Client:** Wind Works Power Corp.; **Position:** Project manager and lead scientist; **Activities performed:** Designed and conducted a site characterization study (USFWS WEG Tier 2), and a suite of wildlife baseline studies (USFWS WEG Tier 3) for the proposed Grand Vent Wind Project, located in Jefferson Davis Parish, Louisiana. **Project**: Wind-wildlife baseline study scopes of work for the International Finance Corporation's Infra-ventures program **Years:** 2015-2016; **Location:** Uzbekistan **Client:** ERM Group, Inc; **Position:** Project manager and lead scientist. **Activities performed:** Prepared general terms of reference for wind-wildlife baseline study scopes of work for the International Finance Corporation's (IFC, World Bank Group) Infra-ventures program, as a subcontractor to ERM. Terms of reference were intended to be used by IFC for future wind energy projects financed by IFC worldwide. **Project**: Biomonitoring for potential impacts Solar Energy Facility **Years:** 2015-2016).; **Location:** USA **Client:** NextEra Energy Resources; **Position:** Project manager and lead scientist. **Activities performed:**

	Performed specialized risk analysis and biomonitoring for potential impacts to federally threatened Wood Storks for the White Oak Solar Energy Facility in Burke County, Georgia. Consultation included developing a conservation and management practices strategy and document, as well as performing biomonitoring to avoid potential impacts to Wood Storks during project construction. **Project**: Silver Canyon Wind Energy Project **Years:** 2015-2018; **Location:** Uzbekistan **Client:** EDP Renewables; **Position:** Project manager and lead scientist. **Activities performed:** Designed and conducted a one-year pre-construction set of tier 3 field studies including various site-specific fieldwork components in support of the proposed Silver Canyon Wind Energy Project in Briscoe and Swisher Counties, Texas. **Project**: EOLO wind energy facility **Years:** 2014-2017 **Location:** USA **Client:** EOLO de Nicaragua (A subsidiary of Globeleq Mesoamerica Energy) **Position:** Project manager and lead scientist **Activities performed:** Conducted a two-year post-construction bird/bat fatality monitoring study at the EOLO wind energy facility in Rivas, Nicaragua. Study entailed road-and-pad-only carcass searching as well as the development and application of a novel, anisotropic density function to model highly directional bird and bat carcass fall patterns. **Project**: Mammoth Plains Wind Energy Facility **Years:** 2014-2015 **Location:** USA **Client:** NextEra Energy Resources **Position:** Project manager and lead scientist. **Activities performed:** Prepared a Bird and Bat Conservation Strategy (BBCS) for the Mammoth Plains Wind Energy Facility in west-central Oklahoma, integrating all wildlife-related pre-construction study reports, impact minimization, avoidance, and mitigation measures, and agency correspondence to document compliance with the USFWS' Land-based Wind Energy Guidelines (WEG). **Project**: Rattlesnake Wind Energy Facility **Years:** 2014 **Location:** USA **Client:** RES Americas, Inc **Position:** Project manager and lead scientist. **Activities performed:** Conducted habitat mapping for the federally endangered Black-capped Vireo (*Vireo atricapilla*), as well as eagle surveys and other pre-construction ecological studies at the proposed Rattlesnake Wind Energy Facility in McCullough County, Texas. **Project**: Eurus Wind Energy Facility **Years:** 2014-2017 **Location:** USA

	Client: Acciona **Position:** Project manager and lead scientist. **Activities performed:** Performed independent, third-party expert review on behalf of a consortium of lenders, including the Interamerican Development Bank (IDB), the International Finance Corporation (IFC), the US Export-Import Bank (Ex-Im Bank), and the Clean Technology Fund (CTF) for the Eurus Wind Energy Facility in Oaxaca, Mexico. Review work consisted of evaluation of compliance with IFC Performance Standard 6, and specifically a "Corrective Action Plan" (CAP) agreed to between the lenders and the project developer that stipulated certain post-construction bird and bat fatality monitoring efforts and impact mitigation measures. **Project**: Cape Wind offshore wind energy facility **Years:**2014-2016 **Location:** USA **Client:** Bureau of Ocean Energy Management (BOEM) / Bureau of Safety and Environmental Enforcement (BSEE) **Position:** Project manager and lead scientist. **Activities performed:** Coordinated a team of scientists to develop a project-specific collision model application and generate a fatality rate prediction for federally threatened Red Knots (*Calidris canutus rufa*) at the proposed Cape Wind offshore wind energy facility in Nantucket Sound, Massachusetts. Work entailed coordinating internal staff plus five subcontracted entities, including field-leading experts from the Netherlands, Denmark, and the US, and from academia, eNGOs, and environmental consultants. This work was contracted as order M14PD00050 under GSA contract GS-10F-072BA. **Project**: Development of a Biodiversity Action Plan (BAP) for the proposed Khauzak-Shadi natural gas development near Lake Dengizkul **Years:** 2011- 2013 **Location:** Uzbekistan **Client:** The World Bank Group, Multilateral Investment Guarantee Agency (MIGA) **Main project features:** Dengizkul Lake is an important international conservation area providing numerous. Biodiversity Action Plan (BAP), to guide as to protect the natural environment. **ecological services.** **Position:** Lead Ornithologist. **Activities performed:** Review and biological assistance. Review draft BAP documents and provided comments, develop guidance for improving BAP and for developing enhanced and interim biological monitoring plans. Conduct in-country site visit to conduct field reconnaissance on project impacts, and to meet with international project team to reach consensus on ongoing monitoring and research efforts. **Project**: Wind-wildlife technical research synthesis and summary report. **Years:** 2012 **Location:** USA **Client:** The Inter-American Development Bank (IDB) **Main project features:** **Position:** Project manager and lead scientist. **Activities performed:** Performed comprehensive review of technical literature and expert opinion on the effectiveness of bird-bat impact mitigation measures, the effectiveness of collision risk

	modeling. Prepared the IDB's first protocol/guidance for conducting post-construction monitoring of bird-bat fatalities at wind energy facilities in Latin America. **Project**: Avian Risk Assessment **Years:** 2010-2011 **Location:** Uzbekistan **Client:** The World Bank Group, Multilateral Investment Guarantee Agency (MIGA) **Main project features:** Potential for Collisions and Electrocutions Associated with the Proposed Talimarjan Transmission Line Project **Position:** Technical contributor **Activities performed:** Researched avian biology, conservation, and collision risk issues for avian risk assessment for a proposed 214 km 500kV transmission line and the potential risks to migrating storks, cranes and raptors.

Additional Information:

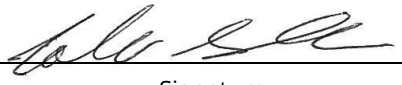
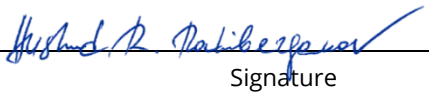
Representative Publications

- Palmer, R., C. Gordon, and P. Petracci, 2017. Interacciones entre la fauna silvestre y la energía eólica en Argentina: conocimiento científico y prioridades para el futuro. Estudio estratégico patrocinado por la Corporación Interamericana de Inversiones. Corporación Interamericana de Inversiones, Washington, DC, USA. 55 pp + frontmatter and appendices.
- Gordon, C. E. and C. Nations, 2016. Collision risk model for "rufa" Red Knots (*Calidris canutus rufa*) interacting with a proposed offshore wind energy facility in Nantucket Sound, Massachusetts. US Department of the Interior, Bureau of Ocean Energy Management, Sterling, Virginia. OCS Study BOEM 2016-045. 90 pp. + frontmatter and appendix.
- Ruth, J. M., T. R. Stanley, C. Gordon**,** 2014. Associations of wintering birds with habitat in semidesert and plains grasslands in Arizona. Southwestern Naturalist 59: 199-211.
- Bennet, V., K. Karsten, A. Hale, C. Gordon, B. Suson, 2014. Effect of wind turbine proximity on nesting success in shrub-nesting birds. American Midland Naturalist 172:317-328.
- Normandeau Associates, Inc. (C. Gordon, principal author), 2012. High-resolution aerial imaging surveys of marine birds, mammals, and turtles on the US Atlantic Outer Continental Shelf – Utility assessment, methodology recommendations, and implementation tools for the U.S. Dept. of the Interior, Bureau of Ocean Energy Management. Contract # M10PC00099. 378pp.
- Burger, J., L. J. Niles, R. R. Porter, A. D. Dey, S. Koch**,** C. Gordon, 2012. Migration and over-wintering of Red Knots (Calidris canutus rufa) along the Atlantic Coast of the United States. The Condor 114:1-12.
- Burger, J., L. J. Niles, R. R. Porter, A. D. Dey, S. Koch, C. Gordon, 2012. Using a shore bird (red knot) fitted with geolocators to evaluate a conceptual risk model focusing on offshore wind. Renewable Energy 43:370-377.
- Normandeau Associates, Inc. (C. Gordon, principal author), 2011. New insights and new tools regarding risk to roseate terns, piping plovers, and red knots from wind facility operations on the Atlantic Outer Continental Shelf. A Final Report for the U.S. Department of the Interior, Bureau of Ocean Energy Management, Regulation and Enforcement, Report No. BOEMRE 048-2011. Contract No. M08PC20060. 287 pp
- Burger, J., C. Gordon, L. Niles, J. Newman, G. Forcey, L. Vlietstra, 2011. Risk evaluation for federally listed (Roseate Tern, Piping Plover) or candidate (Red Knot) bird species in offshore waters: A first step for managing the potential impacts of wind facility development on the Atlantic Outer Continental Shelf. Renewable Energy 36:338-351.
- Greeney, H. F., M. Jipa, W. S. Gibson, P. A. Gordon, B. Suson, E. T. Miller, C. E. Gordon, R. A. Gelis, 2011. The nest and eggs of Black-capped Hemispingus (Hemispingus atropileus) in eastern Ecuador. Kempffiana 7:33-37.
- Niles, L. J., J. Burger, R. Porter, A. D. Dey, H. Sitters, J. Fox, and C. Gordon 2010. Preliminary data on migratory, breeding, and wintering movement patterns of Red Knot Calidris canutus rufa indicate unexpected variability. Wader Society Group Bulletin 117:123-130
- Bueter, C., J. Weckstein, K.P. Johnson, J.M. Bates, and C.E. Gordon. 2009. Comparative phylogenetic histories of two louse genera found on Catharus thrushes and other birds. J. Parasitol. 95(2):295-307.

- Gordon, C., B. McGill, G. Ibarra-Núñez, R. Greenberg, and I. Perfecto, 2009. Simplification of a coffee foliage-dwelling beetle community under low-shade management. Basic and Applied Ecology 10:246-254.
- Philpott, S.M., W.J. Arendt, I. Armbrecht, P. Bichier, T.V. Dietsch, C. Gordon, R. Greenberg, I. Perfecto, R. Reynoso-Santos, L. Soto-Pinto, C. Tejeda-Cruz, G. Williams-Linera, J. Valenzuela, and J.M. Zolotoff, 2008. Biodiversity loss in Latin American coffee landscapes: reviewing evidence on ants, birds, and trees. Conservation Biology 22:1093-1105.
- Tejeda-Cruz, C., and C. Gordon, 2008. Diversidad y abundancia de aves en un gradiente cafetalero del centro de Veracruz. In: R. Manson, K. Mehltreter, A. Contreras, S. Gallina, and V. Hernández , editors. Conservación de biodiversidad en agroecosistemas cafetaleros. Veracruz, Mexico: INE, SEMARNAT, Instituto de Ecología, A.C. p 149-160.
- Schramm, M., J. Fiala, T. Noe, P. Sweet, A. Prince, and C. Gordon, 2007. Calls, captures, and collisions: triangulating three census methods to better understand nightly passage of songbird migrants through the Chicago region during May. The Meadowlark 16(4):122-129.
- Gordon, C. 2007. Grassland birds. In: J. Bezy, C.F. Hutchinson, and C.J. Bahre, editors. Buenos Aires National Wildlife Refuge anthology. Desert Plants 23(2); p 24-25.
- Gordon, C.E., R. Manson, J. Sundberg, and A. Cruz-Angón, 2007. Biodiversity, profitability, and vegetation structure in a Mexican coffee agroecosystem. Agric., Ecosystems, and Environ. 118:256-266.
- Bueter, C., B. Larsen, K. Lawser, K. Nikogosian, and C. Gordon, 2006. Arrival dates and recapture patterns of spring migrant songbirds in northeastern Illinois. The Meadowlark 15(1):2-9.
- Gordon, C.E**.,** B. Skinner, and R. Gratis, 2002. Chicagoland's first spring migration bird banding station: first year of results and comparison with other North American data sets. The Meadowlark 11(3):122-129.
- Gordon, C.E., and J.F. Ornelas, 2000. Comparing endemism and habitat restriction in the Mesoamerican tropical deciduous forest avifauna: implications for biodiversity conservation planning. Bird Conservation Int. 10:289-303.
- Gordon, C.E., 2000. Fire and cattle grazing on wintering sparrows in Arizona grasslands. J. Range Management 53:384-389.
- Gordon, C.E., 2000. Movement patterns of wintering grassland sparrows in Arizona. The Auk 117:748-759.

Certification:

I certify that (1) to the best of my knowledge and belief, this CV correctly describes me, my qualifications, and my experience; (2) that I am available for the assignment for which I am proposed; and (3) that I am proposed only by one Offeror and under one proposal. I understand that any wilful misstatement or misrepresentation herein may lead to my disqualification or removal from the selected team undertaking the assignment

Caleb Edward Gordon		16/01/2023
Name of Personnel	Signature	Date
Hushnudjon Rahimberganov		16/01/2023
Name of authorised representative	Signature	Date

CURRICULUM VITAE (International)

Position title and No:	International Social Expert
Name of Firm:	Juru Energy Ltd.
Name of Expert:	Marianne Lupton
Date of Birth:	22 August 1976
Citizenship:	UK and New Zealand

1. **Education:**
   - MA in International Development, Deakin University, Australia, 2008
   - BA Honours Course with double major in Anthropology and Sociology, Victoria University of Wellington, New Zealand, 1999
   - BA with double major in Anthropology and Sociology, Victoria University of Wellington, New Zealand, 1995-1998
2. **Employment record:**

Period	Employer/position/reference	Country	Summary of activities
2019-present	**Associated Social Expert** Juru Energy Limited Botir Gafurov, Managing Director b.gafurov@juruenergy.com	UK	• Support firm's international power projects in relation to environmental and social aspects; • Preparation of environmental and social impact assessments (ESIAs), Environmental and Social Management Plans (ESMPs), master plans, guidance notes and other project and policy documents.
01/2020 – present	**Independent Engineer** Social Specialist Ref: Nicola Davies Email: njdadvisory@gmail.com	USA	• Undertaking assessments of the social risks, impacts, and benefits of projects in line with lender requirements (such as ADB, AfDB, DFC (formerly OPIC), EBRD, EIB, FMO, IDB, IFC, JBIC, KfW and the World Bank). • Preparing ESIAs, poverty and social analyses (PSA), ESMPs, resettlement plans (RPs or RAPs), stakeholder engagement plans (SEPs), human rights risk assessments (HRRAs) and indigenous peoples plans, as required. • Management of local consultants • Undertaking site visits to project locations, which involve stakeholder engagement, review of labour and working conditions, community and occupational health and safety, and cultural heritage impacts
01/2015 - 01/2020	**Senior Social Safeguard Consultant** Mott MacDonald Inc (USA) Ref: Carlos Riano E-mail: carlos.riano@mottmac.com	USA	• Assessments of the social risks, impacts, and benefits of projects • Assisted clients to prepare policy and strategy planning documents • Structuring appropriate development solutions, such as mitigation measures • Undertook site visits to project locations, which included public consultation and stakeholder engagement • Assessed human rights and labour impacts· • Provided capacity building, for developers, subcontractors and team members.

02/2011–01/2015	**Principal Social Safeguard Consultant** Mott MacDonald Ltd (UK). Ref: Hannah Mills E-mail: hannah.mills@mottmac.com	UK	• Prepared ESIAs, SEPs, grievance mechanisms, RAPs, ESDD reports, and other relevant action and management plans • Undertook stakeholder engagement, labour monitoring, review of community and occupational health and safety, review of cultural heritage impacts. · • Assessed human rights and labour impacts. • Managed local consultants and undertook analysis of data provided by national experts • Provided capacity building and training. · • Assisted developers to manage indigenous peoples' issues.
03/2007 - 02/2011	**Director Social and Poverty Analysis Services** TERA International Group, Inc Ref: Jim Rizer E-mail: jimrizer22@gmail.com	China	• Conducted socioeconomic and gender specific baseline surveys, field studies, stakeholder group meetings, public consultations. • Reviewed community grievances, prepared reports and plans, such as PSA, land acquisition and RPs and gender action plans. • Participated in projects assessing regional impacts of infrastructure projects. · • Monitored key issues including; livelihood, trade and transport patterns; strategies to maximize benefits to women; the risk of HIV/AIDS and human trafficking; indigenous peoples' issues; and a summary poverty reduction and social strategy.
09/2006-03/2007	**Social and Poverty Reduction Specialist** Independent Consultant – David Lupton and Associates Ref: David Lupton E-mail: david@lupton.org	Kyrgyz Republic	• Assessed the poverty and social situations in the Kyrgyz Republic including identifying a range of socioeconomic, poverty, ethnicity and health issues. · • Prepared policy frameworks relating to HIV/AIDS and Human Trafficking. · • Prepared and participated in focus group meetings (FGM) and assisted local consultants.
05/2006-09/2006	**Communications Specialist** New Zealand Government, Ministry of Education Ref: Andrew Pillay E-mail: andrewpillay@hotmail.com	New Zealand	• Worked on the Learning for Living Program. This Program was responsible for improving adult literacy in New Zealand. • Organized, managed, and undertook marketing and promotion of the National Communications Workshops. · • Prepared communications materials that was aimed at advising people of their rights, identifying gaps in the education system, and identifying and recommending remedial measures.
2001-2006	Various short-term jobs based in London UK and Spain	UK and Spain	• Tourism Communications Assistant in a hotel in Spain • Customer Services Representative for the management and outsourcing firm. · • Administrator (communications) at a real estate agency. ·

			• Customer Services Officer for an estate management agency.
1995-2001	New Zealand Government, Prime Minister's Office Senior Records Officer (2000-2001) and Records Officer (1996-2000)	New Zealand	• Reviewing and summarizing all incoming correspondence for the Prime Minister's information. • Analysed key issues raised by the community including cultural concerns and specific issues of ethnic minority groups (ranging from land rights/issues, tribal resource issues, ecological concerns and health). · • Compiled a database and statistics of issues and concerns raised by the community. • Managed staff members and trained new staff members.

3. **Professional development & Certification:**

- Managing People for Excellence, Impact International, 2018.
- Member of the International Association of Impact Assessment (IAIA)

4. **Language skills:**

Language	Speaking	Reading	Writing
English	Native	Native	Native
Spanish	Excellent	Excellent	Excellent

5. **Adequacy for the Assignment:**

Detailed Tasks Assigned	Assignments that Best Illustrate Capability to Handle the Assigned Tasks
	Project: Surkhandarya CCPP ESIA **Year:** 2022 **Location:** Uzbekistan **Client:** Stone City Energy and the Ministry of Energy, Uzbekistan **Main project features:** Environmental and social assessment of the 1600 MW Combined Cycle Power Plant (CCPP) located in the Angor district of the Surkhandarya region of the Republic of Uzbekistan **Activities performed:** • Prepared a Human Rights Impact Assessment/Human Rights Due Diligence for the project. **Project:** Sarimay-Dzhankeldy 500kV Transmission Line **Year:** 2021 – 2022 **Location:** Uzbekistan **Client:** EBRD **Main project features:** Environmental and social assessment of the 500kV overhead transmission line in Khorezm and Bukhara regions of Uzbekistan **Activities performed:** • Provided inputs into the scoping phase and ESIA reports • Prepared a Stakeholder Engagement Plan • Prepared a Land Acquisition and Livelihood Restoration Framework to Uzbek laws and EBRD Performance Requirements. • Assisted and oversaw the stakeholder engagement and surveys used complete the abovementioned documents. **Project:** Clean Energy for Buildings **Year:** 2022 **Location:** Uzbekistan **Client:** Confidential Client **Main project features:** On behalf of a confidential client, prepared documents to World Bank standards, for a project that intends improve energy efficiency in schools, pre-schools and hospitals across Uzbekistan (through small individualized construction packages).

	Activities performed: • Prepared a Labor Management Plan, Stakeholder Engagement Plan and inputs into an Environmental and Social Monitoring Framework (ESMF) and Environmental and Social Commitment Plan (ESCP) **Project:** Development of the Best Practice Guidelines on Management of Environmental and Social Impacts in the Solar Energy Sector **Year:** 2021 – ongoing **Location:** Desk based **Main Project Features:** Developing Best Practice Guidelines on Management of Environmental and Social Impacts in the Solar Energy Sector and Uzbekistan. **Activities Preformed:** • Provided social inputs into the best practice guidance, particularly related to labor, community, land acquisition, indigenous peoples and cultural heritage best practice actions to successfully implement solar energy projects. **Project:** Tampico (Prana) Solar Power Plant **Year:** 2021 **Location:** Mexico **Client:** Tampico Solar SA de CV **Main project features:** The Tampico (30MW) solar plant located in the state of Guanajuato in Mexico owned by Prana Power, SAPI de CV **Activities performed:** • Carried out a high-level Environmental and Social (E&S) construction progress update review for the Project. **Project:** Regional Power Sector Masterplan **Year:** 2020 – 2021 **Location:** Uzbekistan, Kyrgyz Republic, Kazakhstan, Tajikistan **Client:** ADB **Main project features:** Review and assessment planned country and regional projects. Propose new projects as appropriate. Prepare a regional power sector master plan considering environmental, social, economic, financial, technical and country security issues). **Position:** Social Expert **Activities performed:** • Develop a social analysis framework for assessing existing generation and transmission assets (including social impact) to ensure compliance with E(&S) standards and safeguard requirements of ADB; • Review the national policies in terms of social impacts to identify constraints on the implementation of new projects; • Perform high-level screening of projects planned by countries and detailed social assessment of projects proposed by Consultants; • Quantify social benefits of a proposed Regional Power Sector masterplan. **Project:** TA-9879 BAN - Preparing the South Asia Sub regional Economic Cooperation Integrated Trade Facilitation Program - Recruitment of Consultants for the SASEC Integrated Trade Facilitation Program (53260-002) **Year:** 2020 – ongoing **Location:** Bangladesh **Client:** ADB **Main project features:** ADB is planning to finance development and modernization of custom facilities in Dhaka and at nine international border areas across Bangladesh. **Position:** International Social Safeguard Specialist **Activities performed:**

	• Preparation of a PSA, Resettlement Plans; Indigenous Peoples Plans for each of the project sites as relevant and a summary poverty reduction and social strategy (SPRSS). • It also involves coordination of site visits, stakeholder engagement and public consultations, made challenging by the Covid-19 crisis. **Project:** Indorama Cotton Production Project **Year:** 2019 **Location:** Uzbekistan, **Client:** IFC **Main project features:** Indorama is attempting to improve cotton production in four pilot locations before implementing the strategy across Uzbekistan. It is purchasing small land parcels and employing the previous owners to farm the land, with increased training, improved equipment and other assistance from Indorama. **Position:** Senior Social Scientist **Activities performed:** • Preparation of a Resettlement Plan for the Project. This included identifying impacts that had already occurred and planning mitigation measures for future impacts. **Project:** Monte Plata, Solar Farm, **Year:** 2017 **Location:** Dominican Republic **Client:** FMP **Main project features**: Operations monitoring review against the Equator Principles for a 30MW Solar Farm in the Dominican Republic. **Position:** Senior Social Scientist **Activities performed:** • Undertook a social review of the operations of the Project. In particular review of project management documents and monitoring reviews. **Project:** Helios Solar Power Plant **Year:** 2016 – ongoing **Location: Honduras** **Client:** FMO **Main project features:** Undertook an ESDD and now construction monitoring of a 25MWAC solar PV power plant in San Jose de la Landa, Honduras. **Position:** Senior Social Scientist **Activities performed:** • The ESDD was undertaken on behalf of FMO. Key social concerns for the Project are in relation to labour and working conditions. **Project:** Entropy Solar **Year:** 2015 **Location:** Panama **Client:** OPIC **Main project features:** Environmental and Social (E&S) compliance review for a solar PV plant in Panama **Position:** Senior Social Scientist **Activities performed:** The scope of this review was to assess likely compliance of the Project against Panamanian requirements, the IFC Performance Standards, the Overseas Private Investment Corporation's (OPIC) Environmental, Health and Safety (EHS) and social requirements, and the Equator Principles. **Project:** Aguas Blancas Solar PV Plant Due Diligence **Year:** 2015

	Location: Chile **Client:** Confidential **Main project features:** Lender's Engineer for a solar photovoltaic power plant in Antofagasta, Chile. **Position:** Senior Social Scientist **Activities performed:** • Prepared an ESDD to IFC Performance Standards and the Equator Principles. **Project:** SunEdison Boshof Solar PV Power Plant **Year:** 2014 **Location:** South Africa **Client:** OPIC **Main Project Features:** A solar PV power plant in South Africe. **Activities performed:** Carried out two social safeguard monitoring visits on behalf of OPIC, which involved interviews with workers and worker representatives, review of site and worker accommodation and training in IFC Performance Standards. Key issues were worker strikes and treatment of workers by supervisors. **Project:** Taza Wind Farm Due Diligence **Year:** 2013-2016 **Location:** Morocco **Client:** EBRD **Main project features:** Lenders' technical services with respect to a 150MW wind farm. **Positions: S**ocial Specialist **Activities performed:** • Reviewed the resettlement action planning and stakeholder engagement process for the project against compliance with IFC performance standards and compliance with Moroccan legislation. • Key issues are managing government run resettlement of a large number of people. **Project:** Kilwa Energy Project **Year:** 2013-2014 **Location:** Tanzania **Main project features**: a combined circuit gas turbine (CCGT) power plant and transmission line in Tanzania to determine compliance with IFC performance standards and the Equator Principles. **Activities performed:** • Provided inputs into an ESDD • Key impacts were related to resettlement of large numbers of people for the transmission line. **Name of assignment or project:** Lake Turkana Wind Power Project, **Year:** 2012-2016 **Location:** Kenya **Client:** Consortium of lenders including AfDB, FMO, EIB, Proparco, DEG, Triodos, EKF, and EADB **Main Project Features:** Construction of a 360MW wind farm consisting of 365 Vestas wind turbines, located in the north of Kenya close to Lake Turkana. The project also includes the construction of 200km of existing roads and a 400km transmission line. It also required the relocation of a traditional village located in the project concession area. **Positions held:** Environmental and Social Lead

	Activities Performed: • Prepared social due diligence to IFC Performance Standards, World Bank Group EHS Guidelines, EIB, OPIC and African Development Bank (AfDB) Standards. • Undertook quarterly construction monitoring and monthly inputs into the technical monitoring reporting. Social impacts were the most demanding obstacle for the project. • Key issues have included managing relations and expectations between multiple lenders, resettlement, indigenous peoples' issues, influx of people to the area, traditional forms of violence and training a workforce of people that have never before undertaken construction works. **Project:** Kaxu and Khi Solar Thermal Electric Power Plants, **Year:** 2012-2014 **Location: South Africa** **Client:** IFC **Main project features:** As part of International Finance Corporation's (IFC) technical adviser team, undertaking a study of two power plants (respectively 50MW and 100MW) **Position:** Senior Social Scientist **Activities performed:** • Responsible for reviewing stakeholder engagement plans (SEPs) and labour accommodation plans and providing critical feedback to IFC/EBRD consultation and information disclosure standards. **Name of assignment or project:** Chah-e Anjir to Gereshk Road Improvements **Year:** 2012-2013 **Location:** Afghanistan **Client:** ADB **Main Project Features:** This ADB funded project involves road improvements of a 31.6 km stretch from Chah-e Anjir to Gereshk under consideration by ADB for financing. **Position Held:** Senior Social Scientist **Activities Performed:** • Updating the Resettlement and Land Acquisition Assessment (RRLA) to make it a compliant Land Acquisition and Resettlement Plan (LARP) for the Chah-e Anjir to Gereshk Road and updating the initial social and poverty assessment (IPSA) based new surveys data. **Name of assignment or project:** Yerevan Sustainable Urban Transport Programme, **Year:** 2012 **Location:** Armenia **Client:** ADB **Main Project Features**: The Asian Development Bank (ADB) agreed to provide the Armenian Government with a $300 million Multi-tranche Financial Facility (MFF) to finance Tranche 1 of the Program which includes sub-projects to construct missing road links to complete the Yerevan west bypass. One such project is the construction of the Shirak Street and Arshakuniats Avenue to Artashat Highway Urban Road Link. **Position Held:** Senior Social Scientist **Activities Performed:** • Updating the Land Acquisition and Resettlement Plans (LARPs) for the Yerevan West Bypass Highways Project 2 and Project 3 based on new surveys that have been undertaken one year after the LARPs were originally prepared. **Project:** Wampu Hydroelectric Power Project, **Year:** 2012

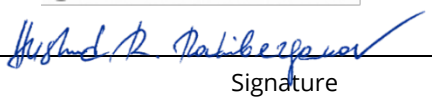
	Location: Indonesia **Client:** PT Wampu Electric Power **Main project features:** This project was funded by PT Wampu Electric Power and was the construction of a run of river hydropower project in Indonesia. **Position:** Senior Social Scientist **Activities performed:** • Involved preparation of Social Impact Assessment including an assessment of gender equality in the Project area. Carried out gender specific consultations to identify project benefits for women and also prepared the land acquisition and resettlement framework (LARF) and SEP for the construction of a hydropower plant. **Project:** Kenya LNG Facility **Year:** 2011-2012 **Location:** Kenya **Client:** Kenyan Ministry of Energy **Main project features:** An LNG terminal and storage facility in Mombasa Kenya that will be built to store LNG to be used in power plants around Kenya (including the LNG Power Plant that is being funded by KenGen). **Positions held:** Senior Social Scientist **Activities performed:** • Prepared the social impact assessment, which provided a baseline for gender, disabilities, poverty and social issues, as part of the environmental and social impact assessment to IFC and World Bank standards and also assisted in the preparation of the resettlement plan for an LNG terminal and storage facility. **Project:** Thar Coal to Power Project **Year:** 2011-2012 **Location:** Pakistan **Client:** Coal and Energy Development Department, Government of Sindh **Main project features:** A project to facilitate the development of the Thar Coalfields and put in place a basis for measuring and determining what impacts developments in the coalfields will have on the environment and on the people of the Thar area. The project is located in the Thar Desert of Pakistan 400kms east of Karachi. **Position held:** Resettlement specialist **Activities performed:** • Prepared a resettlement policy framework and a stakeholder engagement plan to IFC and World Bank standards for a mega coal powered energy project that involves multiple stakeholders and affected people. • Undertook stakeholder engagement in the form of workshops in order to prepare the documents. **Project:** Adjaristsqali Hydropower Cascade **Year:** 2011-2012 **Location:** Georgia **Client:** Clean Energy Invest **Main project features:** Preparation of an ESIA for a hydropower cascade project in Georgia. **Position:** Senior Social Scientist **Activities performed:** • Provided specialist contributions in relation to management of resettlement planning • Prepared a resettlement policy framework in accordance with IFC and EBRD standards. **Project:** Surgil Gas Extraction and Petrochemical Processing Project **Year:** 2011

	Location: Uzbekistan **Client:** Uz-Kor and the ADB **Main project features:** A project to drill new gas wells, construct new gas pipelines and develop a petrochemical production factory in Uzbekistan. **Position:** Senior Social Scientist **Activities performed:** • Assessed the need for an Ethnic Minority Development Plan, located and interviewed experts in indigenous people in Uzbekistan and provided a desktop study of indigenous people for this project to drill new gas wells, construct new gas pipelines and developing a petrochemical production factory. **Project:** Railway Development Investment Program; **Year:** 2010–2011 **Location:** Pakistan **Client:** ADB **Main Project Features:** Construction of double track for the the railway line from Lahore to Rawalpindi in Pakistan. **Position Held:** Social Development and Gender Specialist **Activities Performed:** • Developed recommendations and a gender action plan. Responsible for drafting a land acquisition and resettlement framework. Conducted a poverty and social analysis (PSA) and report. Conducted a social survey and stakeholder consultations. Assessed the poverty impact of the investment program and formulated a methodology for monitoring impacts. **Name of assignment or project:** Nanning-Kunming Railway Capacity Enhancement Project **Year:** 2008-2010 **Location:** China **Client:** ADB **Main Project Features:** A railway project in the PRC. **Position Held:** Poverty and Social Analyst **Activities Performed:** • Responsible for supervision of social and resettlement issues and socioeconomic baseline surveys. Outlined necessary training and skills development assistance, and analysed possible local area development. Assisted in producing an Ethnic Minorities Development Plan (EMDP). **Project:** Lanzhou Sustainable Urban Transport Project ; **Year:** 2008-2009 **Location:** China **Client:** ADB **Main Project Features:** A project to transfer the main town center and local government offices of Lanzhou from one part of the city to the other. Including building, roads and utilities infrastructure. **Position Held:** Social/Poverty Analyst **Activities Performed:** • Assessed and provided mitigation measures for poverty, gender, indigenous people and disabled issues. Developed a Social Development Action and Monitoring Plan (SDAMP). Assisted in the preparation of a Resettlement Action Plan. **Project:** Pre-Feasibility Study on the Almaty – Issyk-Kul Road Project; **Year:** 2007- 2008 **Location:** Kazakhstan and Kyrgyz Republic **Client:** European Bank of Reconstruction and Development (EBRD)

	Main Project Features: An EBRD Feasibility Study (FS) in order to assess the feasibility of building a road from Almaty in Kazakhstan to join with the Bishkek-Issyk-Kul highway in the Kyrgyz Republic; **Position Held:** Social/Poverty Analyst **Activities Performed:** • Assessed the poverty situation in the area and identified development possibilities and mitigating actions for HIV/AIDS, communicable diseases, drug and human trafficking in the two countries. • Prepared a Social Development Action Plan and a Land Acquisition and Resettlement Framework. • A gender analysis was carried out including sections on gender equity in education and employment and gender and family welfare. **Project:** TA 6347 REG - Central Asia Regional Economic Cooperation: Transport Sector Strategy Study; **Year:** 2007- 2008 **Location:** China **Client:** Asian Development Bank (ADB); **Main Project Features:** ADB Technical Assistance project in the CAREC region which identified the longer-term challenges for CAREC regional transport cooperation and development, and assessed the impact of new global supply chains on CAREC trade and traffic flows. **Position Held:** Social/Poverty Analyst **Activities Performed:** • Responsible for assessing the poverty situation in the area, recommending actions that would assist in social development in the project area (including mitigating actions for HIV/AIDS, communicable diseases, drug and human trafficking) in accordance with ADB Policies and Guidelines. **Project** Maintenance of Regional Road Transport Corridors Project (TA-6309 REG) **Year:** 2006 – 2007 **Location:** Kyrgyz Republic **Client:** ADB **Main project features:** ADB funded TA to create a long-term maintenance programme for a selection of key roads in the Kyrgyz Republic. **Position:** Assistant Social and Poverty Reduction Specialist **Activities performed:** • Prepared baseline survey and profile data, organised and supervised focus group meetings. Assisted in assessment of poverty and social situations in the Kyrgyz Republic including identifying a range of socio-economic, poverty, indigenous people and health issues.

Certification:

I, the undersigned, certify that to the best of my knowledge, these data correctly describe my qualifications, my experience and me. I am available to undertake the assignment in case of an award. I understand that any misstatement or misrepresentation described herein may lead to my disqualification or dismissal and/or sanctions by the Bank.

Marianne Lupton		15/01/2023
Name of Personnel	Signature	Date
Hushnudjon Rahimberganov		15/01/2023
Name of authorised representative	Signature	Date

CURRICULUM VITAE (Local)

Position Title and No.	Environmental Expert
Name of Firm:	Juru Energy Ltd.
Name of Expert:	Viktoriya Filatova
Date of Birth:	28 February 1989
Country of Citizenship/Residence:	Uzbekistan

1. Education

- MSc in Biotechnology, National University of Uzbekistan, 2009-2011;
- BSc in Biology (Honours), National University of Uzbekistan, 2005-2009

Other Trainings:

- International Visitor Leadership Program on "Parks, Biodiversity and Ecotourism Management", United States Department of State, Bureau of Educational and Cultural Affairs, USA (May 21 – June 8, 2012)
- The ASPBAE (Asia South Pacific Association for Basic and Adult Education) Basic Leadership Development Course, ASPBAE, Indonesia (September 12 - 17, 2011)
- Darwin Scholarship Program "Monitoring and Communicating Biodiversity", Field Studies Council, United Kingdom (August 13 - 23, 2010)
- Acquaintance with birds' observation and monitoring methods, RSPB, UzSPB, Bird Life Int., The Rufford Small Grants Foundation, Uzbekistan (May 9 – 11, 2008)

2. Employment Record:

Period	Employer/Position, Reference	Country	Summary of Activities
07/2020 – present	**Juru Energy Ltd.** Senior Environmental and Biodiversity Consultant / Head of Environmental Team Ref: Botir Gafurov, Managing Director b.gafurov@juruenergy.com	Uzbekistan	• Coordination of the activities of the Environmental and Climate change team; • Coordination of the baseline studies and biodiversity surveys; • Provide environmental and social safeguards due diligence to a level of detail sufficient to determine project safeguard categorization for environment (ENV); • Coordination of the performance of ongoing environmental projects; • Coordination of biodiversity experts' activities related to the ongoing projects; • Arranging site visits for performing environmental surveys (including biodiversity baseline studies); • Development of the methodologies for baseline biodiversity studies; • Reviewing project reports and submissions; • Development and submission of Environmental Impact Assessment reports to local authorities for obtaining required permission for project implementation; • Assistance in preparation of the Environmental and Social Impact Assessment reports to the lenders; • Assistance in preparation of the Critical Habitat Assessment reports.
02/2008 – 01/2020	**Centre of Forensic Expertise of the Ministry of Justice of Uzbekistan (Laboratory of forensic human DNA biological examination)** State Forensic Expert, Third-class lawyer	Uzbekistan	• Carrying out laboratory investigations and making expert reports • Participating in scientific researches • Working on scientific articles and tutorials • Applying new methods to the Laboratory routine • Making summary reports on the Laboratory's activities • Training of interns of the Laboratory for independent expert work • Giving lectures on the potentialities and policy for carrying out forensic human DNA biological examination for investigators, judges, lawyers and students of the Academy of the Ministry of Internal Affairs of Uzbekistan • Development of quality manuals for forensic human DNA biological examination procedures within the framework of the quality management system (QMS) implementation in the Centre

01/2018 – 12/2019	**Centre for advanced technologies (Laboratory of screening and molecular interactions)** Junior researcher	Uzbekistan	• Working on the project Regulation of the level of inorganic polyphosphates as a way to protect against ischemia-reperfusion • Participating in other scientific researches • Working on scientific articles • Applying new methods to analyse
09/2015 – 09/2016	**Uzbekistan Society for the Protection of Birds (UzSPB)** Public Relations Assistant	Uzbekistan	• Working on articles for UzSPB website and a monthly news digest • Assisting in organizing and execution of PR events, campaigns etc. • Drafting and distributing content such as newsletters and releases • Supporting relations with UzSPB members, media, SMM • Coordination of projects: Spring alive, Eurobirdwatch, "House for birds: We are waiting for new settlers!", World migratory bird day, International birds' day, International waterbird census, "Bird of the year" campaign
03/2013 – 06/2013	**Vienna International Science Conferences & Events Association (VISCEA)** Assistant		• Scientific publications survey via EndNote software • Identification of top research topics and research laboratories in the following areas: • Translational Cereal Genomics • Plant Transformation Technologies III • Plant Gene Discovery & "Omics" Technologies • Applied Vegetable Genomics • Collecting information on leading scientists - potential invited speakers
02/2008 – 07/2009	**Centre of Forensic Expertise of the Ministry of Justice of Uzbekistan (Laboratory of forensic human DNA biological examination)** Laboratory Assistant		• Laboratory maintenance • Participating in scientific researches • Translating scientific articles and manuals

3. Membership of Professional Bodies: N/A

4. Language Skills:

Language	*Reading*	*Speaking*	*Writing*
English	5	5	5
Russian	5	5	5
German	4	4	4

5. Adequacy for the Assignment:

Detailed Tasks Assigned on Consultant's Team of Experts:	Reference to Prior Work/Assignments that Best Illustrates Capability to Handle the Assigned Tasks
	Project: 500 MW Bash Wind Project and 162 km OHTL – ESIA and RAP/LRP **Year:** 2021 – Ongoing **Location:** Gijduvan district, Bukhara region, Uzbekistan **Client:** ACWA Power **Main project features:** The Project includes the development, financing, construction, operation and maintenance of the Wind Farm including the Wind Farm electrical substation. In addition, it will also include development, financing, construction and transfer of Purchase Electrical Facilities (OHTL and common electrical facilities shared with Dzhankeldy 500MW Wind Farm), switchyard (with transformers) or 500/220kV pooling station. All of these make the Project technically one of the most complex in Uzbekistan power system. Juru worked with the lead partner to undertake ESIA and LRP based on lenders' requirements (IFC, EBRD, ADB, DEG). **Position:** Environmental/Biodiversity Specialist **Activities performed:** • Preliminary site assessment and preparation of ToR for environmental and biodiversity surveys;

	• Monitor critical habitat assessment according to IFC PS6; • Recon survey along the proposed route of 24 km of unpaved road; • Recon survey along 162 km road along proposed route of OHTL; • Assist partner's expert in development of mitigation measures for identified Critically endangered species; • Develop suggestion related to the project layout (placing wind turbines, OHTLs, administrative buildings, etc) from environmental perspective; • Coordination of baseline studies (water, soil, air testing) and baseline noise monitoring; • Manage negotiation with local regulator in establishing Environmental management plan; • Preparation and submission of the Chance find procedure to SCEEP; • Development of the Pre-construction surveys methodologies; • Coordination of the Reptile and flora Pre-construction surveys; • Addressing lenders' comments.
	Project: 500 MW Dzhankeldy Wind Project and 128,5 km OHTL – ESIA and RAP/LRP **Year:** 2021 – Ongoing **Location:** Peshku district, Bukhara region, Uzbekistan **Client:** ACWA Power **Main project features:** The Project includes the development, financing, construction, operation and maintenance of the Wind Farm including the Wind Farm electrical substation. In addition, it will also include development, financing, construction and transfer of Purchase Electrical Facilities (OHTL and common electrical facilities shared with Dzhankeldy 500MW Wind Farm), switchyard (with transformers) or 500/220kV pooling station. All of these make the Project technically one of the most complex in Uzbekistan power system. Juru worked with the lead partner to undertake ESIA and LRP based on lenders' requirements (IFC, EBRD, ADB, DEG). **Position:** Environmental/Biodiversity Specialist **Activities performed:** • Preliminary site assessment and preparation of ToR for environmental and biodiversity surveys; • Recon survey along the proposed route of 40 km of unpaved road; • Recon survey along 128.5 km road along proposed route of OHTL; • Assist to international expert in development of mitigation measures for identified Critically endangered species; • Develop suggestion related to the project layout (placing wind turbines, OHTLs, administrative buildings, etc) from environmental perspective; • Coordination of baseline studies (water, soil, air testing) and baseline noise monitoring; • Manage negotiation with local regulator in establishing Environmental management plan; • Preparation and submission of the Chance find procedure to SCEEP; • Development of the Pre-construction surveys methodologies; • Coordination of the Reptile and flora Pre-construction surveys; • Addressing lenders' comments.
	Project: ESIA & LARF for Sarimay – Dzhankeldy 500kV Transmission Line (Category A) **Year:** 2021 – Ongoing **Location:** Countrywide, Uzbekistan **Client:** EBRD **Main project features:** The EBRD is supporting GoU in upgrading the national grid system by providing a loan to JS "National Electric Grid of Uzbekistan" (NEGU) for construction of a ca. 120 km of 500 kV OHTL that will connect existing Sarimay substation (Khorezm region) with planned Dzhankeldy 500 MW wind farm (Bukhara region), as well as 10 km of 500 kV OHTL to connect a new 500 kV open switchgear of planned Bash 500 MW wind farm with existing Navoi transmission lines. 130 km of proposed OHTL route runs through unmodified area of Kyzylkum that is characterised with massive sand hills. Areas around Dzhankeldy are considered as a habitat of critically endangered Southern even-fingered gecko and Houbara Bustard. Close location of Amudarya river to Sarimay substation poses a danger for bird migration after the construction of the Project, by increasing their collision and electrocution. According to EBRD

	ESP 2019, the Project is Category A project, due to the potential significant adverse impact to environment. EBRD intends to obtain bankable ESIA, ESAP as well as ESDD of NEGU's standards/policies highlighting gaps against the compliance requirements of the EBRD ESP 2019. **Position:** Local Project Coordinator/Local Environmental & Biodiversity Specialist **Activities performed:** • Overall coordination of the Project; • Preparation of the Scoping report and full ESIA package, including NTS, SEP, ESMP, BAP; • Coordination of the biodiversity surveys including 12-months VP bird monitoring, seasonal mammals, botanical/habitat, reptile survey; • Communication with NEGU/EBRD.
	Project: Uzbekistan: Case Study and Development of the Best Practice Guidelines on Management of Environmental and Social Impacts in Solar Energy Sector **Year:** 2021 – Ongoing **Location:** Uzbekistan **Client:** EBRD **Main project features:** Over the last couple of years, through its involvement in a number of the power projects in Uzbekistan EBRD identified a number of issues associated with the development of solar project that need to be addressed in a systemic manner. These include land disturbance/land use impacts; potential impacts to specially designated areas; impacts to soil, water and air resources; impacts to vegetation, wildlife, habitat and sensitive species; visual, cultural, socioeconomic impacts, supply chain and community impacts and potential impacts from hazardous materials, labour, health and safety during construction and operation. EBRD hired Juru to develop *Best Practice Guidelines on Management of E&S Impacts in Solar Energy Sector* that would be used by the government, existing and potential clients and other stakeholders in solar energy sector in Uzbekistan. As part of the assignment, Juru will also conduct capacity building webinar for local governmental authorities. **Position:** Environmental/Biodiversity Specialist **Activities performed:** • Review of EBRD requirements, Uzbekistan regulatory framework and solar projects pipeline; • Develop Best Practice Guidelines on Management of Environmental and Social Impacts; • Preparation of draft guidelines including Biodiversity aspects: - Preparation of TOR for a Critical and Natural Habitat assessment and pre-construction bird impact screening of candidate solar project sites and associated OHTL routes; - Preparation of TOR for pre-construction bird impact screening on candidate OHTL segments; - Methodological guidance for pre- construction and operation phases construction bird baseline field surveys bird impact monitoring programs on OHTL segments identified as potentially high risk as well as biodiversity/vegetation management programs within PV solar panel arrays; - Methodological guidance for operations-phase bird impact monitoring programs on OHTL segments identified as potentially high risk; - Methodological guidance for operations-phase biodiversity/vegetation management programs within PV solar panel arrays; - Guide to "top 10" sensitive species for solar project siting in Uzbekistan. • Develop Sector Specific Best Practice Guidelines.
	Project: Support for the Implementation of Wind Auctions in Uzbekistan (Phase II) **Year:** 2021 – Ongoing **Location:** Karatau district, Republic of Karaklpakistan, Uzbekistan **Client:** EBRD **Main project features:** The GoU has launched a program for the development of wind power projects, with support from the EBRD for a capacity of up to 1GW under PPP modality. The Consultant already implemented a number of studies and assisted to successfully conduct the tendering process for the first project of

	the program, a 100 MW wind power plant at a site located in the Qorao'zak district of Karakalpakstan, Uzbekistan. The EBRD hired the Consultant to help identify new sites for further development and to implement similar scope for the Second Wind Project including: • Preliminary desktop-based assessment of the list of sites for construction of wind farm identified by the GoU and selection of 3 most suitable sites for further development; • Conduct wind resource measurement, site assessment and E&S studies for the Second Wind Project in Karakalpakstan; • Prepare conceptual wind park layout and yield assessment, preliminary geotechnical investigations, power evacuation study, cost estimation and technical risk analysis; • Implement legal review, financial and economic analysis, risk analysis and project structuring; • Prepare the tender documents for EoI, RFQ and RFP stages; • Draft project agreements such as PPA and GSA; • Implement tender procurement support and bid evaluation; • Conduct negotiations with the preferred bidder. **Position:** Local Environmental & Biodiversity Expert **Activities performed:** • Preliminary site assessment: receptor mapping, identification of the nearest IBAs/KBAs, RAMSAR sites and national protected areas; • Conduct terrestrial survey and prepare habitat map (flora&fauna) of the proposed project footprint; • Monitoring recon surveys along proposed access road and OHTL alignment; • Legislation overview and gap analysis between local and DFI's requirements; • Conducting consultations with local stakeholders; • Preparation of ToR for environmental impact assessment; • Collaboration with technical staff and engineers to ensure that environmental measures are incorporated at further stages of Project including project design, preparation and evaluation of bidding documents and bids; Desktop-based environmental assessment of the list of sites for construction of wind farm.
	Project: Syrdarya II 1,600 MW Syrdarya CCGT - ESIA & LRP **Year:** 2022 – Ongoing **Location:** Boyavut/Shirin, Syrdarya region, Uzbekistan **Client:** EDF/5Capitals **Main project features:** Ministry of Energy of Uzbekistan competitively selected consortium of EDF, Sojitz, Nebras Power, and Kyuden to develop the Syrdarya II CCGT Project, which has a total capacity of 1,600 MW as well as associated facilities such as water corridor, gas pipeline and access road. Moreover, it planned that Project will reroute the existing 500 kV OHTL to connect it to a new 500 kV AIS, which is under construction at the moment. Overall 55 ha of agricultural land were allocated for the construction of CCGT plant. Allocated land plot is located next to ACWA Power Syrdarya 1,500 MW CCGT plant, which is currently under construction. There are Yuzhno-Golodnostepsky canal located 500 meters away and 3,000 MW existing Syrdarya TPP. **Position:** Local Biodiversity Specialist **Activities performed:** • Desktop study; • Three seasonal ecological terrestrial survey walk-overs on the Project site and at the intake point at the YG canal; • Preparation of the Biodiversity baseline report.
	Project: Dzhankeldy 500 MW WF Bird and bat monitoring **Year**: 05.2020 - ongoing **Location**: Uzbekistan, Bukhara region **Client**: ACWA/5 Capitals **Main project features:** The Dzankeldy Wind Farm Project is a ≈ 500MW proposed wind energy facility to be located roughly 60 km N of the city of Bukhara in Bukhara District, Republic of Uzbekistan. The primary objective of bird and bat baseline studies at planned Dzankeldy Wind Farm was to characterize the risk that the proposed project poses to flying vertebrates. More

	specifically, bird and bat baseline studies at Dzankeldy Wind Farm were intended to provide a comprehensive profile of the spatio-temporal distributions of all species that occur within the project's area of influence, usually with more focused, in-depth information on "target" species, so identified based on conservation/protection status and/or known or suspected susceptibility to impacts from the project. The bird and bat baseline studies included: • Bird monitoring based upon international best practice guidance specifically that outlined in the Scottish Natural Heritage: Recommended bird survey methods to inform impact assessment of onshore windfarms (March 2017, v2.) (SNH 2017) and IFC EHS Guidelines for Wind Energy (2015); • 12 - month Vantage point (VP) surveys (May 2020 to April 2021); • 12 - month transect surveys (May 2020 to April 2021) for general information about species present based on the lack of previous monitoring data in the area; • Breeding surveys (summer only May to August); • Static bat detector survey; • Collision Risk Modeling using the Band (2012) model, following Scottish Natural Heritage (SNH) Guidance recommendations; • Raptor/Vulture nest search in Spring 2022. **Position:** Local Coordinator **Activities performed:** • Local support in environmental and social feasibility assessment of the selected site in the Bukhara region; • Communication with clients; local and international experts; • Local coordination of bird and bat monitoring; • Providing regular bird and bat reports according to SNH 2017; • Review of scientific publications related to bird monitoring in the project area.
	Project: Bash 500 MW WF Bird and bat monitoring **Year**: 03.2020-ongoing **Location**: Uzbekistan, Navoi region **Client**: ACWA/5 Capitals **Main project features:** The Navoi Bash Wind Farm Project is a ≈ 500MW proposed wind energy facility to be located roughly 30 km W of the city of Kokcha in Vabkent District, Republic of Uzbekistan. The primary objective of bird and bat baseline studies at planned Navoi Bash Wind Farm was to characterize the risk that the proposed project poses to flying vertebrates. More specifically, bird and bat baseline studies at Navoi Bash Wind Farm were intended to provide a comprehensive profile of the spatio-temporal distributions of all species that occur within the project's area of influence, usually with more focused, in-depth information on "target" species, so identified based on conservation/protection status and/or known or suspected susceptibility to impacts from the project. The bird and bat baseline studies included: • Bird monitoring based upon international best practice guidance specifically that outlined in the Scottish Natural Heritage: Recommended bird survey methods to inform impact assessment of onshore windfarms (March 2017, v2.) (SNH 2017) and IFC EHS Guidelines for Wind Energy (2015); • 9 - month Vantage point (VP) surveys (March to November 2020); • 9 - month transect surveys (March to November 2020) for general information about species present based on the lack of previous monitoring data in the area. • Breeding surveys (May to August); • Static bat detector survey; • Collision Risk Modeling using the Band (2012) model, following Scottish Natural Heritage (SNH) Guidance recommendations; • Winter 2021/2022 VP bird monitoring and lake Agitma waterbirds survey; • Raptor/Vulture nest search in Spring 2022. **Position:** Local Coordinator **Activities performed:** • Local support in environmental and social feasibility assessment of the selected site in the Navoi region; • Communication with clients; local and international experts; • Local coordination of regular bird and bat monitoring;

	• Providing bird and bat reports according to SNH 2017; • Review of scientific publications related to bird monitoring in the project area.
	Project: 500 MW Zafarshan Wind Farm - Terrestrial and Bird & Bat Monitoring Surveys **Year**: 03.2020 – ongoing **Location**: Uzbekistan, Navoi region **Client**: Masdar/Wood group **Main project features**: The Zarafshan Wind Farm Project is a ≈ 500MW proposed wind energy facility to be located in Zarafshan, Navoi Region, Uzbekistan. Bird and bats surveys was required to quantify the impact of the Zarafshan Wind Farm Project on key Avifauna species; inform final turbine layout; develop additional mitigation (e.g. turbine shut down, habitat/species management plan); and form the baseline for any future required supplementary surveys and operational monitoring. One-year surveys were conducted for an assessment of the Zarafshan Wind Farm project's likely ecological impact for an Environmental and Social Impact Assessment (ESIA). Additionally, to Avifauna surveys, Chiroptera, Flora, Mammals, Herpetofauna and Invertebrates surveys were undertaken. The baseline studies included: • Assistance in technical due diligence of the project location and setting up ToR for ESIA from biodiversity perspective; • Assessment of selected project site from E&S perspective; • Biodiversity survey of the project site and associated facilities (OHTL, access road); • Bird monitoring: 15-months Vantage point (on 14 VP) surveys (36 hours per VP per season) based on guidelines outlined in the *Scottish Natural Heritage: Recommended bird survey methods to inform impact assessment of onshore windfarms (March 2017, v2.)* (SNH 2017); • Bird and bat survey at Mount Aktau that considered as Important Bird Area; • Transect surveys during bird breeding period; • *Transect survey along existing OHTL;* • One-year bat monitoring; • Breeding bird survey; • Breeding Houbara bustard survey. **Position:** Local Coordinator **Activities performed:** • Local support in environmental and social feasibility assessment of the selected site in the Navoi region; • Communication with clients; local and international experts; • Local coordination of regular bird monitoring (Vantage points and transects), bat monitoring (static detector and transects) and terrestrial ecology survey (including habitat and botanical, reptile, amphibian, mammal and invertebrate surveys); • Providing regular bird and bat monitoring reports according to SNH 2017.

6. Publications: N/A

Certification:

I, the undersigned, certify that to the best of my knowledge, these data correctly describe my qualifications, my experience and me. I am available to undertake the assignment in case of an award. I understand that any misstatement or misrepresentation described herein may lead to my disqualification or dismissal and/or sanctions by the Bank.

Viktoria Filatova		15/01/2023
Name of Personnel	Signature	Date
Hushnudjon Rahimberganov		15/01/2023
Name of authorised representative	Signature	Date

CURRICULUM VITAE (Local)

Position Title and No.	Local Biodiversity/Bird and Houbara Expert
Name of Firm:	Juru Energy Ltd
Name of Expert:	Anna Ten
Date of Birth:	10 July 1982
Country of Citizenship/Residence:	Uzbekistan

1. **Education**
   - Institute of Zoology of Uzbekistan Academy of Science 2006-2008
   - Master degree in hydrobiology, National University of Uzbekistan 2003-2005
   - Bachelor degree in zoology, National University of Uzbekistan 1999-2003
2. **Other trainings:**
   - 2017-2018 CADI Fellowship programme "The approbation of actual methods for monitoring of rare species, on example of Egyptian vulture *Neophron percnopterus* and Saker Falcon *Falco cherrug* survey in Central part of Kyzylkum Desert". Succow Foundation, Greifswald, Germany.
   - 16-19 November 2016, Bishkek, Kyrgyzstan: GIZ seminar "Integrating Ecosystem Services into Development Planning"
   - 30 October - 4 November 2015, Ecocenter «Djeyran», Uzbekistan: WCS's training on camera traps
   - 23 May – 10 June 2011, USA: International Visitor Leadership Program "Parks, Biodiversity and Ecotourism Management"
   - 2007: DIERET Distant Internet Education on renewable energy technology
   - 28-31 March 2006, Almaty, Kazakhstan: RSPB-ASBK seminar "Number estimation of wild animals: introduction to the bird counts methods"
3. **Employment record relevant to the assignment:**

Period	**Employing organization and your title/position. Contact information for references**	**Country**	**Summary of activities performed relevant to the Assignment**
09/2022 – present	**Juru Energy** Senior Biodiversity Specialist	Uzbekistan	• Support in biodiversity assessment • Scope biodiversity site visit • Field biodiversity survey • Support in CHA • Bird monitoring • Geoinformation database • Mapping
09/2018 – present	**Institute of Zoology of Uzbek Academy of Science** Researcher (part-time)	Uzbekistan	• Birds and animal counts • Data base conducting, • Mapping and GIS data base analysis
07/2016 – 09/2022	**Uzbekistan Society for the Protection of Birds** Assistant (part-time)	Uzbekistan	• Monitoring of IBAs • Endangered species conservation Programme • Surveys and analyses • Database
10/2011 – 06/2016	**Ecocenter "Djeyran"** Researcher	Uzbekistan	• Monitoring of animal population • Management plan 2012 • Fundraising 2011-2015 • Ecotourism 2011-2016
02/2007 – 08/2011	**Uzbekistan Society for the Protection of Birds** Assistant of Important Bird Areas Programme	Uzbekistan	• Data bases conducting (www.avica.uz and others) • Project work management • Organizing and conducting expeditions • Organizing and conducting field training for students • Analyze and scientific reporting • Mapping with using of ArcGIS
09/2001 – 01/2007	**Institute of Zoology of Academy of Science of Uzbekistan** Researcher in laboratory of Ornithology	Uzbekistan	• Research work

4. **Membership in Professional Associations and Publications:**
   - 2021 – now Member of IUCN Bustards working group
   - 2010 - 2016. Member of National Steering Committee of the Global Ecological Fund Small Grants Programme in Uzbekistan (SGP GEF) www.sgp.uz
   - 2008 – now. Member of the Uzbekistan Society for the Protection of Birds (NGO).
   - 2006 – 2010. Member of Uzbekistan Youth Ecological network.
5. **Language skills:**

Language	*Reading*	*Speaking*	*Writing*
English	4	4	4
Russian	5	5	5
Uzbek	3	2	2

6. Adequacy for the Assignment:

Detailed Tasks Assigned	Assignments that Best Illustrate Capability to Handle the Assigned Tasks
	Project: Kharezm Road 4R156 Project **Year:** 2022 – Ongoing **Location:** Kharezm region, Uzbekistan **Client:** EBRD **Main project features:** In accordance with Development Strategy of the New Uzbekistan for 2022-2026, namely, Objective 36: "Development of a unified transport system in conjunction with all types of transport, creating conditions for the possibility of conducting daily trips via transport routes between major cities", as well as Presidential Decree of 09.12.2019 PD-5890 "On Measures to Deeply Reform the Road Service System of the Republic of Uzbekistan", with the aim of improving resilience of the local road network of Khorezm region to climate change, optimising opportunities to provide positive impacts on the local economy and communities, and improving road safety for all users, the European Bank for Reconstruction and Development **in** (EBRD) is considering providing a sovereign loan to the Republic of Uzbekistan to Committee for Automobile Roads to finance the rehabilitation of around 84 kilometres of existing 4R156 road between Urgench and the A380 motorway in Khorezm Region of Uzbekistan (the "Project"). **Position:** Biodiversity Specialist **Activities performed:** • Biodiversity scoping report preparation • Baseline surveys • Biodiversity baseline report and support ESIA activities
	Project: TA-9292 REG: Strengthening Project Preparation Capacity in Asia and the Pacific Supporting Preparation of Infrastructure Projects with Private Sector Participation in Asia Pacific (Subproject 4) - #1 UZB: Technical Firm (Fergana/Jizzakh Solar Phase 3/4) (49407-005) **Year:** 06/2022-08/2022 **Location:** Uzbekistan **Client:** Suntrace, for Asian Development Bank **Main project features:** Suntrace supports the Asian Development Bank (ADB) in its role as a Transaction Advisor to the government of Uzbekistan in the preparation, structuring and procuring of a second 200-300 MW solar In-dependent Power Producer (IPP) project with potential storage components in Fergana region. Suntrace acts as the Technical Advisor to ADB covering all technical aspects relevant to update the existing Feasibility Study, conduct a site qualification and support ADB during the tendering process. Anna performs ESIA activities for ADB Uzbekistan Solar Phase 3 - Fergana Project **Position:** Team leader in environmental activities **Activities performed:** • Support ESIA Activities. **Project:** Zarafshan Wind Farm **Year:** 02/2022-08/2022 **Location:** Uzbekistan **Client:** Juru Energy Consulting, for Wood Group **Main project features:** Raptor Breeding Survey and Houbara bustard survey **Position:** Field ornithologist **Activities performed:** • Raptor nest search for Zarafshan WF area and Aktau IBA

	• Houbara bustard breeding survey. **Project:** TA-9292REG: Technical Consulting Firm for Project Definition, Preparation and Tender Process – Uzbekistan Solar Phase 2 - Guzar Project **Year:** 2021-2022 **Location:** Uzbekistan **Client:** Suntrace, for Asian Development Bank **Main project features:** Suntrace supports the Asian Development Bank (ADB) in its role as a Transaction Advisor to the government of Uzbekistan in the preparation, structuring and procuring of a second 200-300 MW solar Independent Power Producer (IPP) project with potential storage components in Guzar district of Kashkadarya region. Suntrace acts as the Technical Advisor to ADB covering all technical aspects relevant to update the existing Feasibility Study, conduct a site qualification and support ADB during the tendering process. Anna performs ESIA activities for ADB Uzbekistan Solar Phase 2 - Guzar Project **Position:** Team leader in environmental activities **Activities performed:** • Support ESIA Activities. **Project:** Environmental and Social Impact Assessment (ESIA) for Sarimay-Djankeldy Transmission line **Year:** 2021-2022 (not finished) **Location:** Uzbekistan **Client:** Juru Energy Consulting, for EBRD **Main project features:** Bird monitoring and Houbara bustard survey **Position:** Field ornithologist **Activities performed:** • Bird monitoring during year • Houbara bustard breeding survey **Project:** Wind Project in Uzbekistan – Phase II - Country assessment **Year:** 2021 **Location:** Uzbekistan **Client:** EBRD **Main project features:** Country assessment for wind energy sector. **Position:** Local biodiversity expert **Activities performed:** • Desktop assessment of the proposed sites for wind farms in Uzbekistan **Project:** Central Asian Desert Initiative (CADI) **Year:** 02/2021 – 10/2021 **Location:** Uzbekistan **Client:** Michael Succow Foundation on nature protection **Main project features:** Development of uzbek part **of p**roposal of the transnational dossier "Cold winter deserts of Turan" for inscription on the UNESCO world heritage site list **Position:** Consultant **Activities performed:** • Participation in development of uzbek part of proposal of the transnational dossier "Cold winter deserts of Turan" • Action plan for Southern Ustyurt National nature park • Mapping **Project: Uzbekistan:** OSME project "Identifying migration routes and wintering sites of Egyptian Vultures breeding in Uzbekistan" **Year:** 2021 - 2022 **Location:** Uzbekistan

	Client: OSME **Main project features:** Survey of the migration routes and wintering sites of the Egyptian Vulture on Central Asian flyway **Position:** project leader **Activities performed:** • Field survey • Satellite tagging of the Egyptian vultures in 2021 And 2022 • Mapping **Project:** Conservation of wintering Great Bustard (VU) in Uzbekistan **Year:** 2020-2022 **Location:** Uzbekistan **Client:** Uzbekistan Society for the protection of birds (UzSPB), for LASH **Main project features:** Identification of the Great bustard's wintering sites in Uzbekistan **Position:** Field team leader **Activities performed:** • Field survey • Mapping • IBA development • Reporting **Project: Uzbekistan:** Stone City Energy-1600 Mw Combined Cycle Power Plant **Year:** 2021 **Location:** Uzbekistan **Client:** UzAssystem, for Stone city **Main project features:** ESIA **Position:** Field ornithologist **Activities performed:** • Bird field survey in 2019, ornithological report, mapping **Project: Uzbekistan:** ESIA for Bash Wind Farm Project in Uzbekistan **Year:** 2021 **Location:** Uzbekistan **Client:** Juru Energy Consulting, for ACWA/5Capitals **Main project features:** The Navoi Bash Wind Farm Project is a ≈ 500MW proposed wind energy facility to be located roughly 30 km W of the city of Kokcha in Vabkent District, Republic of Uzbekistan. Houbara bustard survey is a part of the biodiversity surveys in the framework of Critical habitat assessment. **Position:** Local biodiversity expert **Activities performed:** • Houbara bustard survey design, field survey, data analysis, reporting **Project:** Asian Houbara survey (East Anglia University) **Year:** 2021 **Location:** Uzbekistan **Client:** East Anglia University **Main project features:** Participation in annual Asian Houbara breeding monitoring **Position:** Field researcher **Activities performed:** • Field work **Project**: Technical Consulting Firm for Project Definition, Preparation and Tender Process - Sherabad Solar IPP Project (457 MW) **Year**: 2020 **Location**: Uzbekistan

	Client: Suntrace, for Asian Development Bank **Main project features:** Suntrace supports the Asian Development Bank (ADB) in its role as a Transaction Advisor to the government of Uzbekistan in the preparation, structuring and procuring of a 457 MW solar Independent Power Producer (IPP) project around the cities of Sherabad, Muzrabad and Angor in Surkhandarya region. Suntrace acts as the Technical Advisor to ADB covering all technical aspects relevant to update the existing Feasibility Study, conduct a site qualification and support ADB during the tendering process. Anna performs ESIA activities for ADB Uzbekistan Solar Phase 1. **Position:** Team leader in environmental activities **Activities performed:** • Organisation of field survey, • team leader of environmental experts, • Ornithological survey, • GIS analysis on bird survey **Project: Uzbekistan:** Breeding Ecology of Turkestan Ground Jay **Year:** 2019 **Location:** Uzbekistan **Client:** OSME **Main project features:** Survey breeding success of the locally endemic Turkestan Ground Jay (Podoces panderi) in the southern areas of Bukhara province to improve the ecological understanding of this species. **Position:** Collaborator **Activities performed:** • Field survey • Mapping • Publication in reviewed scientific journal **Project**: Sustainable natural resource and forest management in key mountainous areas important for globally significant biodiversity **Year**: 04/2019-11/2019 **Location**: Uzbekistan **Client**: UNDP/GEF **Main project features:** CHA for Snow leopard **Position:** National Consultant on biodiversity critical habitats assessment (part-time) **Activities performed:** • Analyze available geospatial data for snow leopard and main prey species (ungulates and marmots) distribution, including areas of seasonal concentrations and use, and migratory corridors. • Analyze ecosystem attributes for critical habitats, including slope, land cover, solar orientation, elevation, current anthropogenic land use, etc. • Identify critical habitat and corridors for snow leopard and prey species, within the existing hotspots in recognized snow leopard landscapes (Western Tien Shan and Gissar Alay transboundary landscapes). • Map critical habitat areas within identified KBAs for snow leopard and prey species within the snow leopard landscapes. • Analyze the current PA coverage, and needs for further PA coverage or special seasonal management regimes for snow leopard and prey critical habitats. • Develop recommendations for optimization of protected areas coverage or biodiversity-sensitive special management regimes for effective conservation of snow leopard landscapes in Uzbekistan. **Project**: UNDP/GEF Project "Sustainable natural resource and forest management in key mountainous areas important for globally significant biodiversity" **Year**: 04/2018 -08/2018 **Location**: Uzbekistan **Client**: UNDP/GEF

	Main project features: Gissar snow leopard landscape **Position:** National Consultant on environmental information analysis (part-time) **Activities performed:** • Based on existing spatial and non-spatial databases, and/or ground-truthing, revise and update information on key habitats (e.g. high mountain forests, steppe, alpine and subalpine meadows etc.) and key species (e.g. keystone – snow leopard and its prey species, endangered and/or endemic species) in Gissar Snow Leopard landscape (Gissar ridge) in Kashkadarya and Surkhandarya provinces. • Based on collected information analysis of environmental threats, risks and/or hazards (e.g. invasive species, climate change effect to species and their areas, fire risks, erosion) in Gissar Snow Leopard landscape. • Analysis of gaps in environmental information in existing spatial and non-spatial databases, and/or ground-truthing. • Provide the final map of environmental information in Gissar ridge (Gissar Snow Leopard landscape) jointly with GIS specialist. **Project:** "Sustainable natural resource and forest management in key mountainous areas important for globally significant biodiversity" **Year**: 09/2017-11/2017 **Location**: Uzbekistan **Client**: UNDP/GEF **Main project features**: Ugam-Chatkal snow leopard landscape **Position:** National Consultant on environmental information analysis (part-time) **Activities performed:** • Based on existing spatial and non-spatial databases, and/or ground-truthing, revise and update information on key habitats (e.g. high mountain forests, steppe, alpine and subalpine meadows etc.) and key species (e.g. keystone – snow leopard and its prey species, endangered and/or endemic species) in Ugam-Chatkal Snow Leopard landscape. • Based on collected information analysis of environmental threats, risks and/or hazards (e.g. invasive species, climate change effect on species and their areas, fire risks, erosion) in Ugam-Chatkal Snow Leopard landscape. • Analysis of gaps in environmental information in existing spatial and non-spatial databases, and/or ground-truthing. • Provide the final map of environmental information in Western Tian Shan (Ugam-Chatkal Snow Leopard landscape) jointly with GIS specialist. **Project:** Central Asian Desert Initiative Fellowship Programme (CADI) **Year:** 01/2017 – 09/2018 **Location:** Uzbekistan **Client:** Michael Succow Foundation on nature protection **Main project features:** The approbation of actual methods for monitoring rare species on the example of Egyptian vulture *Neophron percnopterus* and Saker Falcon *Falco cherrug* survey in the Central part of Kyzylkum Desert **Position:** Fellow **Activities performed:** • Conducting work plan using GIS technology • Collect information on Egyptian vultures and Saker Falcon in Kyzylkum desert • GIS analysis on distributions of these species • Assessment of the population of these 2 species in Uzbekistan • Internship at Michael Succcow Foundation • The results of the research within the Fellowship programme are to be published in a • peer-reviewed international journal. **Project:** Mountains of Central Asia Biodiversity Hotspot **Year:** 07/2016 – 10/2016 **Location:** Uzbekistan **Client:** Critical Ecosystem Partnership Fund (CEPF)

	Main project features: Development of the Ecosystem Profile "Mountains of Central Asia Biodiversity Hotspot" (Uzbekistan part) **Position:** National consultant, GIS expert **Activities performed:** • Identifying Key Biodiversity Areas (KBAs) on bird species in Uzbekistan • Mapping **Project**: Monitoring of IBA 'Oygaing valley' and the adjoining territories, Uzbekistan **Year**: 2016 **Location**: Uzbekistan **Client**: OSME **Main project features**: Monitoring of the IBA 'Oygaing valley' and quality check of IBA **Position**: Project leader **Activities performed**: • Field survey of Oygaing • Analysis of populations of key bird species • Preparation of background to change the IBA site **Project:** Support of ecotourism development in nature-protected area – Ecocenter "Djeyran" by preparing souvenir and PR materials **Year**: 2012 – 2014 **Location**: Uzbekistan **Client:** Democracy Outreach / Alumni Grants Program of the US embassy **Main project features**: Development of souvenirs and booklets for tourism development in national protected area Ecocenter Djeyran **Position:** Leader **Activities performed:** • Development of the ceramic souvenirs • Development of the booklet and book about Ecocenter **Project:** Survey of 3 potential Important Bird Areas in collaboration with students in Uzbekistan. **Year**: 2010 – 2011 **Location**: Uzbekistan-Germany **Client**: Conservation Leadership Programme (CLP) **Main project features**: capacity building of students and development IBA Programme in Uzbekistan **Position:** Leader **Activities performed:** • Collaboration with Uzbekistan Society for the Protection of Birds. • Collaboration with the National University of Uzbekistan, Bukhara national university, Samarkand national University, Karakalpakstan national university • Conduct 3 field surveys and training in Karakalpakstan, Bukhara region and Tashkent regions for 30 students • IBA identification • Publication **Project:** Important Bird Areas Programme in Central Asia **Year:** 2008 **Location:** Uzbekistan **Client:** Uzbekistan society for the protection of birds **Main project features:** IBA technical assistant, GIS specialist **Position:** IBA technical assistant **Activities performed:** Tajikistan Data form sheet editing, review of IBA's category, IBA boundaries digitalization, mapping in ArcGIS

	Project: Important Bird Areas Programme in Uzbekistan **Year:** 2007-2011 **Location:** Uzbekistan **Client:** Uzbekistan society for the protection of birds **Main project features:** Field leader, data analysis, GIS specialist, bird conservation programme **Position:** IBA technical assistant **Activities performed:** data bases management (www.avica.uz and others), project work management, organizing and conducting of expeditions, organizing and conducting field trainings for students, analysing and scientific reporting, mapping in ArcGIS

7. Publications:

- Kashkarov R., Ten A.G., Soldatov V., Mitropolskaya Yu.O. 2022. Wintering grounds of Great Bustard Otis tarda in Uzbekistan: modern statement and conservation issues // «Nature Conservation Research. Заповедная наука» (in print.)
- Roman Kashkarov, Yulia Mitropolskaya & Anna Ten. 2022. The historical and current status of the Great Bustard Otis tarda tarda in Uzbekistan, a key winter refuge.// Sandgrouse volume 44 (1) Spring 2022. Pp 26-34
- Bykova E.A., Ten A., Esipov A., Dobrev V. 2022. Hedgehogs in the diet of the Egyptian vulture in Uzbekistan // Mammal News. Spring 2022. 12-13 pp.
- Солдатов В.А., Добрев В., Бернсайд Дж., Тен А. Первый опыт мечения стервятника Neophron percnopterus в Узбекистане // Материалы III республиканской научно-практической конференции «Зоологическая наука Узбекистана: современные проблемы и перспективы развития» - Ташкент 18-19 ноября 2021. Ташкент: «ФАН», с.282-283.
- Ten, A., Dobrev, V., Soldatov V., Burnside, R.J. 2021. Migration routes and wintering sites of Egyptian Vulture Neophron percnopterus breeding in Central Asia: first results from satellite tracking three juveniles tagged in Uzbekistan // 11th Annual Meeting of Saving Asia's Vultures from Extinction. Virtual event – December 2021.
- Тен А.Г., Грицына М.А., Абдураупов Т.В. Певчие птицы и их рациональное использование // Зоологическая наука Узбекистана: современные проблемы и перспективы развития. Мат-лы II респ. научно-практ. конф 15-16 окт, 2020. Ташкент: ФАН, 2020. 253 - 260
- Тен А.Г., Тулаев Ж.А., Солдатов В.А., Хайдаров А. Места зимовок большой дрофы Otis tarda в Джизакской области и угрозы // Зоологическая наука Узбекистана: современные проблемы и перспективы развития. Мат-лы II респ. научно-практ. конф 15-16 окт, 2020. Ташкент: ФАН, 2020. - С. 281-283
- Грицына М.А., Тен А.Г., Абдураупов Т.В., Нуриджанов Д.А., Солдатов В.А. Обзор орнитофауны планируемого Пскемского заповедника // Зоологическая наука Узбекистана: современные проблемы и перспективы развития. Мат-лы II респ. научно-практ. конф 15-16 окт, 2020. Ташкент: ФАН, 2020. - С.224-232.
- Burnside, R.J., Brighten, A.L., Collar, N.J., Soldatov,V., Koshkin, M., Dolman, P.M., Ten, A. Breeding productivity, nest-site selection and conservation needs of the endemic Turkestan Ground-jay Podoces panderi. J Ornithol (2020). https://doi.org/10.1007/s10336-020-01790-9
- Ten, A.G., Soldatov V.A. (2019) The Practice of identifying a nesting biotope for raptors in the central part of the Kyzylkum Desert using the GIS technology. Raptors conservation journal 2019, 39: 34-42 pp.
- Lampila, P., Eskelin, T &. Ten, A. (2019). Monitoring of Lesser White-fronted Geese in Uzbekistan. December 2018. AEWA Lesser White-fronted Goose International Working Group Report Series, Bonn, Germany
- Anna Ten, Robert Tizard, Valentin Soldatov First record of Rüppell's Warbler Curruca ruppeli for Uzbekistan and Central Asia. Sandgrouse 41 (2019): 209-210 pp.
- Lampila, P., Ten, A. & Eskelin, T. (2018). Monitoring of Lesser White-fronted Geese in Uzbekistan. AEWA Lesser White-fronted Goose International Working Group Report Series No. 10, Bonn, Germany.
- Ten A.G., Soldatov V.A. The record of White-fronted Goose Anser albifrons and Lesser White-fronted Goose Anser erythropus on Talimarjan water reservoir // Materials of the conference "The actual problems of rare, endangered and data deficient species conservation of the Uzbekistan". Tashkent: 2016. 160-161pp. [in Russian]
- Nodirjon Azimov, Petar Iankov, Roman Kashkarov, Maxim Koshkin, Eldar Rustamov, Valentin Soldatov, Anna Ten & Atymurat Veyisov. 2018. Further surveys at a globally important staging site for migrating Sociable Lapwings Vanellus gregarius in Turkmenistan and Uzbekistan. Sandgrouse 40 (2018): pp.38-50.
- Paul F. Donald, Nodir N. Azimov, Elizabeth Ball, Rhys E. Green, Johannes Kamp, Shirin Karryeva, Roman Kashkarov, Aman Kurbanov, Eldar Rustamov, Jumamurad Saparmuradov, Robert Sheldon, Valentin Soldatov, Anna Ten, Reg Thorpe, Mark Underhill, Ruslan Urazaliyev & Atamyrat Veyisov A globally important migration staging site for Sociable Lapwings Vanellus gregarius in Turkmenistan and Uzbekistan //Sandgrouse 38 (2016). 82-95pp.
- Soldatov V.A., Ten A.G. The expansion of Common Otter Lutra lutra seistanica area in Uzbekistan // International conference "Theriofauna of Russia and adjacent territories". X Congress of Russian Theriological society RAS. Moscow, 2016. 402p.[in Russian]
- Anna Ten, Roman Kashkarov, Gulara Matekova, Ilia Zholdasova & Mukhtor Turaev Akpetky lakes, Sarykamysh lake, Ayakaghytma lake, and their desert surrounds: three new Important Bird Areas in Uzbekistan.// Sandgrouse 34 (2012). p.137-147
- Ten A. Materials on raptors in north-eastern part of Golodnaya steppe, Baliklitau range // The Survey on Important Bird Areas in Central Asia and Kazakhstan, v.3. Tashkent, 2010. 16-17 pp. [in Russian]

- Ten A. The new data on bird species appropriated to Important Bird Areas (IBAs) criteria in Uzbekistan // The Survey on Important Bird Areas in Central Asia and Kazakhstan, v.3. Tashkent, 2010. 90-93 pp. [in Russian]
- Soldatov V.A., Ten A.G., Nuridjanov A.S. The new records of Sociable Lapwing Chettusia gregaria (Pallas, 1771) in Uzbekistan // Selevinia, 2009. 239p. [in Russian]
- Wunderlich Jens, Veyisov A.S., Ten A.G., Rustamov E.A. The usage of GIS technologies in Important Bird Areas inventory process of Central-Asian region // The Survey on Important Bird Areas in Central Asia and Kazakhstan, v.2. Ashgabat, 2007. 11-19 pp. [in Russian]
- Лановенко Е.Н., Тен А.Г. Анализ численности и добычи некоторых охотничье-промысловых птиц Узбекистана (1993-2003 гг.) // Биоразнообразие Узбекистана - мониторинг и использование. Ташкент - 2007: с. 231-239.
- Жолдасова И.М., Матекова Г.А., Тен А.Г., Асенов Г.А., Сапарбаев Ж. Проблемы и перспективы создания природоохранных территорий в юго-восточной зоне Приаралья // Мат-лы научно-практ. конф. "Проблемы сохранения биоразнообразия на охраняемых природных территориях Узбекистана". Нукус - 2008. С. 43-49
- Lanovenko E.N., Shernazarov E.Sh., Ten A.G. The changes of areas of some bird species in Uzbekistan Изменение ареалов некоторых видов птиц в Узбекистане во второй половине прошлого века // Ўзбекистон республикаси биологик хилмағхиллигининг экологик муаммолари. Республика илмий-амалий конференция материаллари. Навоий - 2006 й. 8-10 б. [in Russian]
- Лановенко Е.Н., Филатов А.К., Тен А.Г., Филатова Е.А. Опыт мониторинга зимовки серого журавля в Южном Узбекистане // Биоразнообразие Узбекистана - мониторинг и использование. Ташкент - 2007. С. 89-98
- Тен А.Г., Кашкаров Д.Ю. Опыт управления массовыми ночевками майны и вороновых в Ташкенте. Selevinia. Казахстанский зоологический ежегодник. 2003. с.157-161.
- Тен А.Г. Эксперименты по управлению массовыми ночевками майны, сороки, грача и галки в Ташкенте. II Международная конференция "Наука и технология в XXI веке". Ташкент 18-22 ноября 2003 г. Тезисы докладов. Ташкент: "Тинбо", 2003. С. 70-72.

Certification:

I, the undersigned, certify that to the best of my knowledge and belief, this CV correctly describes myself, my qualifications, and my experience, and I am available to undertake the assignment in case of an award. I understand that any misstatement or misrepresentation described herein may lead to my disqualification or dismissal by the Client, and/or sanctions by the Bank.

Anna Ten		15/01/2023
Name of Personnel	Signature	Date
Hushnudjon Rahimberganov		15/01/2023
Name of authorized representative		Signature Date

CURRICULUM VITAE (Local)

Position Title and No.	Local Project Coordinator/Resettlement Expert
Name of Firm:	Juru Energy Ltd
Name of Expert:	Zilola Kazakova
Date of Birth:	24 December 1980
Country of Citizenship/Residence:	Uzbekistan

1. **Education**
   - Master's Degree in Capacity Development of Women Leaders, EWHA Woman's University, 2015 – 2016;
   - Bachelor's Degree in Banking, Tashkent State University of Economics, Banking, 2002 – 2006;
   - Bachelor's Degree in English Language Teaching, Jizzakh State Pedagogical Institute, Department of Foreign Languages, 1998 – 2002.
2. **Employment Record:**

Period	Employer/Position, Reference	Country	Summary of Activities
01/2022 - present	**Juru Energy Ltd** Principal social consultant Ref: Botir Gafurov, Managing Director b.gafurov@juruenergy.com	Uzbekistan	• Coordinate RAP/LRP process for assigned projects; • Prepare stakeholder engagement plans for assigned projects; • Coordinate stakeholder consultations; • Arrange and conduct public disclosure meetings with different groups; • Conducting socio economic surveys; • Preparation of socio-economic and gender assessment reports
04/2021 – 01/2022	**Juru Energy Ltd** Senior social specialist Ref: Botir Gafurov, Managing Director b.gafurov@juruenergy.com	Uzbekistan	• Conducting socio-economic surveys and social compliance audits; • Carry out Livelihood restoration activities for assigned projects; • Report writing
2019 - 2021	**Ekostandart Ekspert LLC** Social Development/ Gender Specialist Ref: Olga Vakhidova-Mordovina vakhidovamordovina@mail.ru	Uzbekistan	• Conducting socio-economic research of the population living on the project territory in order to identify the degree of impact of the project on the population; • Identification of social problems in the research area; • Provide assistance on implementation of Gender Action Plan; • Establish Monitoring and Evaluation system; • Assess the potential gender impact of proposed projects; • Description of measures to be taken to prevent, reduce, or even compensate for these consequences; • Organizing and conducting focus groups; • Organizing and conducting public hearings and consultations; • Conduct activities
2018 - 2019	**LLC "Nafis Travel" under the Women's Committee of Uzbekistan** Director	Uzbekistan	• Preparation and organization of seminars, training and other events for the development of opportunities and potential of women in Uzbekistan; • Organization of meetings and cultural support to official delegations and groups; • Preparation of development programs and possible partnerships within the work of the women's Committee of Uzbekistan.
2017 - 2018	**Women's Committee of Uzbekistan** Gender Specialist	Uzbekistan	• Promote the mainstreaming of gender issues at all stages of the project cycle, from planning through evaluation; • Participate in operational missions and the drafting of project documents in order to promote the implementation of the Committee's gender

			policy, ensure that women are consulted and enhance the level of gender analysis of program/project; • Support the inclusion of gender in all program/project activities especially gender balance in project staff teams, training, and beneficiaries.

3. Language Skills:

Language	*Reading*	*Speaking*	*Writing*
English	5	5	5
Russian	5	5	5
Uzbek	5	5	5

4. Adequacy for the Assignment:

Detailed Tasks Assigned	**Assignments that Best Illustrate Capability to Handle the Assigned Tasks**
	Project: Namangan Waste Water Treatment Plant Project – ESIA and National EIA **Year:** 06/2022 – 02/2023 **Location:** Namangan district, Namangan region, Uzbekistan **Client:** 5 Capitals/Metito Limited **Main project features:** Metito Utilities Limited ("Metito") won a PPP tender by GoU to Design, Build, Finance, Operate and Maintain the Namangan Wastewater Treatment Plant with a total capacity of 100 MLD as well as 8 km effluent pipeline. Discharge point is Syrdarya river. Allocated land plot with overall size of 4 ha is located next to existing Namangan WWTP. Surrounding areas are occupied by agricultural fields for cultivating cotton and wheat. There are living and business structures on the northern and western parts of Project site. **Position:** Social specialist/Stakeholder engagement expert **Activities performed:** Social economic study for the Project site and 8km effluent pipeline Creating local communities' profile by conducting 250 household surveys in three nearest villages; Determining land use and users at the Project site and along the effluent pipeline; Development of stakeholder matrix and conducting consultations; Preparation of GRM template and support it throughout the ESIA duration; Regulatory review of main social requirements applicable for Project; Organization of public consultations and disclosure meetings for Project **Project:** ESIA & LARF for Sarimay – Dzhankeldy 500kV Transmission Line (Category A) **Year:** 09/2021 – 11/2022 **Location:** Kharezm and Bukhara region, KR, Uzbekistan **Client:** EBRD **Main project features:** The EBRD is supporting GoU in upgrading the national grid system by providing a loan to JS NEGU for construction of a ca. 120 km of 500 kV OHTL that will connect existing Sarimay substation (Khorezm region) with planned Dzhankeldy 500 MW wind farm (Bukhara region), as well as 10 km of 500 kV OHTL to connect a new 500 kV open switchgear of planned Bash 500 MW wind farm with existing Navoi transmission lines. According to EBRD ESP 2019, the Project is Category A project, due to the potential significant adverse impact to environment. EBRD intends to obtain bankable ESIA, ESAP as well as ESDD of NEGU's standards/policies highlighting gaps against the compliance requirements of the EBRD ESP 2019. **Position:** Senior social Resettlement Engagement Specialist

	Activities performed: Identification of social issues in the research area; Providing focus group discussions and interviews with PAPs on the project site; Conducting consultations with different stakeholders based on SEP through Zoom calls, face to face meetings and business correspondence; Providing survey with PAPs located on/near the project site; Writing a report summarizing research findings. Writing social part of the report and assistance to international experts in submission of final reports to the Client based on social and gender assessment of the site; Conducting preliminary consultations and correspondence with relevant state and non- governmental organizations, such as: Ministries, Committees and local authorities etc. Primary and secondary data collection from ministries, Committees, local authorities etc.; Arranging site visits for identifying social receptors and gender issues such as access to services, poverty and unemployment rate etc.; Arranging performance on data collection to identify opportunities to promote gender equality and economic opportunities for women on/near the project site; Providing public consultations with PAPs; Conducting focus group discussion to identify issues and benefits for women and youth. **Project:** EBRD - Country Assessment **Year:** 2021 **Location:** Autonomous Republic of Karakalpakstan **Client:** EBRD **Position:** Senior Social Specialist/Stakeholder Engagement Specialist **Activities performed:** Identifying social receptors and cultural heritage as well as archaeological sites on the project area. **Project:** Diligence for general corporate finance, equity and multi-site operations, Tashkent Power Loan. **Year:** 2020 – 2022 **Location:** Uzbekistan **Client:** EBRD/JSC "Thermal Power Plants" **Position:** Social and Gender Specialist **Activities performed:** Supporting in adapting questionnaires intended for personnel responsible for ensuring safe working conditions and appropriate labor relations, both at the (1) corporate level and (2) at the level of individual enterprises (TPPs /CHPPs) subject to audit. Carrying out audits in the field of labor relations and working conditions (general or detailed) of the eight facilities in accordance with the methodology and work plan agreed with Customer. Conducting a search (in the media) for information on labor issues /problems, litigation, disputes and complaints about the project, information about the client of "TashTES" and objects of audit in order to identify issues that require more detailed verification during the environmental and social audit. **Project:** Pre-feasibility study for 500KV transmission lines – Bash WPP and Dzhankeldy WPP Projects in Bukhara region **Year:** 2021 **Location:** Bukhara region, Uzbekistan

	Client: ACWA Power **Position:** Senior Social Resettlement Specialist **Activities Performed:** Conducting desktop research involving a review of official data related on the project area; Providing summary of socio-economic research and identifying impact for PAPs; Conducting preliminary consultations and correspondence with relevant state and non- governmental organizations, such as: Ministries, Committees, local authorities etc.; Conducting site visit and providing surveys on the project site according proposed OHTL routes; Writing, reviewing and submitting of social part of the pre-feasibility report. **Project:** 500 MW Bash Wind Project and 162 km OHTL – ESIA and RAP/LRP **Year:** 2021- ongoing **Location:** Gijduvan district, Bukhara region, Uzbekistan **Client:** ACWA Power **Main project features:** The Project includes the development, financing, construction, operation and maintenance of the Wind Farm including the Wind Farm electrical substation. In addition, it will also include development, financing, construction and transfer of Purchase Electrical Facilities All of these make the Project technically one of the most complex in Uzbekistan power system. Juru worked with the lead partner to undertake ESIA and LRP based on lenders' requirements (IFC, EBRD, ADB, DEG). **Position:** Social Resettlement Specialist **Activities performed:** Preparation of stakeholder matrix and development of SEP; Conducting consultations with different stakeholders based on SEP through Zoom calls, face-to-face meetings and business correspondence; Monitoring social economic surveys of current land users and household surveys of local communities; Organization of public consultations and disclosure meetings for different groups (local authorities, female, vulnerable groups, unemployed people, youth etc); Determining land acquisition procedure and resettlement procedures as per local legislation; Coordinating socio-economic surveys for PAPs; Preparation of institutional arrangement for the implementation and monitoring of RAP (for the Project site) and LRP for areas of OHTL construction. **Project:** Dzhankeldy 500 MW Wind Farm including 128 km of OHTL **Year:** 2021- ongoing **Location:** Peshku district, Bukhara region, Uzbekistan **Client:** ACWA Power **Main project features:** The Project includes the development, financing, construction, operation and maintenance of the Wind Farm including the Wind Farm electrical substation. In addition, it will also include development, financing, construction and transfer of Purchase Electrical Facilities All of these make the Project technically one of the most complex in Uzbekistan power system. Juru worked with the lead partner to undertake ESIA and LRP based on lenders' requirements (IFC, EBRD, ADB, DEG). **Position:** Social Resettlement Specialist **Activities performed:**

	Monitoring social economic surveys of current land users and households' surveys of local communities; Organization of public consultations and disclosure meetings for different groups (local authorities, female, vulnerable groups, unemployed people, youth etc); Determining land acquisition procedure and resettlement procedures as per local legislation; Coordinating socio-economic surveys for PAPs; Preparation of institutional arrangement for the implementation and monitoring of RAP (for the Project site) and LRP for areas of OHTL construction. **Project:** Construction of mining and metallurgical complex on the basis of Tebinbulak deposit, Uzbekistan. Environmental and Social Impact Assessment (ESIA) **Year:** 2019 – 2020, **Location:** Karakalpakstan, Karauzyak district **Client:** JSC "Uzbekistan railways **Position:** Social and Gender Specialist **Activities performed:** Conducting socio-economic research of the population living on the project territory in order to identify the degree of impact of the project on the population. Identification of social problems in the research area; Conducting inspections and audits of facilities for environmental and social reasons in accordance with legislation, client standards and business procedures. **Project:** Construction of the 500 kV Guzar-Regar transmission line" (L-507) with a length of 63.36 km on the territory of the Republic of Uzbekistan"- Land Acquisition Resettlement Framework (LARF) **Year:** 2019 – 2020, **Location:** Surkhandarya region **Client:** ADB / Uzbekistan National Power Networks **Position:** Social and Resettlement Specialist **Activities performed:** Conducting socio-economic research of the population living on the project territory in order to identify the degree of impact of the project on the population. Identification of social problems in the research area; Development of research methodology taking into account project specifics and target metrics, rules and procedures for social screening of investments /subprojects; holding public consultations and FGDs. Conducting inspections and audits of facilities for environmental and social reasons in accordance with legislation, client standards and business procedures. Providing input in respect of planning projects in terms of price and programme with regards to known and reasonably foreseeable social and resettlement risks and opportunities across social disciplines. **Project:** Construction of a 200 kV Zafarobod substation and two 220 kV transmission lines (2*142=284 km) "Syrdarya TPPZafarobod PS" in Jizzakh region" -Land Acquisition Resettlement Framework (LARF) **Year:** 2019 – 2020, **Location:** Jizzakh and Syrdarya regions **Client:** ADB / Uzbekistan National Power Networks **Position:** Social and Resettlement Specialist

	Activities performed: Conducting socio-economic research of the population living on the project territory in order to identify the degree of impact of the project on the population. Identification of social problems in the research area; Development of research methodology taking into account project specifics and target metrics, rules and procedures for social screening of investments /subprojects; holding public consultations and FGDs; Conducting inspections and audits of facilities for environmental and social reasons in accordance with legislation, client standards and business procedures; Providing input in respect of planning projects in terms of price and programme with regards to known and reasonably foreseeable social and resettlement risks and opportunities across social disciplines. **Project:** Consulting services for the development of a feasibility study for investment project: "Reconstruction of water supply and sewage facilities In Kattakurgan town, Samarkand region" **Year:** 07/2019 – 09/2019, **Location:** Kattakurgan, Samarkand region **Client:** WB / CECT Infrastructure Consulting LLC **Position**: Social and Communication Specialist **Activities performed:** Conducting socio-economic research of the population living on the project territory in order to identify the degree of impact of the project on the population; Identification of social problems in the research area; Focus group discussions; Household research **Project:** Kilim - Environmental and Social Impact Assessment (ESIA) - Indorama Cotton Clusters **Year:** 2019 – Ongoing **Location:** Syrdariya and Kaskadariya region **Client:** EBRD / Mott MacDonald (UK). **Position:** Social/Resettlement Specialist **Activities performed:** Preparing the social part of ESIA for the large-scale agricultural project to establish modern production of cotton, wheat and mungbean or any other suitable rotation crop to rotate with cotton within the area of about 54k ha in Kashkadarya and Syrdarya regions of the Republic of Uzbekistan; Development of research methodology taking into account project specifics and target metrics, rules and procedures for social screening of investments / subprojects; holding public consultations and FGDs;

	Conducting inspections and audits of facilities for environmental and social reasons in accordance with legislation, client standards and business procedures; Providing input in respect of planning projects in terms of price and programme with regards to known and reasonably foreseeable social and resettlement risks and opportunities across social disciplines; Preparing social part of ESIA report, conducting with social specialists of Mott MacDonald FGD surveys and social-economic analysis. **Project:** Water Services and Institutional Support Program (WASIS) Consulting Services for development of the Environmental and Social Management Framework (ESMF) and Resettlement Policy Framework (RPF) **Year:** 08/2019 – 11/2019 **Location:** Kattakurgan, Nukus, Hodjeyli, Kungrad, Takhiatash,Syrdarya region **Client:** International Bank for Reconstruction and Development and Kommunkhizmat agency Under the Ministry of Housing and Communal Services of the Republic of Uzbekistan **Position:** Social and Communication Specialist **Activities performed:** Development of research methodology taking into account project specifics and target metrics, rules and procedures for social screening of investments/ subprojects; ESIA guidelines for subprojects; holding public consultations. Collecting and analysing information from project areas, conducting surveys, analysing data, and preparing interim reports; Preparing social and gender part of ESMF

5. **Membership of Professional Bodies:** N/A

Certification:

I, the undersigned, certify that to the best of my knowledge, these data correctly describe my qualifications, my experience and me. I am available to undertake the assignment in case of an award. I understand that any misstatement or misrepresentation described herein may lead to my disqualification or dismissal and/or sanctions by the Bank.

Zilola Kazakova		15/01/2023
Name of Personnel	Signature	Date
Hushnudjon Rahimberganov		15/01/2023
Name of Authorised Representative of the Firm	Signature	Date

CURRICULUM VITAE (Local)

Position Title and No.	Local Biodiversity Expert/Herpetologist
Name of Firm:	Juru Energy Ltd.
Name of Expert:	Timur Abduraupov
Date of Birth:	08 July 1988
Country of Citizenship/Residence:	Uzbekistan

1. **Education**
   - Master's Degree - Department of Zoology, Faculty of Natural Sciences, Samarkand State University, Samarkand, Uzbekistan, 2013
   - Bachelor's Degree - Department of Zoology, Faculty of Natural Sciences, Samarkand State University, Samarkand, Uzbekistan, 2009
2. **Employment Record:**

Period	Employer/Position, Reference	Country	Summary of Activities
2020 – present	**Juru Energy** Biodiversity Specialist	Uzbekistan	• Reptile survey design • Field survey • Data analysis • Reporting • Southern even fingered Gecko survey
2016 - present	**Institute of Zoology, Academy of Sciences of the Republic of Uzbekistan** Researcher	Uzbekistan	• Formulating and conducting scientific experiments, performing data collection, and analysing and evaluating test and research results • Proposing techniques to improve research quality and team productivity • Contributing to and writing research findings for publications, papers, presentations, grants, and other documents • Assisting with grant and manuscript submissions • Guiding, training, and advising junior researchers and students, and supporting senior research staff • Replicating, evaluating, and refining research strategies and approaches and recommending improvements, and testing, customizing, and implementing new methods and procedures
2015 – 2016	**Gosbiocontrol, State Committee for Nature Protection of the Republic of Uzbekistan** Leading Specialist of the Monitoring Department for Bioresources	Uzbekistan	• Monitoring ongoing projects • Monitor and determine requirements • Systematics, zoogeography, phylogeny, morphology and ecology; • Conducting cadastre and monitoring of wildlife of the Republic of Uzbekistan
2014 – 2015	**Faculty of Natural Sciences, Samarkand State University** Assistant of the Department of Zoology	Uzbekistan	• Maintain all laboratory records • Conducting laboratory and practical classes for 1st and 4th-year students • Collaborates with other institutes • Carrying out risk assessments • Preparation of presentations, and reports • Conducting and supporting scientific investigations and experiments
2013 – 2014	**Faculty of Natural Sciences, Samarkand State University**	Uzbekistan	• Planning, setting up and undertaking controlled experiments and trials • Writing reports, reviews and summaries • Classify and label samples • Prepare samples for testing using various laboratory equipment

	Laboratory assistant of the Department of Zoology		
2009 – 2010	**The Samarkand Museum of Regional Studies, Ministry of Culture and Sport** Researcher of the Nature Department	Uzbekistan	• Research funds and grants • Maintaining records and cataloguing acquisitions • Researching, compiling and preparing written information about catalogues and publishing it on the institution's website

3. **Membership of Professional Bodies:** N/A
4. **Language Skills:**

Language	*Reading*	*Speaking*	*Writing*
English	5	5	5
Russian	5	5	5
Tajik	4	4	4
Uzbek	4	4	4

5. **Adequacy for the Assignment:**

Detailed Tasks Assigned on Consultant's Team of Experts:	**Reference to Prior Work/Assignments that Best Illustrates Capability to Handle the Assigned Tasks**
	Project: 100 MW Nukus WPP – ESIA & LRP **Year:** 2021 – 2022 **Location:** Karakalpakstan **Client:** 5 Capitals **Main project features:** GoU has launched a program for the development of wind power projects, with support from the EBRD for a capacity of up to 1GW under the PPP modality. The first project of the program, a 100 MW wind power plant and associated evacuation infrastructure ("Project") has been auctioned, which was won by ACWA Power. The allocated land for this Project is located at a greenfield location in Karatau mountain region between the Beruniy and Qorao'zak district of Karakalpakstan. Key features of the Project: • 100 MW wind farm [details TBD] • 220 kV AIS and ca.16 km 220 kV OHTL • 23 km access road **Position:** Local Biodiversity Expert **Activities performed:** Reptile survey design, field survey, data analysis, reporting
	Project: ESIA & LARF for Sarimay – Dzhankeldy 500kV Transmission Line (Category A) **Year:** 2021 – Ongoing **Location:** Countrywide, Uzbekistan **Client:** EBRD **Main project features:** The EBRD is supporting GoU in upgrading the national grid system by providing a loan to JS "National Electric Grid of Uzbekistan" (NEGU) for the construction of a ca. 120 km of 500 kV OHTL that will connect to existing Sarimay substation (Khorezm region) with planned Dzhankeldy 500 MW wind farm (Bukhara region), as well as 10 km of 500 kV OHTL to connect a new 500 kV open switchgear of planned Bash 500 MW wind farm with existing Navoi transmission lines. 130 km of the proposed OHTL route runs through an unmodified area of Kyzylkum that is characterized by massive sand hills. Areas around Dzhankeldy are considered a habitat of critically endangered Southern even-fingered geckos and Houbara Bustard. The close location of Amudarya river to the Sarimay substation poses a danger to bird migration after the construction of the Project, by increasing their collision and electrocution. According to EBRD ESP 2019, the Project is a Category A project, due to the potential significant adverse impact on the environment. EBRD intends to obtain bankable ESIA, ESAP

	as well as ESDD of NEGU's standards/policies highlighting gaps against the compliance requirements of the EBRD ESP 2019. **Position:** Local Biodiversity Expert **Activities performed:** Reptile survey design, field survey, data analysis, reporting, Southern even fingered Gecko survey.
	Project: ESIA for Bash Wind Farm Project in Uzbekistan **Year:** 2021 **Location:** Uzbekistan **Client:** ACWA/5Capitals **Main project features:** The Bash Wind Farm Project is a ≈ 500MW proposed wind energy facility to be located roughly 30 km W of the city of Kokcha in Vabkent District, Republic of Uzbekistan. The reptile survey is a part of the biodiversity surveys in the framework of Critical habitat assessment. **Position:** Local Biodiversity Expert **Activities performed:** Reptile survey design, field survey, data analysis, reporting, Southern even fingered Gecko survey
	Project: Support for the Implementation of Wind Auctions in Uzbekistan (Phase II) – Country Assessment for Wind Project in Uzbekistan (Phase II) **Year:** 2021 **Location:** Uzbekistan **Client:** EBRD **Main project feature:** Country assessment for the wind energy sector. **Position:** Local Biodiversity Expert **Activities performed:** Desktop assessment of the proposed sites for wind farms in Uzbekistan
	Project: ESIA for Dzankeldy Wind Farm Project in Uzbekistan **Year:** 2021 **Location:** Uzbekistan **Client:** ACWA/5Capitals **Main project features:** The Dzankeldy Wind Farm Project is a ≈ 500MW proposed wind energy facility to be located roughly 60 km N of the city of Bukhara in Bukhara District, Republic of Uzbekistan. The reptile survey is a part of the biodiversity surveys in the framework of Critical habitat assessment. **Position:** Local Biodiversity Expert **Activities performed:** • Reptile survey design; • Field survey; • Data analysis; • Southern even fingered Gecko survey.
	Project: Holding winter census of waterfowl bird species **Year:** 2021 **Location:** Uzbekistan **Client:** Research Institute of Environment and Environmental Technologies of the State Committee of Ecology **Main project feature:** Holding winter census of waterfowl bird species in the lowland water reservoirs of Uzbekistan. A joint expedition of employees of the Main Directorate of Biodiversity and Protected Areas, Research Institute of Environment and Environmental Technologies of the State Committee of Ecology and the Institute of Zoology of the Academy of Sciences of the Republic of Uzbekistan **Position:** Expert Zoologist **Activities performed:** • Accounting for waterfowl and near-water species of wintering birds; • Analysis of the current impact on the animal world; • Writing research papers and reports. • Give presentations on research findings.
	Project: Terrestrial ecology survey on Zarafshan WF project area **Year:** 2020/2021

	Location: Navoi region, Uzbekistan; **Client:** Wood Group **Main project features:** Field survey and literature review and assessment of the current state of the herpetofauna on the project territory of construction of wind power plants. **Position:** Expert Herpetologist **Activities performed:** • Counting the number of amphibians and reptiles in the project area; • Writing a literature review of the amphibian and reptile species inhabiting the project area with a focus on rare species; • Analysis of the state of populations of animal species in the protected area; • Analysis of the current impact on the animal world; • Designing the degree of impact and recommendations to mitigate pressure on the animal world in the future; • Writing reports.
	Project: Carrying out a survey of the animal world **Year:** 2020; **Location:** Uzbekistan **Main project features:** Carrying out a study of the fauna of terrestrial ecosystems during engineering and environmental surveys of IEI (Techproject) for the development of design documentation for a nuclear power plant, engineering and geological surveys for the development of working documentation to provide the first concrete for the reactor building of Unit 1 of the nuclear power plant. **Position:** Expert Herpetologist **Activities performed:** • Counting the number of amphibians and reptiles in the project area; • Analysis of the state of populations of animal species in the protected area; • Analysis of the current impact on the animal world; • Designing the degree of impact and recommendations to mitigate pressure on the animal world in the future; • Writing acts, protocols and reports.
	Project: Sherabad Solar IPP **Year:** 2020 **Location:** Surkhandarya region, Uzbekistan **Client:** Suntrace Dornier Group, Hamburg, Germany **Main project features:** Assessment of the current state of the vertebrate fauna in the Sherabad Solar IPP. **Position:** Expert Herpetologist **Activities performed:** • Counting the number of amphibians and reptiles in the project area; • Analysis of the state of populations of animal species in the protected area; • Analysis of the current impact on the animal world; • Designing the degree of impact and recommendations to mitigate pressure on the animal world in the future; • Writing reports.
	Project: Sustainable Solid Waste Management **Year:** 2020 **Location:** Khorezm region and the Republic of Karakalpakstan **Client:** Environment, Health and Safety, Social Ecoline International Ltd. (E&S consulting), Sofia, Bulgaria **Main project features:** Assessment of biological diversity (fauna) in the areas planned for the placement of infrastructure facilities for the solid waste management system and adjacent territories in the Khorezm region and the Republic of Karakalpakstan. **Position:** Expert Herpetologist **Activities performed:** • Writing a literature review of the amphibian and reptile species inhabiting the project area with a focus on rare species; • Analysis of the state of populations of animal species in the protected area; • Analysis of the current impact on the animal world;

	• Designing the degree of impact and recommendations to mitigate pressure on the animal world in the future; • Writing reports.
	Project: "Sustainable Management of Natural Resources and Forests in Key Mountain Areas Important for Globally Important Biodiversity". **Year:** 2019 **Location:** Uzbekistan **Client:** UNDP / GEF **Main project features:** Organization of an internship program for 3 months in large German companies for students of Uzbek universities. **Position:** Expert on Unmanned Aerial Vehicles. **Activities performed:** • Analysis of all existing models of unmanned aerial vehicles for their use in accounting for the number of wild animals; • Simulation of counts of the number of wild animals using selected unmanned aerial vehicles; • Analysis of threats associated with the use of unmanned aerial vehicles on the territory of the Republic of Uzbekistan; • Legal basis for the use of unmanned aerial vehicles in the Republic of Uzbekistan; • Description of the possibility of obtaining permission to use unmanned aerial vehicles in the Republic of Uzbekistan; • Writing reports and recommendations.
	Project: Carrying out a survey of the animal world **Years:** 2019 **Location:** Uzbekistan – Jizzakh region **Client:** Government of the Russian Federation on cooperation in the construction of a nuclear power plant and the Road Map in the Republic of Uzbekistan **Main project features:** Carrying out a survey of the animal world (reconnaissance, field, analytical, office and map-making work) at three sites for the location of nuclear power plants in the Aydar-Arnasay lake systems area. **Position:** Expert Herpetologist **Activities performed:** • Counting the number of amphibians and reptiles in the project area; • Analysis of the state of populations of animal species in the protected area; • Analysis of the current impact on the animal world; • Designing the degree of impact and recommendations to mitigate pressure on the animal world in the future; • Writing acts, protocols and reports.
	Project: "Sustainable Management of Natural Resources and Forests in Key Mountain Areas Important for Globally Important Biodiversity" **Years:** 2018 **Location:** Uzbekistan **Client:** UNDP / GEF **Main project features:** Data collection for snow leopard research and monitoring in Chatkal subregion. **Position:** Local Expert **Activities performed:** • Managing and monitoring animals in natural habitat and study group and mating behaviour; • Conducting expert assessment and monitoring of animals; • Develop conservation plans and make recommendations; • Writing research papers, reports.
	Project: Monitoring of flora and fauna **Years:** 2017-2018 **Location:** Uzbekistan **Client:** LUKOIL

	Main project features: Organization of monitoring of the state of flora and fauna during the implementation of oil and gas operations of LUKOIL Uzbekistan Operating Company **Position:** Expert Zoologist **Activities performed:** • Conducting expert assessment and monitoring of animals; • Monitoring all offspring and assisting development in control environment and ensure appropriate experimental drugs. • Managing all details for animals and categorizing all according to appearance and habitat. • Monitoring all offspring and assisting development in control environment and ensuring appropriate experimental drugs. • Managing all details for animals and categorizing all according to appearance and habitat. • Writing research papers, reports. • Give presentations on research findings.
	Project: "Support of flora and fauna of Uzbekistan, development of sustainable hunting and ecotourism" **Years:** 2016 **Location:** Uzbekistan **Client:** Sultan Bin Takhnun Al Nehyan (United Arab Emirates) **Main project features:** Counts of vertebrate animals on the territory of Kazakhdarya and Kungrad state forestry hunting farms, Karauzyak and Takhtapyrir forestry enterprises of the Republic of Karakalpakstan **Position:** National Expert - Zoologist **Activities performed:** • Designing and conducting research projects and studies of animals; • Studying the characteristics of animals and their behaviours; • Collecting and analyzing biological data and specimens on the site; • Writing papers, reports, and articles that explain research findings.
	Project: "Modernization of the Botanical Greenhouse of Samarkand State University as a model of an energy-efficient social facility" **Years:** 2010 – 2014 **Location:** Uzbekistan **Client:** GEF SGP, with the support of UNDP, Swiss, German and American embassies, project manager. **Main project features:** Conducting activities in the field of technology of cultivation and introduction of medicinal plants, floristry, and resource science. Development of digital electronic catalogues based on herbarium data. **Position:** Researcher **Activities performed:** • Coordinating and conducting verification of the collections. • Coordination of the construction of an energy-efficient greenhouse • Finding the best equipment for a given project • Search for interested donors • Constant communication with international donors • Writing reports and press releases • Report of reports and presentations • Researching, sourcing and cultivating new taxa for the collections • Database and coordinating associated activities.
	Project: Youth Organisation in Defence of Animals (YODA) **Years:** 2008-2010 **Location:** Uzbekistan **Main project features:** Supporting research and protection of Zarafshan nature reserve **Position:** The leader of the project **Activities performed:** • Creating, together with the other leaders, a program for the term, including activities, studies, social events, supper and who is responsible for organizing

	it; • Welcoming and speaking to the parents of the Youth Group members; • Carrying out your specific responsibilities within the youth group; • Ensuring that there is no breach of trust towards the members of the group or other leaders.
	Project: Training "Strategic planning of the NGO activities". **Years:** 2008 **Location:** Kazakhstan, Uzbekistan **Client:** CAREC **Main project features:** Activity that is used to set priorities, focus energy and resources, strengthen operations, ensure that employees and other stakeholders are working toward common goals, establish agreement around intended outcomes/results, and assess and adjust the organization's direction in response to a changing environment. **Position:** Project Coordinator **Activities performed:** • Developing curricula for training courses; • Identifying, developing, and driving strategies that create opportunities; • Scheduling seminars in regions; • Mentoring of young team members; • Searching and recruiting specialists for seminars and workshops. • Supporting the development of long-term organizational strategy; • Assist with creating programs and challenges that are as effective and efficient as possible.

6. **Publications:** N/A

Certification:

I, the undersigned, certify that to the best of my knowledge, these data correctly describe my qualifications, my experience and me. I am available to undertake the assignment in case of an award. I understand that any misstatement or misrepresentation described herein may lead to my disqualification or dismissal from Project.

Timur Abduraupov		15/01/202
Name of Expert	Signature	Date
		15/01/2023
Name of Authorized Representative of the Consultant (the same who signs the Proposal)	Signature	Date

CURRICULUM VITAE (Local)

Position Title and No.	Local Biodiversity Expert/Botanist
Name of Firm:	Juru Energy Ltd.
Name of Expert:	Natalya Beshko
Date of Birth:	14 June 1969
Country of Citizenship/Residence:	Uzbekistan

1. Education

- PhD in biology, Institute of Botany of the Academy of Sciences of the Republic of Uzbekistan, 2001
- Bachelor in biology, State University Kharkov, 1991

2. Employment Record:

Period	Employer/Position, Reference	Country	Summary of Activities
2020 – present	**Juru Energy** Associated Botanist Ref: Botir Gafurov Managing Director b.gafurov@juruenergy.com	Uzbekistan	• Biodiversity expert (Botanist) - Syrdarya II 1,600 MW Syrdarya CCGT - ESIA & LRP for EDF (2022 – ongoing) • Biodiversity expert (Botanist) - 100 MW Nukus WPP – ESIA & LRP for 5 Capitals (2021 – ongoing) • Biodiversity expert (Botanist) - ESIA for Sarimay – Dzhankeldy 500kV Transmission Line (Category A) for EBRD (2021 – ongoing); • Biodiversity expert (Botanist) - 500 MW ACWA Power Bash Wind Farm Project – National and international ESIA preparation for 5 Capitals (2021 – ongoing) • Biodiversity expert (Botanist) - 500 MW ACWA Power Dzhankeldy Wind Farm Project – National and international ESIA preparation for 5 Capitals (2021 – ongoing) • Local biodiversity expert - Support for the Implementation of Wind Auctions in Uzbekistan (Phase II) – Country Assessment for Wind Project in Uzbekistan (Phase II) (2021 – ongoing)
2012 – present	**Institute of Botany of Academy of Sciences of Uzbekistan** Head of Lab of Rare Plants Cadastre & Monitoring	Uzbekistan	• Botanical research including inventory of the flora of different administrative regions of Uzbekistan • Mapping and monitoring of rare plants; maintenance of the Red Data Book of Uzbekistan (plants) and state cadastre of rare plants • Reporting; writing scientific publications
1995 – 2011	**Nuratau nature reserve** Deputy director on science	Uzbekistan	• Planning and management of all research and eco-educational activities in nature reserve • Field research and monitoring • Reporting; scientific publications • Consultative and technical assistance for students
1991 – 1995	**Nuratau nature reserve** Researcher	Uzbekistan	• Field botanical research including inventory of the flora and vegetation of nature reserve • Monitoring of vegetation cover • Mapping and monitoring of rare plants • Reporting; writing scientific publications

Projects:

- Senior Researcher-Botanist - Construction of Atomic Power Station in Uzbekistan for Uzatom Agency & Rosatom State Atomic Energy Corporation, Uzbekistan, (2019 – 2020)
- Expert Botanist - Sherabad Solar IPP for ADB, Uzbekistan, (2020)
- Expert Botanist - "O'zbekiston Mustaqilligi" Project, Regular Ecological Audit & Monitoring of Oil-and-Sas operations in in Baysun district of Surkhandarya region for Surhan Gas Chemical, Uzbekistan, (2017 – 2020)
- Expert Botanist - Regular Ecological Audit & Monitoring of Oil-and-Sas operations in in Baysun district of Surkhandarya region for Lukoil Uzbekistan, Uzbekistan, (2015)
- National consultant on development of a guidelines on collection, storage and exchange of data enabling full capacity maintenance of "Chronicles of Nature" - UNDP/GEF project "Strengthening Sustainability of the National Protected Area System by focusing on Strictly Protected Areas" for UNDP/GEF, State Committee on Forestry, State Committee on Nature Protection, Uzbekistan, (2011)
- National consultant on flora and monitoring of natural pastures - Sustainable management of pastures in Farish district of Dzhizak region of Uzbekistan, with the participation of local communities for GIZ, Uzbekistan, (2010 – 2012)

- National Consultant-Botanist - UNDP/GEF project "Strengting Sustanaibility of the National Protected Area System by focusing on Strictly Protected Areas" for UNDP/GEF, State Committee on Forestry, State Committee on Nature Protection, Uzbekistan, (2009)

3. Language Skills:

Language	*Reading*	*Speaking*	*Writing*
English	4	4	4
Russian	5	5	5
Uzbek	4	4	4

4. Membership of Professional Bodies: N/A

5. Publications: N/A

Certification:

I, the undersigned, certify that to the best of my knowledge, these data correctly describe my qualifications, my experience and me. I am available to undertake the assignment in case of an award. I understand that any misstatement or misrepresentation described herein may lead to my disqualification or dismissal from Project.

Natalya Beshko  15/01/2023

Name of Expert Signature Date

Hushnudjon Rahimberganov  15/01/2023

Name of Signature Date

Authorised Representative of the Firm

CURRICULUM VITAE (CV)

Position Title and No.	National EIA Expert
Name of Firm:	Juru Energy Ltd.
Name of Expert:	Abdulhoshim Turgunov
Date of Birth:	09.02.1966
Country of Citizenship/Residence:	Uzbekistan

1. **Education**
   - 1992-1995, Scientific-Research Institute of Mechanization and Electrification of Agriculture (ИМЭСХ).
   - 1983-1990, Andijan Cotton Growing Institute (АИХ), specialty in Agricultural, Mechanization.

2. **Employment Record:**

Period	Employer/Position, Reference	Country	Summary of Activities
02.09.2018-Present	TSTU Associate Professor Department of Ecology and Environmental Protection	Uzbekistan	• Developing curricula and delivering course material. • Conducting research, fieldwork, and investigations, and writing up reports. • Publishing research, attending conferences, delivering presentations, and networking with others in the field. • Reviewing methods and teaching materials and making recommendations for improvement.
10.11.2017-30.08.2018	Scientific Research Institute on Ecology and Environment of the SCEEP Director	Uzbekistan	• Controlling, coordinating and carrying out research in various departments of Institute. • Overseeing and coordinating the policy research of the organization. • Supervising the staff, leading quality control efforts.
2017 - 2018	Research and Development Center Eco-Energy Environmental Consultant	Uzbekistan	• Provide expert assessment and advisory services on matters pertaining to the management of environmental issues (waste water, waste utility, pollution).
• 04.06.2009 - 09.11.2017	Research and Engineering Institute "Atmosphere" (NIPTI "Atmosfera") of SCEEP Senior Scientific Worker / Director	Uzbekistan	• Controlling, coordinating and carrying out research in various departments of Institute. • Supervising the staff, leading quality control efforts. • Provide expert assessment and advisory services on matters pertaining to the management of environmental issues (waste water, waste utility, pollution). • Conducting and involving in ESIA process

3. **Language Skills:**

Language	*Reading*	*Speaking*	*Writing*
English	4	4	4
Russian	5	5	5
Uzbek	5	5	5
Detailed Tasks Assigned	**Assignments that Best Illustrate Capability to Handle the Assigned Tasks**		

	Project: Development of the livestock sector in Uzbekistan **Year:** 06/2018-03/2018 **Location:** Uzbekistan **Client:** World Bank **Position:** Ecology and Environmental Protection Trainer **Activities performed:** • Conducting training in 13 regions of the Republic of Uzbekistan on the topic - "Training and raising awareness of project stakeholders on environmental protection and social safeguards and gender issues".
	Project: Developing the technology to produce gaseous and liquid hydrocarbons and coal briquettes from secondary materials and raw resources of domestic, agricultural and industrial origins. Developing the technology for the rehabilitation of soil containing cured drill cuttings to the fertile soil layer **Year:** 01/2017-12/2018 **Location:** Tashkent, Uzbekistan **Client:** Scientific-Research Institute of Environment and Environmental Technologies at the State Committee for Ecology of the Republic of Uzbekistan **Position:** Project Manager **Activities performed:** • To collect published scientific, analytical and technological works on the synthesis of a multifactor complex technological processes scheme aimed at generating heat, utilizing waste and obtaining energy carriers with improved environmental and performance indicators was carried out. A laboratory pyrolysis plant is being manufactured; • Based on the obtained experimental materials, a series of lectures and practical classes was designed for undergraduates for course SA 3211303 as a part of the subject on alternative energy carriers; • To demonstrate the results of the studies, two articles were published in journal "Ecological Bulletin", one article is submitted to a foreign journal (UK) and 10 theses were published at international conferences.
	Project: Developing low-waste technology to treat mineralized wastewater from chemical desalting plants with the electrochemical method to reuse them. Developing technology for cleaning a mixture of household and wastewater from food industries using natural microbiological association. **Year:** 01/2017-12/2017 **Location:** Tashkent **Client:** Ministry of Innovative Development of the Republic of Uzbekistan **Position:** Project Manager **Activities performed:** • Technological plans for the recovery of the ORP of chemical desalination by using the electrochemical method using electrolyzers of various designs were developed; • The technological regulations for the conditioning process of regeneration solutions of sodium-chlorine-ionization by using the electrochemical method were developed. • Studies of the treatment process of wastewater mixture from food industries and household water with ratio of 60:40% were conducted
	Project: Plan of Integrated Water Resources Management and Water Saving in the Zarafshon River Basin" - (EDM1) **Year:** 01.2013 - 12.2013 **Location:** Samarkand and Navoi regions, Uzbekistan **Client:** United Nations Development Programme and Ministry of Water and Agriculture

	Position: Social mobilization consultant (community mobilization specialists) **Activities performed:** • Development of the methodology to work with the community; • Assessment of community potential by considering social and gender criteria; • Training community representatives in community water-supply management.
	Project: Developing geographic information system of the state of the environment of border regions of the Surxondaryo Region within the zone of impact of the state unitary enterprise "Tajik Aluminum Company» (ТАЛКО) **Year:** 01/2014-12/2014 **Location:** Surkhandarya, Uzbekistan **Client:** State Committee of Environmental Protection **Position:** Project Manager **Activities performed:** • The retrospective information and monitoring data on the state of environmental pollution and public health were collected and analyzed; • Digital layers for the map of Surxondaryo Region in a shape file format were developed. Pulkovo coordinate system of 1942 was specified for the map. Projection of zone 12 was used for Surxondaryo Region; • Software for working with the database was developed and a progress report was provided.
	Project: Developing guidance document "Rules for the operation of dust and gas cleaning equipment at industrial plant emission sources **Year:** 01.2013 – 12.2014 **Location:** Tashkent, Uzbekistan **Client:** State Committee of Environmental Protection **Position:** Project Manager **Activities performed:** • Analysis of international experience and similar documents from other countries. Analysis of statistical reporting and other information of the Republic of Uzbekistan about dust removal and gas cleaning unit, as well as efficiency of trapping and neutralization of pollutants emitted into the atmosphere on the example of enterprises in Tashkent region. Determination of parameters to organize control and maintain the equipment to clean atmospheric emissions from enterprises. • Reporting on the achievement of project objectives, tasks and results.

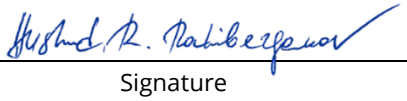
4. **Membership of Professional Bodies:** N/A

5. **Others:**
   - Loan 3963/3965-UZB: Project "Corridor 2 Karakalpakstan" (on the section A380 Kungrad - Daut-Ata) Central Asian Regional Economic Cooperation. Contract NO: KRP/OCB/IND-04. National Environmental Specialist. Republican Road Fund under the Committee on Roads (CAD). Karakalpakstan, 2021 to present;
   - Seminar on financial intermediaries "Project on the development of the value-added chain in the fruit-growing sector in the Republic of Uzbekistan" "Consulting services to verify compliance with the implementation of the social and environmental management system (SEEA) and Environmental and Social Screening and Subproject Monitoring Training "Environmental Specialist/Assistant Lecturer (Lead National Expert). Assist in carrying out environmental, monitoring and reporting training for UZAIFSA; Inspections of project sites and assessment of environmental management of the project; Monitoring and evaluation of the completed environmental management plan. Tashkent, 2020;
   - Training for environmentalists "Program to promote the readiness of Uzbekistan to access the resources of the GCF (Green Climate Fund), Tashkent, 2017;
   - Workshop on the development of air pollutant emission inventories of the UNECE Convention on Long-range Transboundary Air Pollution (CLRTAP) (agricultural group), Tashkent, 2015.

6. **Publications:** N/A

7. **Certification:**

I, the undersigned, certify that to the best of my knowledge, these data correctly describe my qualifications, my experience and me. I am available to undertake the assignment in case of an award. I understand that any misstatement or misrepresentation described herein may lead to my disqualification or dismissal from Project.

Abdulhoshim Turgunov		16.01. 2023
Name of Expert	Signature	Date
Hushnudjon Rahimberganov		16.01. 2023
Name of Authorised Representative of the Firm	Signature	Date