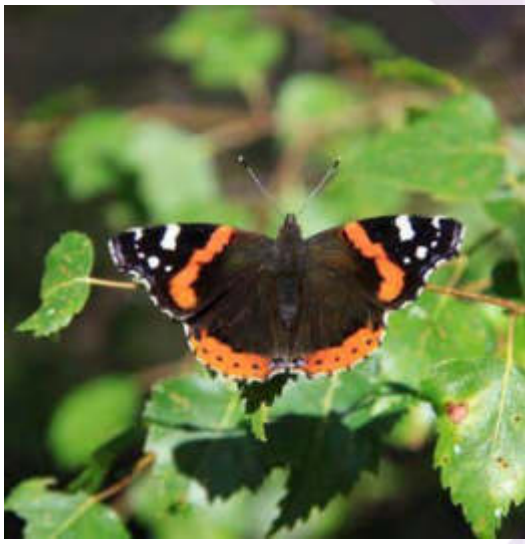
Appendix F Hydrological Report

Masdar

Area 60 Solar Hydrology Study

Baseline Hydrology and Flood Risk Appraisal



Wood Group UK Limited – March 2021

Report for

Jatin Batra
PV Engineer
Masdar

Main contributors

Jack Park
Francesca Hurt
Bidur Ghimire

Issued by

.....
Francesca Hurt

Approved by

.....
Richard Breakspear

Wood

Floor 23
25 Canada Square
Canary Wharf
London E14 5LQ
United Kingdom
Tel +44 (0)20 3215 1610

Doc Ref. 805120.R.004

\\att5-fs7\shared2\projects\43191 technical advisor - masdar 200mw solar park, azerbaijan\deliver stage\d design_technical\reports\805120.r.004.docx

Copyright and non-disclosure notice

Third party disclaimer

Management systems

This document has been produced by Wood Group UK Limited in full compliance with our management systems, which have been certified to ISO 9001, ISO 14001 and ISO 45001 by Lloyd's Register.

Document revisions

No.	Details	Date
1	Hydrology Report	February 2021
2	Revision to Ch 3 following client comments	March 2021

Executive summary

Wood Group UK was appointed by Wood Clean Energy on behalf of Masdar for the provision of a hydrological study to support the development of a new solar project at Area 60, approximately 60km south-west of Baku, Azerbaijan.

A 2D catchment-wide pluvial hydraulic model has been developed in InfoWorks ICM software to characterise the baseline flood hazard at the Site. The model has been developed using a combination of local topographic survey data and various wider global and commercially available datasets.

The rainfall events applied to the hydraulic model have been generated using Extreme Value Analysis (EVA) undertaken on rainfall gauge data from Alat, and subsequent IDF curves. A critical duration analysis was undertaken to determine the storm duration which produces the greatest flood depths and discharge across the Site. The model was subsequently run with four design rainfall hyetographs.

The model results were processed to produce GIS and mapped outputs of maximum flood depth and velocity, and further tabulated at key locations across flowpaths intersecting the Site. The recorded maximum depth and velocity result across the Site should be used to form the basis of watercourse crossing and any flood resilience measures required.

Sensitivity testing of the model was carried out to quantify the impact on the results in response to variations in key parameters and assumptions made in the baseline model. These included the topographic adjustment applied to the wider topography dataset, Manning's n roughness coefficient and the rainfall runoff coefficient. The results of these tests were compared against the baseline modelling to assess the sensitivity of the model to these parameters.

Contents

1. Introduction

1.1 Study aims and objective

The objective of this study is to undertake a hydrological assessment at a proposed Photovoltaic (PV) Power Plant in Eastern Azerbaijan, 60km south-west of Baku, referred to hereafter as the Project site. The study aims to review available data on climate, topography, geology, and hydrology, and to determine the potential flood risk to the site using a hydraulic model. The model outputs will provide the site designers with a constraints map to allow flood risk and flow paths across the site to be considered when finalising the site design.

The specific objectives of the hydrological study are defined below:

- Characterise baseline conditions for the Project site;
- Identify potential flood hazards;
- Quantify flood hazards as far as possible, based on existing datasets and hydraulic modelling of rainfall-runoff across the site; and
- Provide guidance for the future site design including a comment on requirements for watercourse crossings and flood resilience measures.

1.2 Sources of data

Sources of data and other information used to inform the study are listed in Table 1.1.

Table 1.1 Key sources of data

Data	Description	Body	Source
Site Topographical Survey	Topographical survey conducted in Area 60 of Qobustan, Azerbaijan (2020)	Azerbaijan Risk Professionals Association (ARPA)	Masdar
Geotechnical and Geological Survey	Geotechnical and geological survey conducted in Area 60 of Qobustan, Azerbaijan (2020)	Azerbaijan Risk Professionals Association (ARPA)	Masdar
Advanced Land Observing Satellite (ALOS) World 3D-30m (AW3D) Digital Surface Model (DSM)	Digital Surface Model (DSM) of 2.5m resolution for surrounding areas of the site, derived from ALOS stereo satellite imagery (2006-2011). The data has a 5m RMSE.	Japan Aerospace Exploration Agency	https://www.aw3d.jp/en/products/standard/

Data	Description	Body	Source
Soil and Terrain Database	Soil content grid to be used in calculating infiltration	International Soil Reference and Information Centre (ISRIC)	https://data.isric.org/geonetwork/srv/eng/catalog.search#/home
Land Use Cover	Global land cover map obtained 2015, using Sentinel-1 and Sentinel-2 data.	European Space Agency Climate Change Initiative (ESACC)	http://cci.esa.int/hrlandcover
Daily Rainfall Gauge Data	Daily rainfall gauge data for five nearby stations (1881-2017)	National Oceanic and Atmospheric Administration (NOAA)	https://www.ncdc.noaa.gov/
Sub-Daily Rainfall Gauge Data	3-hourly rainfall gauge data for the Alat gauge	Azerbaijan Hydrometeorological Service	Azerbaijan Hydrometeorological Service

1.3 Terminology

Annual Exceedance Probability (AEP)

In this report, the probability of a flood occurring is expressed in terms of Annual Exceedance Probability (AEP), which is the inverse of the long-term average return period. For example, the 1 in 100-year flood can be expressed as the 1 in 100 or 1% AEP flood, which has a 1 in 100 or 1% chance of being exceeded in any year.

1.4 Document structure

The report is divided into seven as summarised below:

1. Introduction - Introductory section and definition of the aims and objectives of the study;
2. Project site description - Introduces the location of the site, and provides a brief overview of the site characteristics;
3. Catchment characteristics -Provides a description of the relevant characteristics of the site and its surroundings, including geology, soils, topography, land use and hydrogeology;
4. Topography and drainage - Describes the topography of the sit, data processing, and the natural drainage networks and channels in the surrounding area;
5. Rainfall data analysis and climate - Describes the climate of Azerbaijan, characterising the rainfall and presents the extreme rainfall intensity-duration-frequency statistics for the site;
6. Flood modelling methodology and results - Provides an overview of the process undertaken in assessing flood risk on the site, including a description of the hydrological and hydraulic modelling methods applied, and presentation of the results; and
7. Conclusions and recommendations - Summarises the main points arising from the assessment, and provides recommendations for flood risk management for the Project.

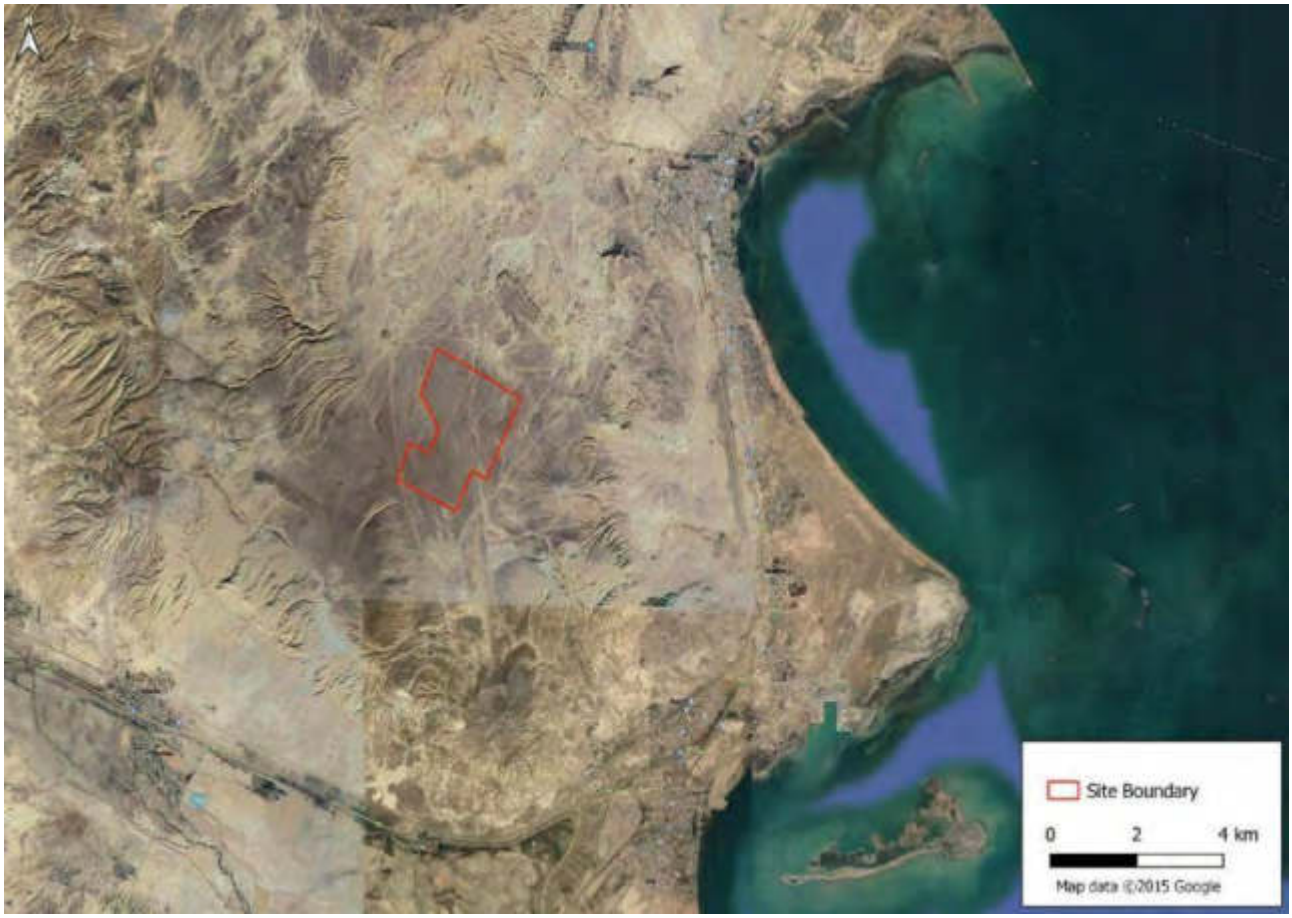
2. Site description

2.1 The Project Site

The Project site occupies an area of 551 acres and can be seen in Figure 2.1. It is located within an area characterised by the presence of mud volcanoes, approximately 60 km south-west of the capital Baku and 11 km north-west of the coastal town of Alat. The site is predominantly covered by sparse herbaceous vegetation and crossed by numerous unsurfaced footpaths and tracks. There are no settlements within the site boundary, however, there are several minor unnamed settlements located to the north-west, north, and east of the Project site.

There are no perennial watercourses within the site, although satellite imagery and topographic data identifies several drainage channels in the northern portion of the site flowing in a northerly direction towards Qobustan. The most significant drainage channel originates to the south-east of the site boundary and captures run-off from the adjacent mud volcano situated 1.5 km East of the site boundary.

Figure 2.1 PV Plant site boundary

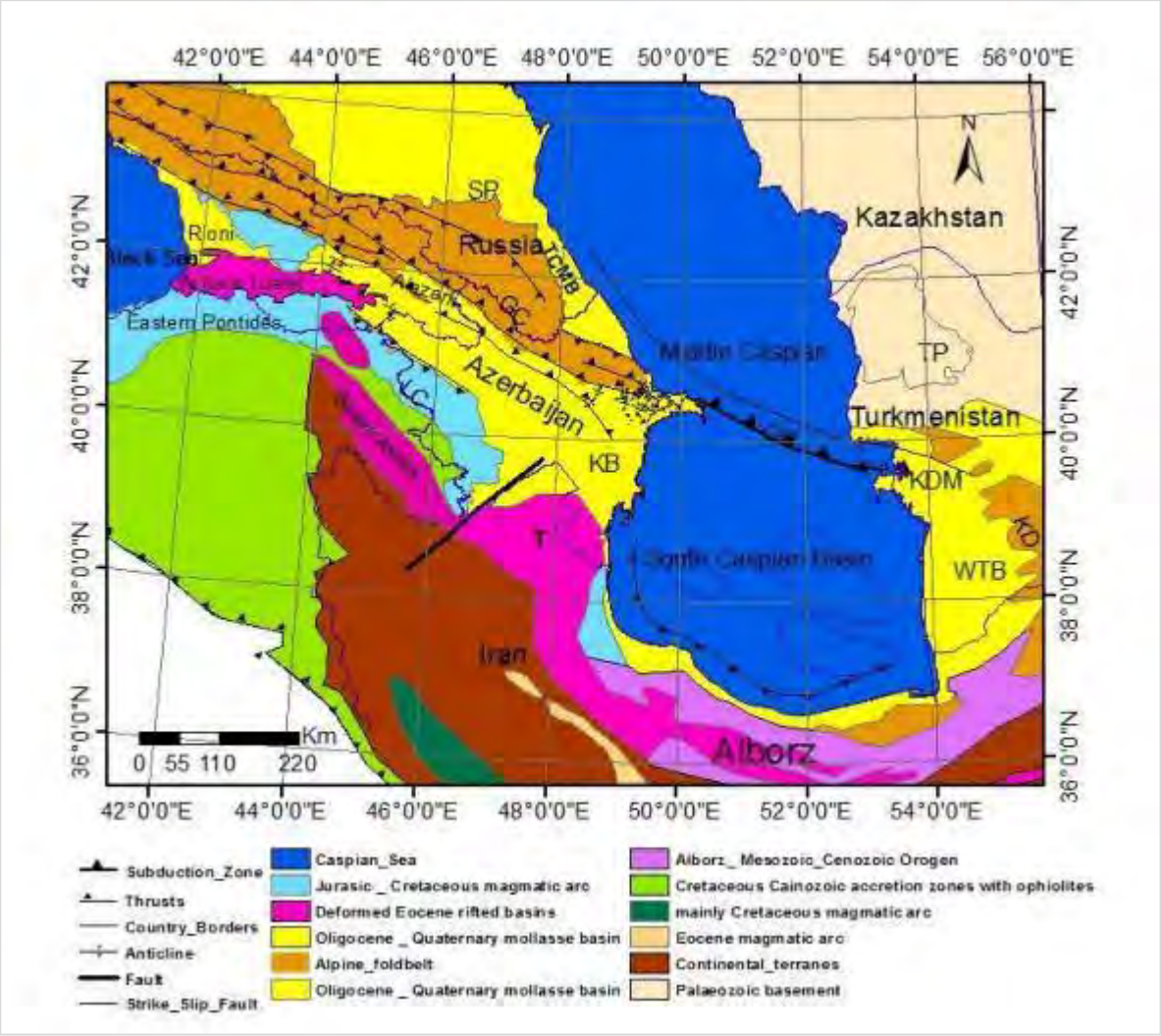


3. Catchment characteristics

3.1 Geology

The geology of Azerbaijan is described in detail by Alizadeh et al. (2016). The varying relief and geology strongly influence climate, hydrology and hydrogeology. The majority of the country consists of sedimentary, volcanic-sedimentary, volcanic and terrestrial deposits across almost the entire stratigraphic range beginning from Pre-Cambrian and through to the Holocene. Figure 3.1 below shows a simplified overview of the geology of the South Caspian area.

Figure 3.1 Simplified geological map of the South Caspian area (Brunet et al, 2003)



A review of the bedrock and superficial geology indicates that the study area is located within a region of Neogene and Quaternary sediments, with a mix of recent volcanic rock and thick clay rich sedimentary sequences. This is supported by the findings of the geotechnical and geological survey undertaken by Masdar (August 2020), which suggested that the underlying geology is dominated by sedimentary complexes. Alluvial-deluvial (edQIV) sediments overlay the bedrock geology and are typically of 2m depth, though reach up to 6m deep in some regions of the Site.

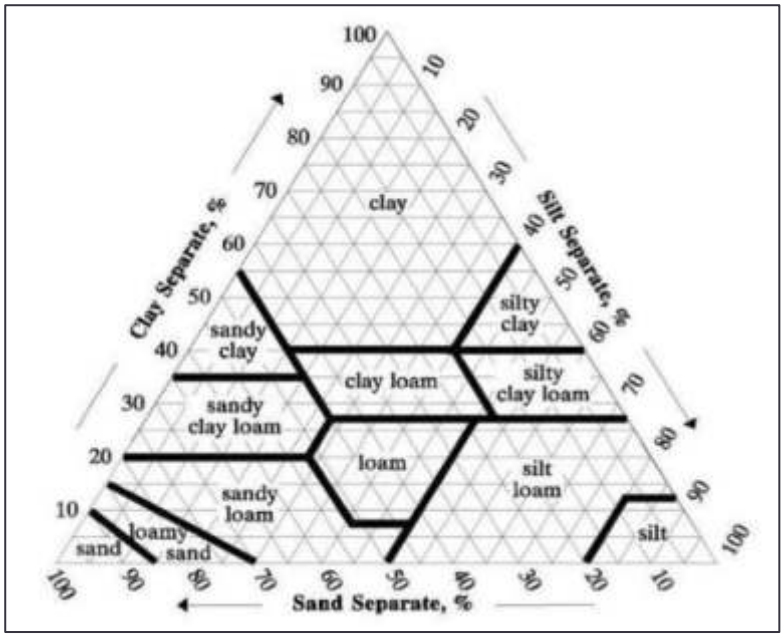
The region is subject to significant tectonism due to its location on an active zone of crustal deformation, caused by the collision of the Arabian and Eurasian tectonic plates. Mud volcanism is present throughout, caused by the upwelling of clay deposits (due to tectonic compression) and the migration and release of gas from shallow, hydrocarbon-rich, deposits.

A review of images of the Gobustan Mud Volcano, approximately 5 km to the south-east of the site boundary, suggests that such volcanism is modern and active. Aerial photography also indicates mud flows due to volcanism have occurred a range of other site close to the study area. The closest visible mud flow is located approximately 1.6 km to the east, with outwash fanning out to the west (i.e., towards the Project site), though information relating to the age and relative timing of this event is unavailable.

3.2 Soils

Soils were classified using the USDA (United States Department of Agriculture) soil textural triangle (USDA, 1999), which defines soil texture classes according to the distribution of size classes of mineral particles less than 2 mm in diameter. The USDA soil textural triangle is shown in Figure 3.2 below.

Figure 3.2 USDA soil textural triangle



The geotechnical and geological survey found that the soils across the Site are typically clay based, of grey and yellowish-brown-grey colour. These contain carbonate dust veins, sandstones, and sand layers, and are sometimes stratified.

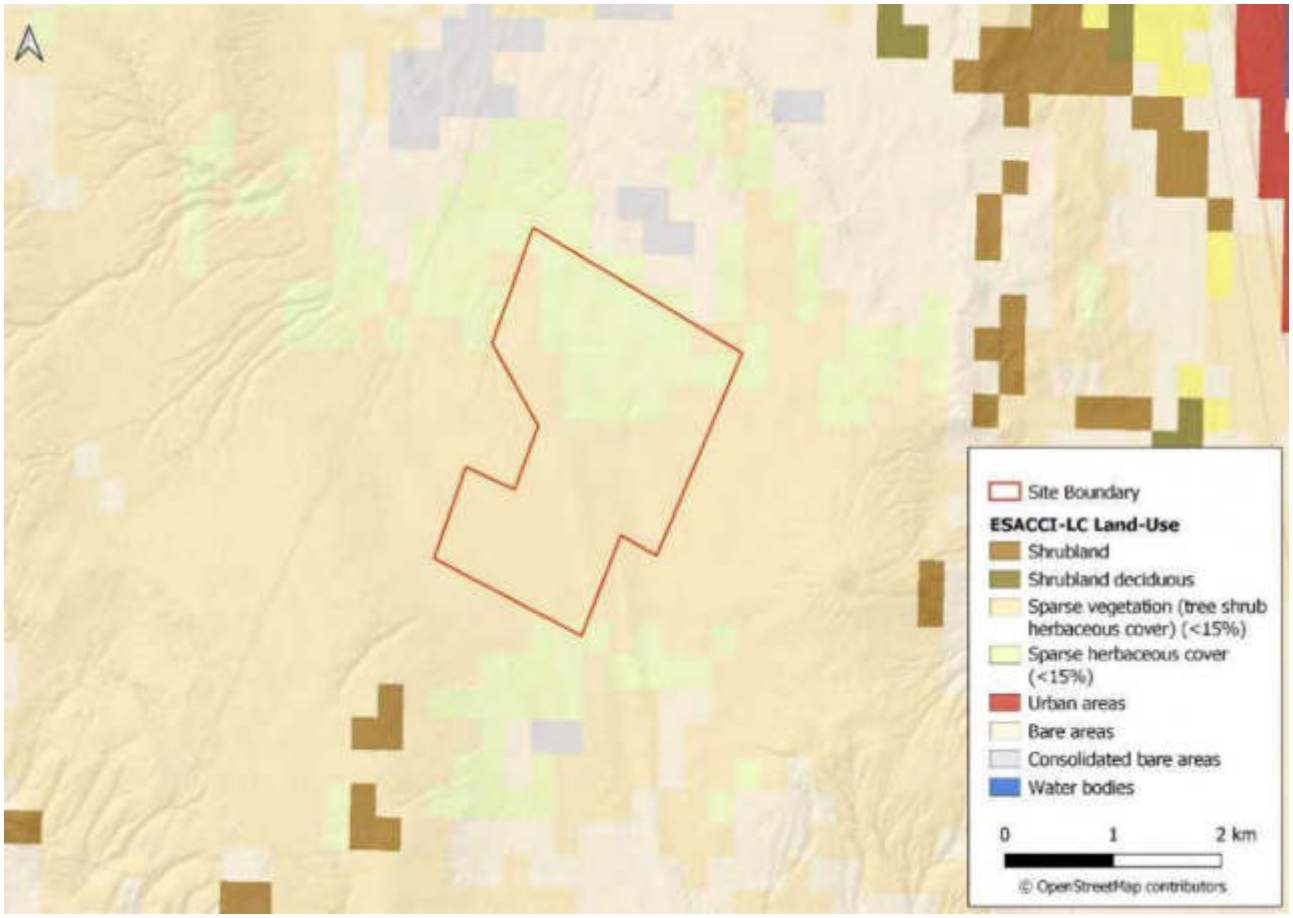
A 250 m resolution grid defining the separate percentages of clay, silt and sand was acquired from SoilGrids.org, a global database provided by the International Soil Reference and Information Centre (ISRIC). Across the proposed Site, grid squares give an average clay-silt-sand percentage of 35-46-19. The dominant soil types across the Site are Silty Clay Loam and Clay Loam, which align to the findings of the geological survey.

3.3 Land-cover

Land-cover across the Project site has been analysed in several ways. Aerial imagery was initially used in combination with site photographs obtained from the site visit in 2020. The vast majority of the site is bare earth with sparse herbaceous vegetation. Some land is being used for livestock grazing. Other land-covers within the site include a network of unsurfaced tracks and footpaths, and a small man-made lake at the eastern boundary of the site. There are no buildings within the site boundary, although the topographical survey and analysis of satellite imagery identifies minor settlements to the north and east of the site boundary, in addition to a further man-made lake and a cemetery to the south of the site.

Global land-cover datasets have been downloaded from several sources, including the European Environment Agency (EEA), Copernicus, and the European Space Agency Climate Change Initiative (ESACCI-LC). The three datasets are of varying spatial resolution and provide differing levels of classification. The EEA dataset defines the land-covers within the site broken down into a mixture of 'shrub cover (deciduous)' and 'cultivated and managed areas'. The Copernicus dataset provides the greatest spatial resolution of the three datasets and defines the majority of the site as 'herbaceous vegetation', with several isolated regions of 'cropland'. The ESACCCI-LC dataset disaggregates the land-uses within the site to 'Sparse vegetation (tree shrub herbaceous cover) <15%' and 'Sparse herbaceous cover <15%'. The ESACCI-LC dataset provides the greatest level of agreement with satellite imagery and photos of the site and surrounding areas, and therefore has been used as a basis to represent the land-cover in the flood model. Neither the satellite imagery or site photos show evidence of the presence of cropland within the site as the EEA and Copernicus datasets suggest. The ESACCI-LC land-use data is displayed in Figure 3.3.

Figure 3.3 ESACCI-LC land cover



3.4 Hydrogeology

The groundwater water system is expected to be dominated by the presence of older (connate) water associated with the upwelling and decompression of saturated sedimentary material. Evidence of this can be observed from a review of photographs of the mud volcanoes, where water ponds are noted in surface depressions close to these sources.

Rates of modern groundwater recharge are expected to the low, given the low annual average rainfall (typically less than 200mm year) combined with the potentially low permeability of the superficial material, given the dominance of clay rich sediments.

Groundwater was not recorded at any level during the drilling works or borehole and trial pits carried out during the geotechnical and geological survey. No evidence has been presented to suggest that there is active baseflow accretion to the surface drainage network, suggesting either that the water table is deep or that the sediments do not form a significant aquifer due to the low permeability of the substrate. In either case, the risk of persistent groundwater flooding is considered to be low.

4. Topography and drainage

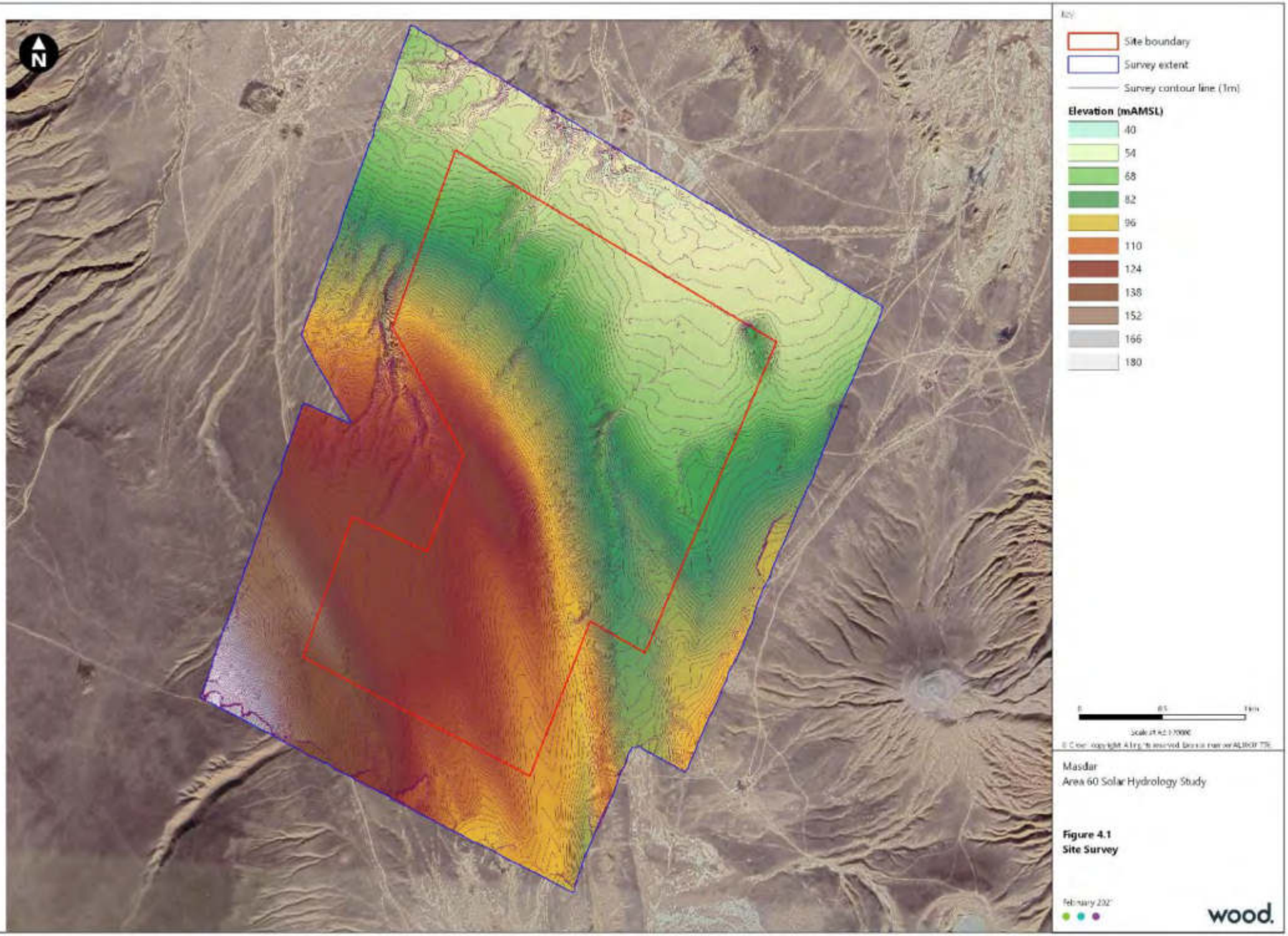
4.1 Topography

Project site survey

The topography of the site and surrounding area was captured in a ground survey conducted by ARPA in 2020 (Figure 4.1).

The survey indicates that the elevation at the Project site varies from 149m AMSL (Above Mean Sea Level) in the south-west of the site, to a minimum of 60m AMSL in the north-east. The site spans a catchment divide, with the northern portion and majority of the site sloping north, whilst the southern portion slopes to the south-east. The gradient of the slope across most of the site is shallow, with the vast majority of land having a slope of less than 3°. Steeper sloped regions are observed in the entrenched drainage channels that drain northwards, with localised slope angles of up to 21°.

The survey extent was refined to remove suspected erroneous elevation points identified along the survey extent boundaries to the south and east, identified via comparison against the AW3D DSM described below.

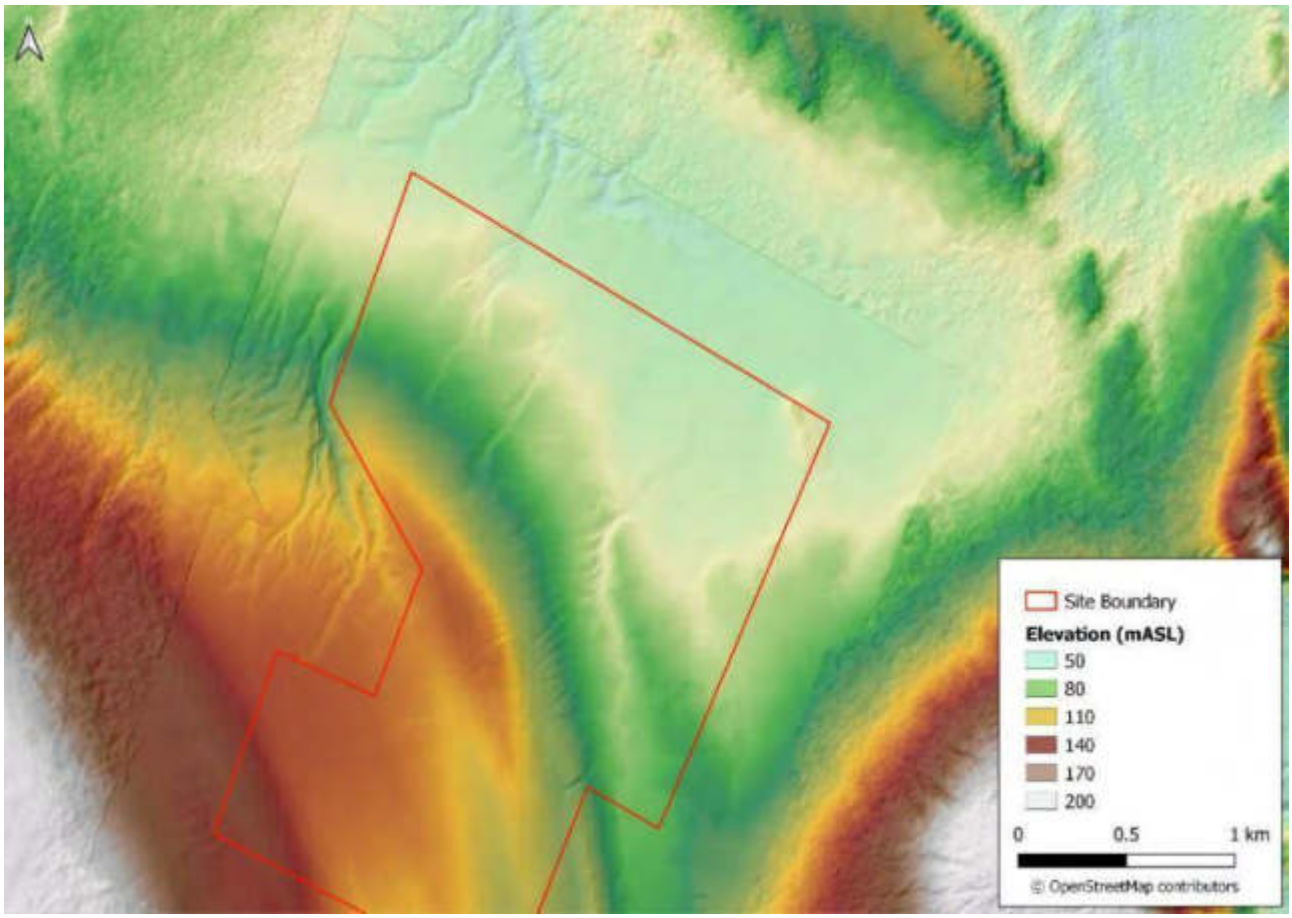

N
Site boundary
Survey extent
Survey contour line (1m)
Elevation (mAMSL)
40
54
68
82
96
110
124
138
152
166
180
Masdar
Area 60 Solar Hydrology Study
Figure 4.1
Site Survey
February 202
wood.

Topography data for the wider area

A Digital Surface Model (DSM) of the wider site area was acquired from ALOS in order to characterise the wider topographic context of the site and include the full contributing catchment areas intersecting the site. A Digital *Surface* Model differs from a Digital *Terrain* Model in that it has not had surface features such as vegetation and trees filtered and removed to express the ground or terrain elevation only. However, as the Project site appears to be predominantly bare earth with sparse vegetation it was deemed that a DSM would be acceptable to use. The supplied DSM had a spatial resolution of 2.5 m.

The ALOS AW3D DSM was analysed against the Project site topographical survey to determine the degree of agreement between the two separate datasets. A raster calculator tool, within the GIS software QGIS, was used to subtract the DSM from the topographical survey model for the area of overlap. The mean divergence of the wider DSM from the topographic survey data was +1.49m, with a standard deviation of 1.23. The disparity between the wider DSM and topographic survey model is most evident on the northern boundary of the of the survey extent, illustrated in Figure 4.3 below, showing a combined dataset with no blending distance. There is a marked 'edge' visible at the join boundary between the two datasets, suggesting strong evidence for a datum shift.

Figure 4.2 Topographic survey vs. AW3D DSM disparity



Based on the above analysis, the wider DSM has been adjusted using the raster calculator tool within QGIS to account for the mean divergence of +1.49m and integrated with the site survey data using a blending distance of 50m to further smooth the transition between the two datasets. The resulting topography layer is shown in Figure 4.3, displaying the improved transition between the survey and wider DSM datasets.

Figure 4.3 Finalised topography dataset

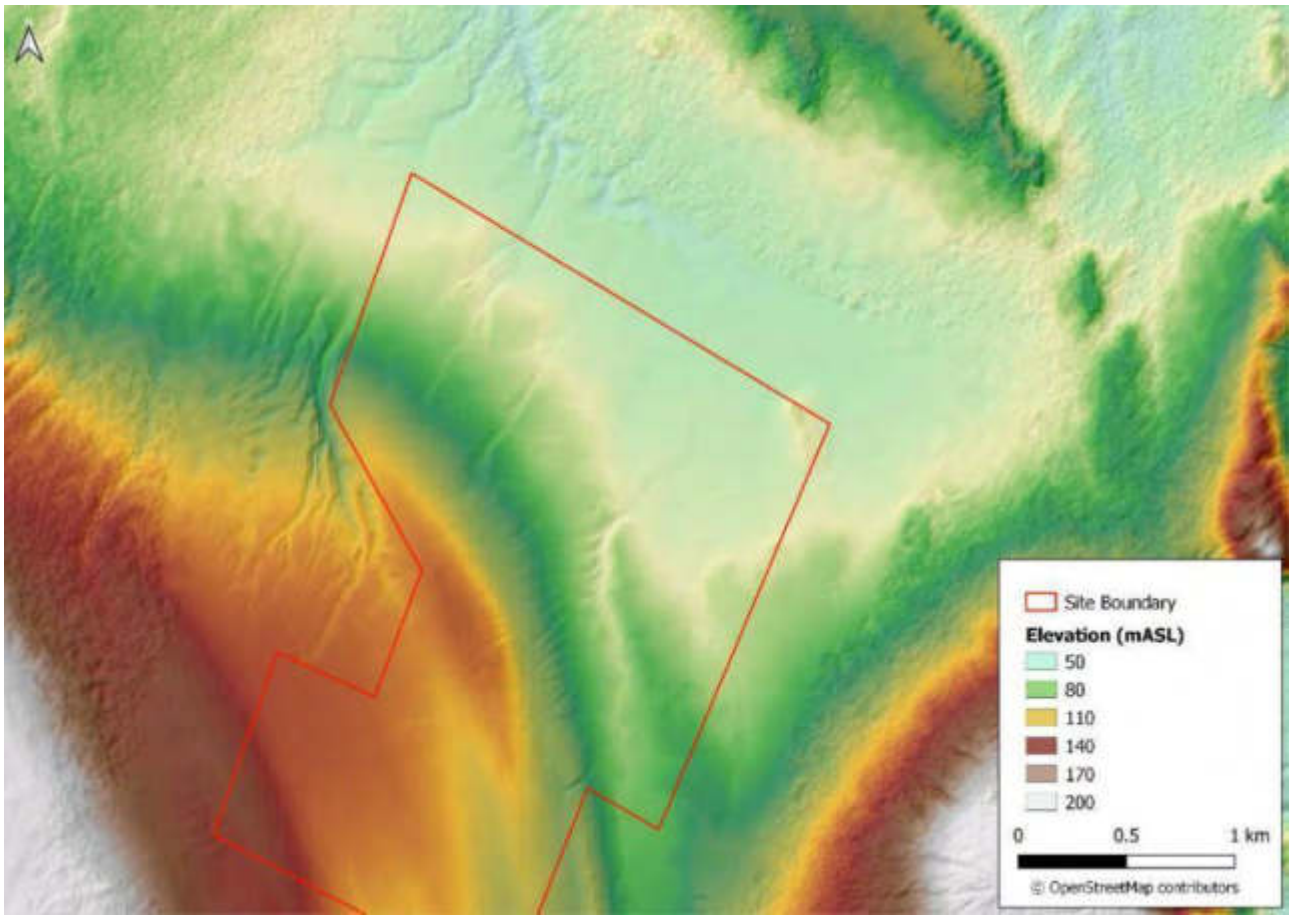
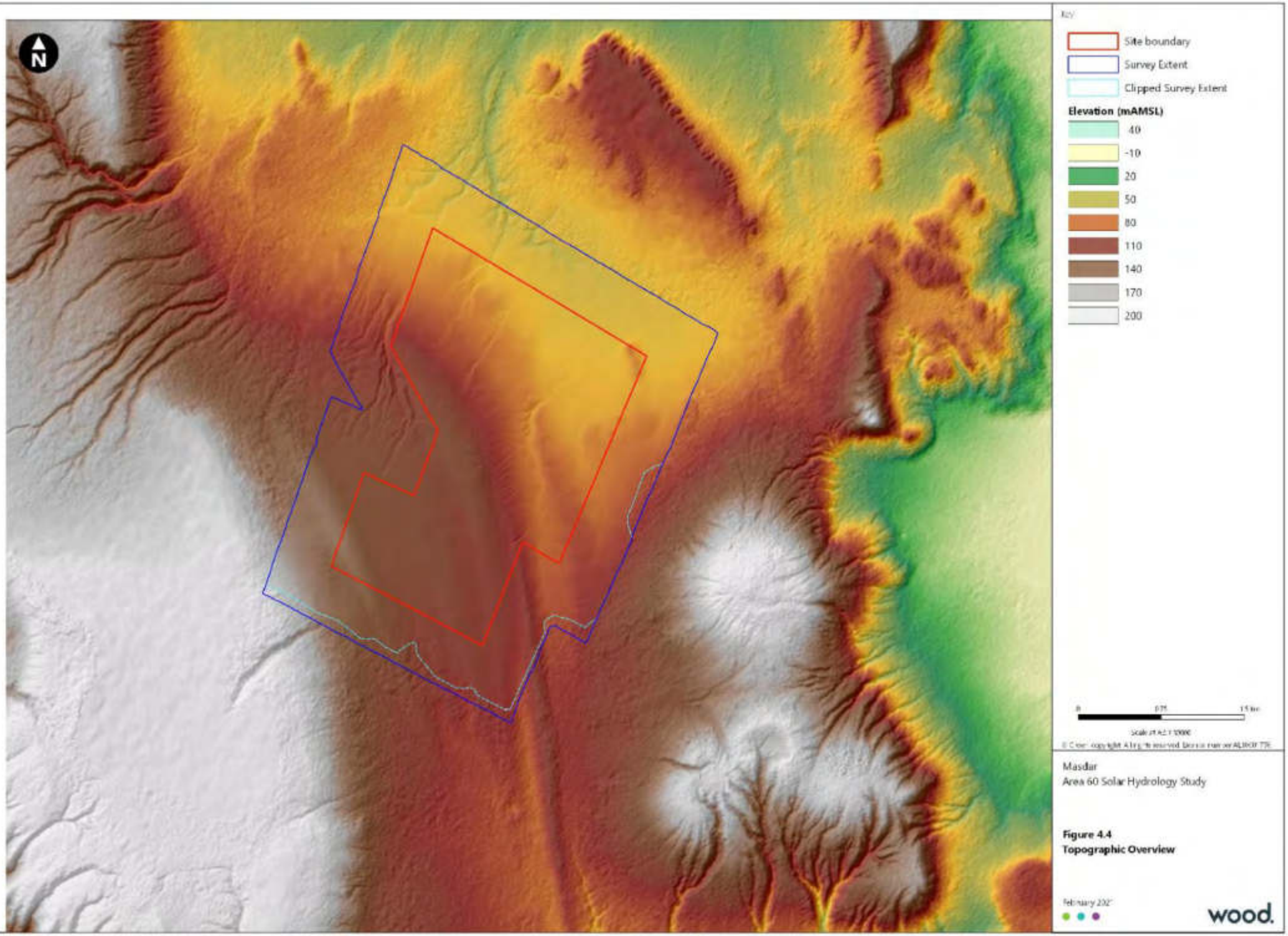


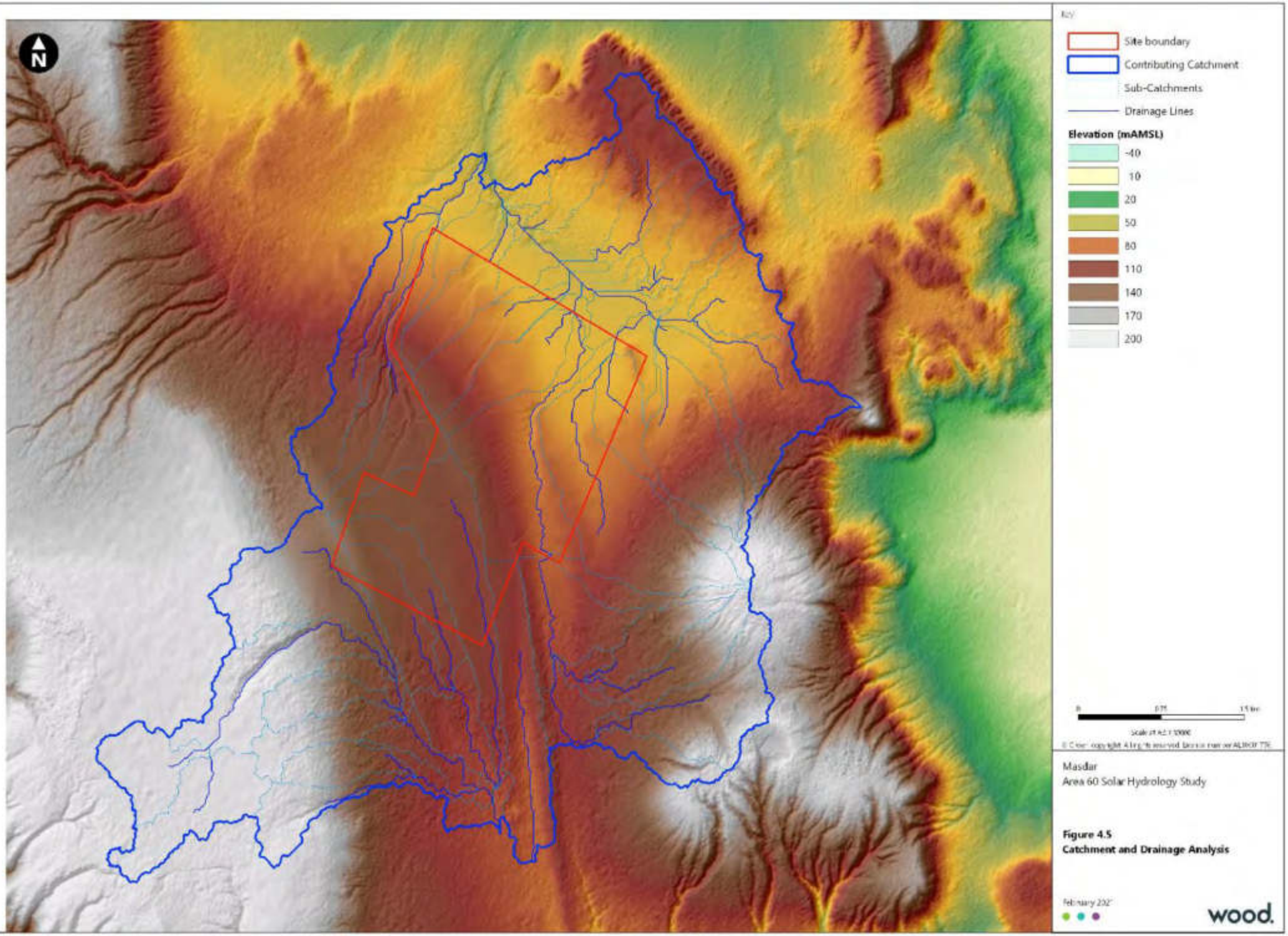
Figure 4.4 below shows the wider topographic overview of the finalised topographic dataset discussed above, including the extent of the topographic survey and refined extent. This formed the terrain model as a basis for the subsequent flood modelling (detailed in section 6.2) and preliminary topographic analysis to determine the runoff pathways and extent of contributing catchments, as described below.


N
Key
Site boundary
Survey Extent
Clipped Survey Extent
Elevation (mAMSL)
40
-10
20
50
80
110
140
170
200
Masdar
Area 60 Solar Hydrology Study
Figure 4.4
Topographic Overview
wood.

4.2 Catchment and drainage analysis

Detailed drainage and catchment analysis has been undertaken on the wider site topography to identify key runoff pathways and delineate the extent of the contributing rainfall-runoff catchments intersecting the site. This was carried out using ArcHydro tools within the ArcGIS software based on the integrated topography dataset described above. The combined topographic model was conditioned to fill sinks and depressions, allowing for the continuous drainage of water to be modelled. The analysis confirmed the location of the ephemeral watercourses identified from the aerial imagery analysis draining in a Northerly direction across the site. The extent of the contributing catchments and drainage pathways can be seen in Figure 4.5.

As part of the analysis, flow accumulation is analysed whereby each elevation grid cell is assigned a flow accumulation value relating to the number of cells upstream of that cell that drain into it. The contributing sub-catchments and drainage lines have been generated using the default flow accumulation value, representing 1% of the maximum recorded flow accumulation within the area of interest. Therefore, drainage lines are only initiated and defined whereby a cell has a flow accumulation value greater than 1% of the maximum recorded value within the catchment.

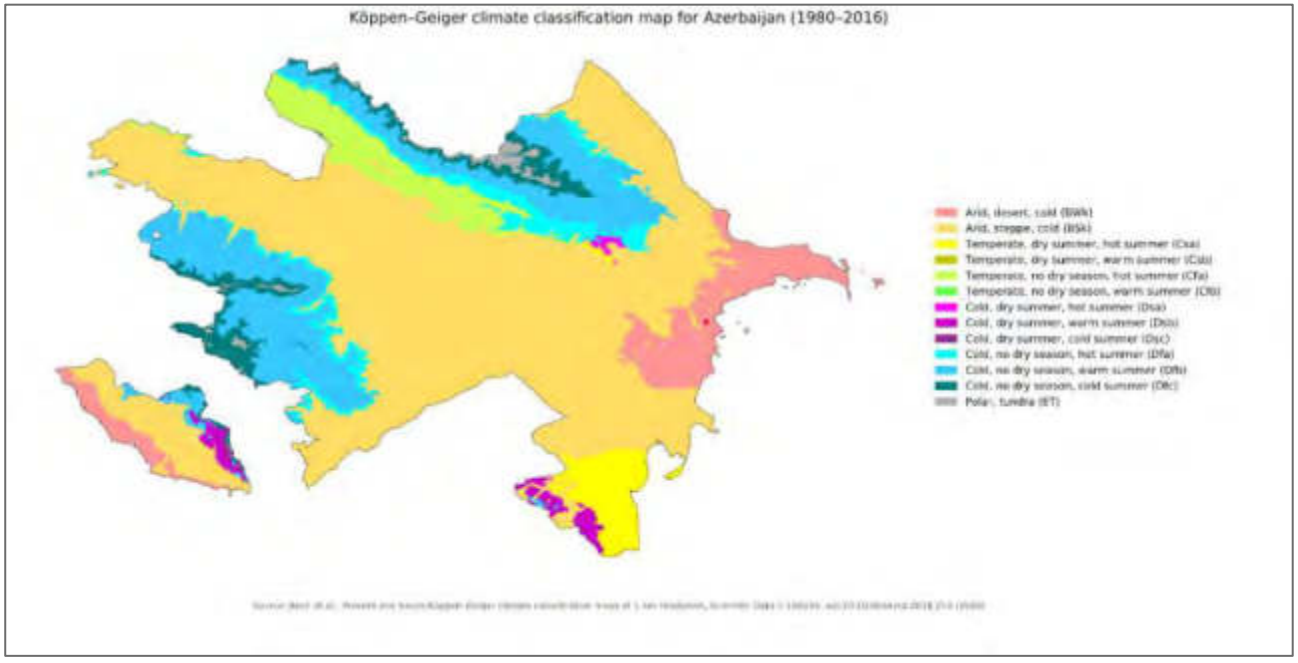

N
Key
Site boundary
Contributing Catchment
Sub-Catchments
Drainage Lines
Elevation (mAMSL)
-40
10
20
50
80
110
140
170
200
Masdar
Area 60 Solar Hydrology Study
Figure 4.5
Catchment and Drainage Analysis
wood.

5. Climate and rainfall data analysis

5.1 Climate

The climate of Azerbaijan is diverse and strongly dictated by the topographic landscape of the country, with influences from the Greater Caucasus, Lesser Caucasus, Talysh and North Iranian mountains. The koppen-geiger climate classification for Azerbaijan is shown in Figure 5.1 below, and the approximate Project site location indicated in red.

Figure 5.1 Azerbaijan Koppen-Geiger classification (Beck et al, 2018)



The central portion of the country in the Kur-Araz lowland between the Greater and Lesser Caucasus is largely cold and arid, with mean annual precipitation of less than 200 mm. The Greater and Lesser Caucasus bounding the country to the north and south have temperate and sub-tropical climates on the foothills and plains. The greatest annual precipitation is observed in these regions, with mean annual rates of up to 1600mm and greater.

5.2 Rainfall analysis

Rainfall analysis has been carried out to generate Intensity Duration Frequency (IDF) and Depth Duration Frequency (DDF) curves which are required to estimate rainfall depths for various event durations and frequencies. The definition of design events for further analysis such as surface runoff rates, attenuation volume requirements and the design of drainage components require the data from the IDF curve. This analysis has been carried out for the provision of a hydrology study for Area 60 solar project, located 60 km south-west of Baku, Azerbaijan.

The approach adopted here uses observed daily data from Alat rain gauge station, considered to be representative of the Site. Maximum daily rainfall depths for events up to 0.001% AEP will be calculated from extreme value analysis for daily rainfall, assuming a suitable statistical distribution for the rainfall.

The IDF generated will be used to estimate various duration rainfall hyetographs to inform hydraulic modelling that will be carried out for flood risk and drainage assessments. The total maximum 24-hour rainfall depths will be reported for various return periods and total rainfall hyetographs will be reported for durations 0.5-hour, 1-hour, 3-hour, 6-hour and 12-hours for the 1% AEP event.

Data used

Daily rainfall data for 84 years (from 1936 to 2019) were used for the rainfall analysis. Publicly available global data from NOAA's National Centers for Environmental Information (NCEI) were downloaded for period 1936 to 1991. A comparative study on the daily cumulative rainfall depths and annual mean rainfall depths were carried out for five following rain gauge stations around the Project site:

1. Alat;
2. Baku;
3. Gazimammad;
4. Saljny; and
5. Neftchala.

The location of the rain gauge stations is presented in Figure 5.2. The distance and elevation of the rain gauge stations from the Project site were also taken into consideration and are presented in Table 5.1.

Figure 5.2 NOAA rainfall stations

Table 5.1 Elevation and distance of RG stations relative to the Area 60 Project site

RG Station:	Project site	Alat	Baku	Gazimammad	Saljny	Neftchala
Elevation, m (AMSLl)*	117	-16	47	-5	-20	-24
Station distance from site, km	-	8	56	37	61	71
Distance from Caspian Sea, km	6	2	5	40	32	5

* As an inland sea, the Caspian Sea has a typical surface level of around -28m relative to AMSL.

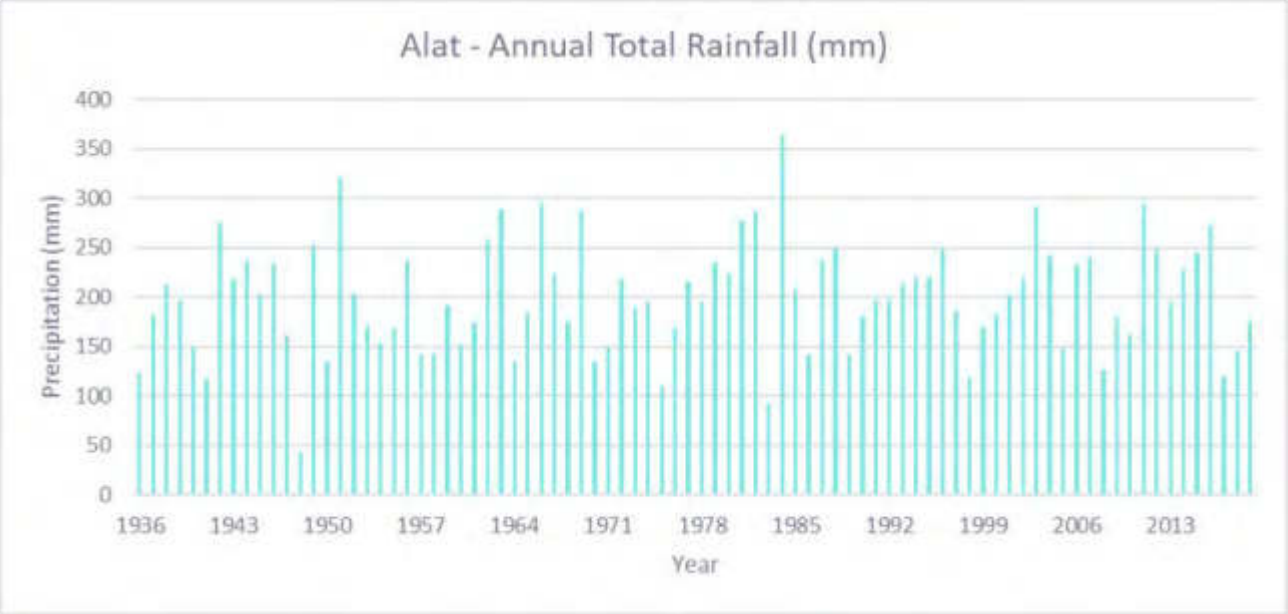
Considering available data period and the proximity from the Project site, Alat was chosen as the most representative rain gauge site. Therefore, further rainfall data from Alat rain gauge station was purchased from the National Hydrological Service Azerbaijan for period 1990 to 2019. These data were supplied as 12-hourly (1990 to 2015) and 3-hourly (2016 to 2019) cumulative rainfall depth data.

Methodology

Daily rainfall depth series was prepared for all five above rainfall gauge stations introduced above and a comparison was made of annual cumulative rainfall at Alat with that at the other four stations to check the consistency of available data. It was found that Alat gauge data was consistent and fit for use in an EVA. A decision was made to purchase recent years data (1990 to 2019) for Alat from the National Hydrological Service Azerbaijan to compare with the overlapping period (1990 and 1991) and add to the rainfall series. A corrected dataset for the years 1990 and 1991 was then provided to Wood as the data for these two compared years were found to be erroneous. All other year rainfall data was considered to be correct.

Some missing daily data for the Alat gauge were filled with the help of available other station data using the Normal Precipitation Ratio method. The Normal Precipitation Ratio method uses long term annual average rainfall from the surrounding station and proportionately estimating the rainfall for the storm. Thus, a daily series for entire period (1936 to 2019) was prepared and taken further for the EVA analysis and then for IDF curve generation, as shown in Figure 5.3 below.

Figure 5.3 Alat annual total rainfall



Rainfall EVA analysis

Annual maximum rainfall series from the daily cumulative rainfall depths (mm) were prepared to carry out the EVA analysis as shown in Table 5.2 below.

Table 5.2 Alat station AMAX from for daily cumulative rainfall

Year	AMAX (mm)	Year	AMAX (mm)
1936	16.00	**1978**	27.10
1937	25.40	**1979**	25.70
1938	28.80	**1980**	31.90
1939	16.20	**1981**	25.70
1940	15.20	**1982**	29.30
1941	22.30	**1983**	19.60
1942	29.50	**1984**	26.70
1943	19.80	**1985**	19.90
1944	38.10	**1986**	16.00
1945	39.50	**1987**	43.00
1946	34.50	**1988**	30.30
1947	51.40	**1989**	19.20
1948	6.00	**1990**	17.70
1949	38.70	**1991**	21.10
1950	22.60	**1992**	25.70
1951	18.90	**1993**	16.20
1952	25.50	**1994**	13.20
1953	11.20	**1995**	24.40
1954	20.60	**1996**	30.20
1955	27.40	**1997**	20.00
1956	33.70	**1998**	9.60
1957	17.10	**1999**	38.20
1958	23.30	**2000**	17.00
1959	14.20	**2001**	18.10
1960	23.90	**2002**	18.80
1961	31.90	**2003**	30.20

Year	AMAX (mm)	Year	AMAX (mm)
1962	22.10	**2004**	22.20
1963	46.30	**2005**	19.00
1964	14.70	**2006**	24.20
1965	14.00	**2007**	30.70
1966	56.99	**2008**	23.70
1967	15.70	**2009**	32.00
1968	18.02	**2010**	20.20
1969	15.19	**2011**	18.40
1970	22.27	**2012**	27.20
1971	9.01	**2013**	19.70
1972	15.56	**2014**	30.40
1973	16.83	**2015**	25.20
1974	32.39	**2016**	21.90
1975	10.11	**2017**	16.00
1976	18.19	**2018**	10.20
1977	32.80	**2019**	10.20
Total years		84 years	
Average annual daily maximum		23.55 mm	

The EVA analysis was carried out assuming a Gumbel distribution with a method of moments (MoM) estimator. Growth factors and corresponding rainfall depths (mm) were derived from the EVA of the Annual Maximum (AMAX) rainfall cumulation series, as shown in Table 5.3 below. The result of the EVA was subsequently taken forward to generate the IDF curve.

Table 5.3 Growth factors and Rainfall depths

AEP	Growth Factor	Rainfall depth, mm
50%	0.934	22.0
20%	1.288	30.3
10%	1.523	35.9
4%	1.819	42.8
2%	2.039	48.0
1%	2.257	53.2
0.5%	2.475	58.3
0.002%	2.762	65.0
0.001%	2.978	70.1
0.0001%	3.698	87.1

IDF curves generation

IDF curves are the intensity of rainfall (usually in mm/hr) curves for a range of storm durations and for a range of return periods. The 24-hour maximum rainfall depths determined from the EVA analysis have been used to derive these curves. In this analysis, the IDF curves were produced using Modified-Temez (Zapata-Sierra et al, 2009) method. The parameters have been manually adjusted so as to match 24-hour (i.e. daily) rainfall intensity derived from the statistical EVA analysis. This manual adjustment of parameters is not free from uncertainties that may lead to underestimate and overestimate of rainfalls for durations other than 24-hour values. Therefore, a check with 12-hour rainfall depth for 10%, 4%, 2%, and 1% AEP events, derived from the 12-hour maximum rainfall series, were made to understand the uncertainties. A comparison has been presented in Table 5.4 below.

Table 5.4 Comparison for 24-hour and 12-hour maximum depth (mm).

AEP	24-hour (Parameterisation) EVA, IDF	12-hour (Check) EVA, IDF
10%	35.9, 35.9	27.8, 27.6
4%	42.8, 42.9	31.9, 32.9
2%	48.0, 48.1	34.9, 36.9
1%	53.2, 53.2	37.9, 40.8

The discrepancy for the 12-hour depth check shows that the results are on the conservative side, so the parameterisation to match 24-hour rainfall depth was considered to be appropriate and the IDF curve generated. The finalised rainfall DDF and IDF values are shown in Table 5.5 and Table 5.6.

Table 5.5 Finalised rainfall DDF values (mm)

Rainfall depth (mm)			**AEP**	
Duration (hr)	**10%**	**4%**	**2%**	**1%**
0.25	6.29	7.52	8.43	9.33
0.50	8.20	9.79	10.98	12.15
1	10.68	12.76	14.30	15.83
2	13.91	16.62	18.63	20.62
3	16.24	19.40	21.74	24.07
6	21.15	25.27	28.32	31.36
12	27.56	32.92	36.90	40.85
24	35.90	42.89	48.07	53.21
48	46.77	55.87	62.62	69.32
72	54.59	65.22	73.10	80.92

Table 5.6 Finalised rainfall IDF values (mm/hr)

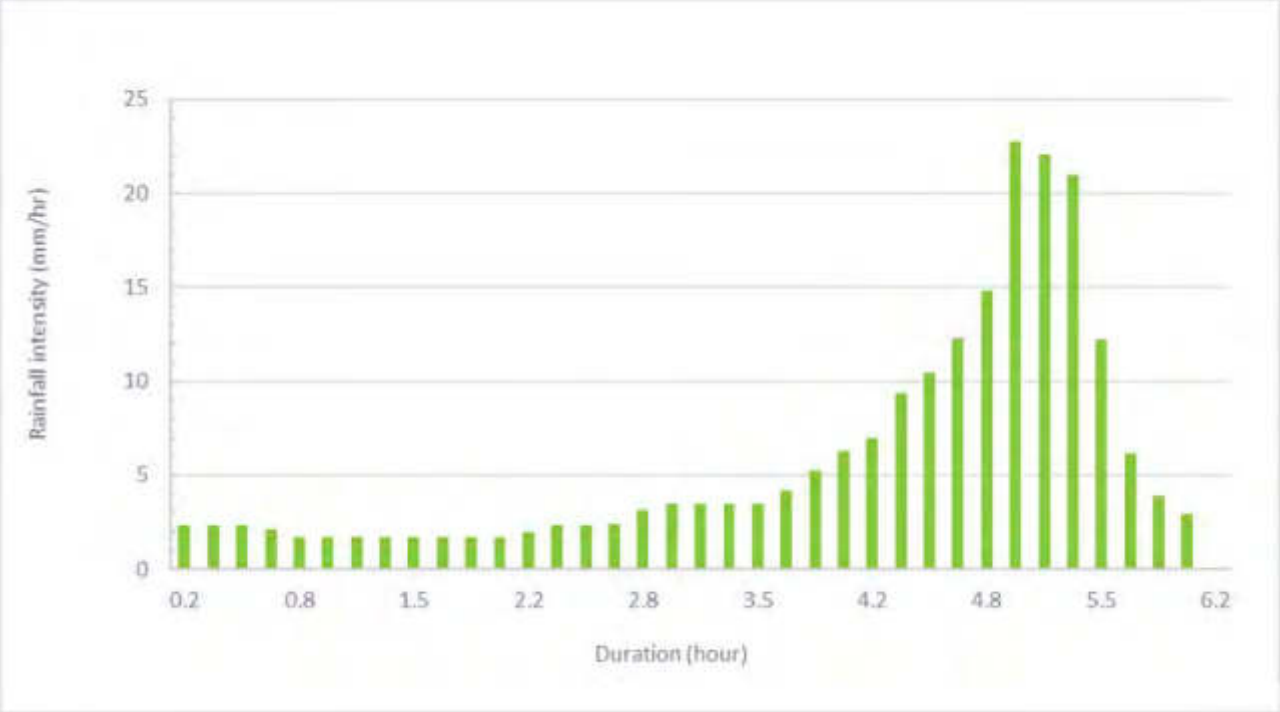
Rainfall intensity (mm/hr)	AEP			
Duration (hr)	**10%**	**4%**	**2%**	**1%**
0.25	25.170	30.068	33.701	37.308
0.50	16.395	19.585	21.952	24.301
1	10.679	12.757	14.298	15.829
2	6.956	8.309	9.313	10.310
3	5.413	6.466	7.248	8.023
6	3.526	4.212	4.721	5.226
12	2.297	2.743	3.075	3.404
24	1.496	1.787	2.003	2.217
48	0.974	1.164	1.305	1.444
72	0.758	0.906	1.015	1.124

5.3 Rainfall Hyetographs

Cumulative Rainfall Profile (CRP)

Rainfall hyetographs are the time distribution of total rainfall intensity over the rainfall event under consideration. Therefore, in order to model, cumulative rainfall needs to be converted to a suitable rainfall hyetograph. Among various rainfall profiles, a profile called Huff fourth quartile (Q4) profile (Huff, 1990) has been selected as an appropriate cumulative rainfall profile to distribute total maximum design rainfall depth over the event duration considered. The Huff Q4 profile means the maximum intensity lies in fourth quartile of the event duration. The Q4 profile has been chosen considering the conservative estimate it gives when peak runoff rates are to be calculated. Rainfall profiles for 0.5 hrs, 1 hr, 3 hr, 6 hr, and 12-hrs have been generated so that they can be applied directly to the pluvial hydraulic modelling. The profile for a 6-hour 1% AEP event as generated using the Huff Q4 profile is shown in Figure 5.4.

Figure 5.4 Huff Q4 rainfall profile for 6-hour 1% AEP event

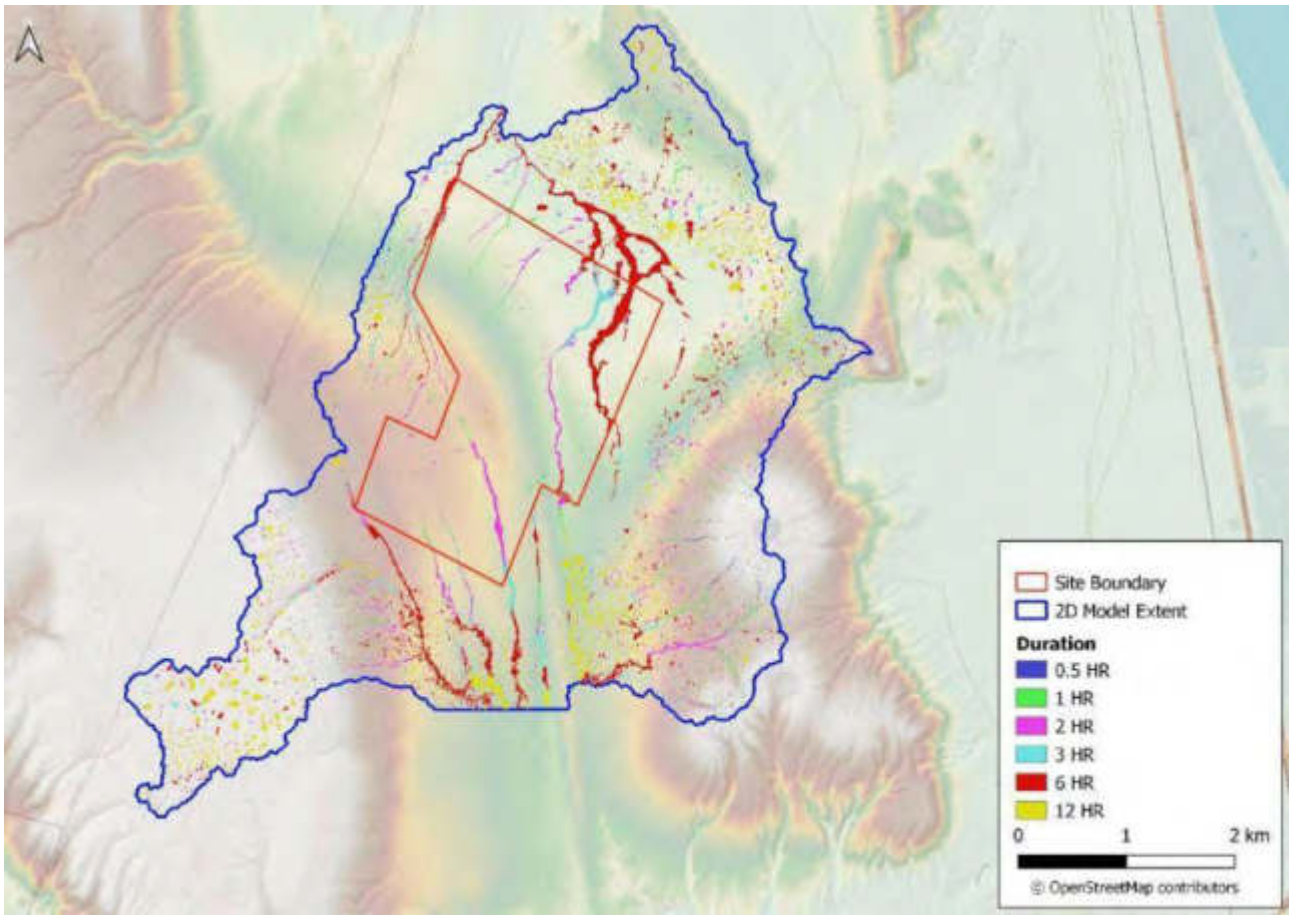


Critical duration

A series of critical duration runs were carried out using the InfoWorks ICM model, described in Section 6, using input hyetographs based on the Huff method for the 1% AEP rainfall event for the following durations: 0.5 hrs, 1 hr, 2 hrs, 3hrs, 6 hrs and 12 hrs.

The results of this assessment have been expressed in terms of a combined maximum flood depth grid across the model domain in Figure 5.5. Flood depth results have been filtered to remove depths of <0.05m, focusing on the main surface water flowpaths only and avoiding shallow ponded water. The grid indicates the storm duration responsible for producing the peak flood depth spatially at each model element. The grid indicates that there is no single storm duration which gives rise to the greatest peak depth across the model domain.

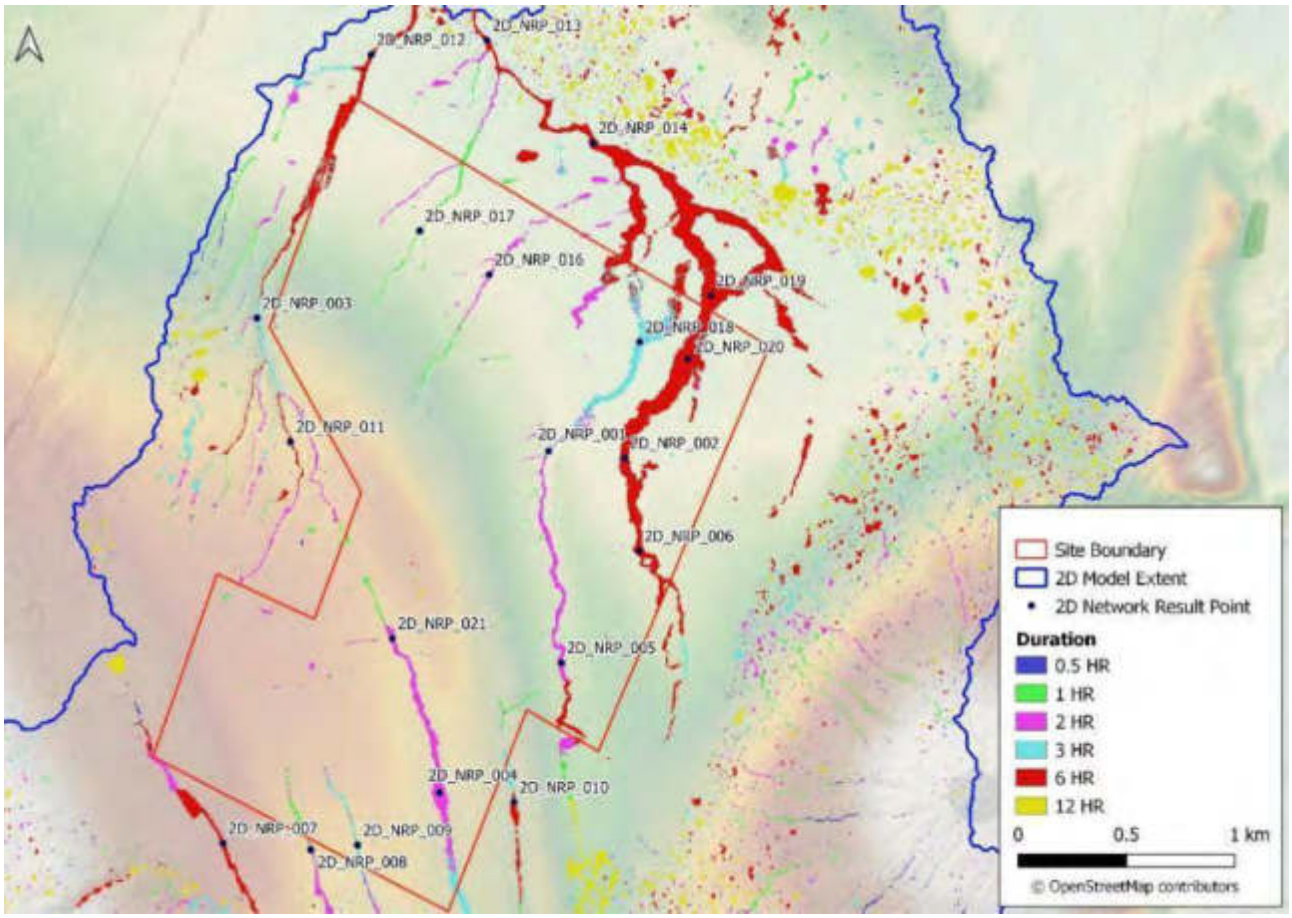
Figure 5.5 Spatial distribution of the critical duration - overview



The upstream portions of the surface water flowpaths and within the Site itself typically report peak depths associated with the shorter duration 1-hour and 2-hour events, whilst the downstream portions report peak depths typically associated with the longer duration 6-hour and 12-hour events.

A zoomed-in overview of the Site and 2D network result points is shown in Figure 5.6.

Figure 5.6 Critical duration assessment and network result points



Peak flood depth results at each of the network result points across the main surface water flowpaths above have been reported in Figure 5.7 below.

Table 5.7 Peak flood depths at 2D network results points

	Duration					
Results Point	**0.5 HR**	**1 HR**	**2 HR**	**3 HR**	**6 HR**	**12 HR**
2D_NRP_001	0.56	0.65	0.71	0.71	0.70	0.62
2D_NRP_002	0.03	0.05	0.07	0.07	0.08	0.07
2D_NRP_003	0.33	0.41	0.44	0.45	0.45	0.36
2D_NRP_004	0.08	0.09	0.10	0.10	0.10	0.08
2D_NRP_005	0.07	0.09	0.11	0.10	0.10	0.08
2D_NRP_006	0.32	0.37	0.41	0.44	0.46	0.42
2D_NRP_007	0.27	0.32	0.35	0.36	0.37	0.33

	Duration					
2D_NRP_008	0.07	0.08	0.08	0.08	0.07	0.05
2D_NRP_009	0.22	0.24	0.25	0.25	0.25	0.23
2D_NRP_010	0.25	0.33	0.38	0.40	0.43	0.42
2D_NRP_011	0.47	0.50	0.54	0.54	0.55	0.51
2D_NRP_012	0.26	0.32	0.37	0.38	0.38	0.32
2D_NRP_013	0.26	0.35	0.45	0.50	0.62	0.54
2D_NRP_014	0.46	0.56	0.65	0.69	0.76	0.70
2D_NRP_016	0.04	0.05	0.05	0.05	0.05	0.03
2D_NRP_017	0.08	0.09	0.09	0.08	0.07	0.05
2D_NRP_018	0.20	0.23	0.25	0.25	0.25	0.22
2D_NRP_019	0.05	0.07	0.09	0.09	0.11	0.10
2D_NRP_020	0.03	0.05	0.06	0.07	0.08	0.07
2D_NRP_021	0.08	0.09	0.10	0.10	0.10	0.07

Note: Network results point '2D_NRP_015' has been omitted. Results are reported to 2 decimal places, and highlighted results indicate peak depths.

The result points indicate that there is typically only minor variation (<0.02m) in the peak depths reported within the Project site between the 2, 3 and 6-hour duration storms.

The 2-hour storm produces the greatest flood depths across the majority of the flowpaths and result points within the Site itself. Where this is the case the magnitude of difference from the 3-hour duration peak depths is typically negligible (<0.01m).

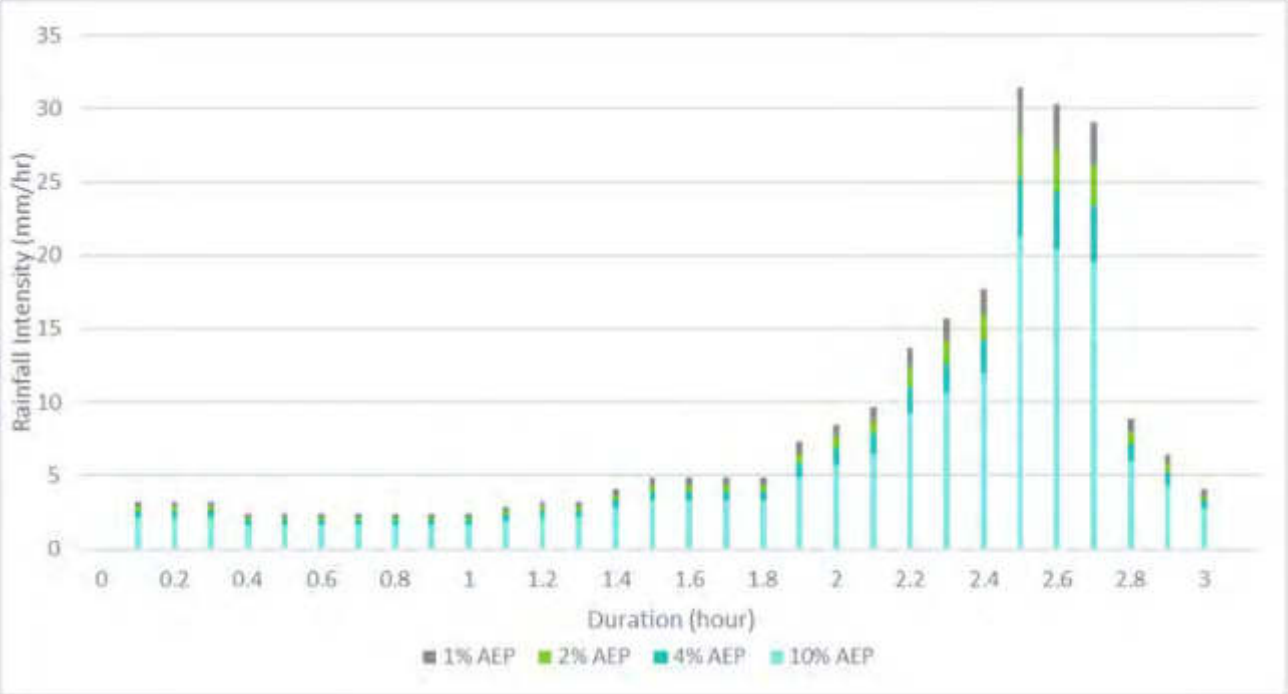
At result points 002, 006 and 020 the 6-hour duration storm is responsible for the peak depths, with a maximum divergence from the 2-hour and 3-hour storm durations observed at result point 006. Along this flowpath, the magnitude of divergence from the peak flood depth is greatest for the 2-hour duration.

Based on this analysis, the 3-hour duration storm is considered to be the critical duration to the Site. Although Table 5.7 shows that the 3-hour storm is not widespread as the critical duration event, it represents a suitable compromise position between the 2-hour and 6-hour storms.

Design Hyetographs

The combined 3-hour duration design hyetographs are shown in Figure 5.7 below, and the individual hyetographs are provided in Appendix A.

Figure 5.7 Combined 3-hour duration design hyetographs

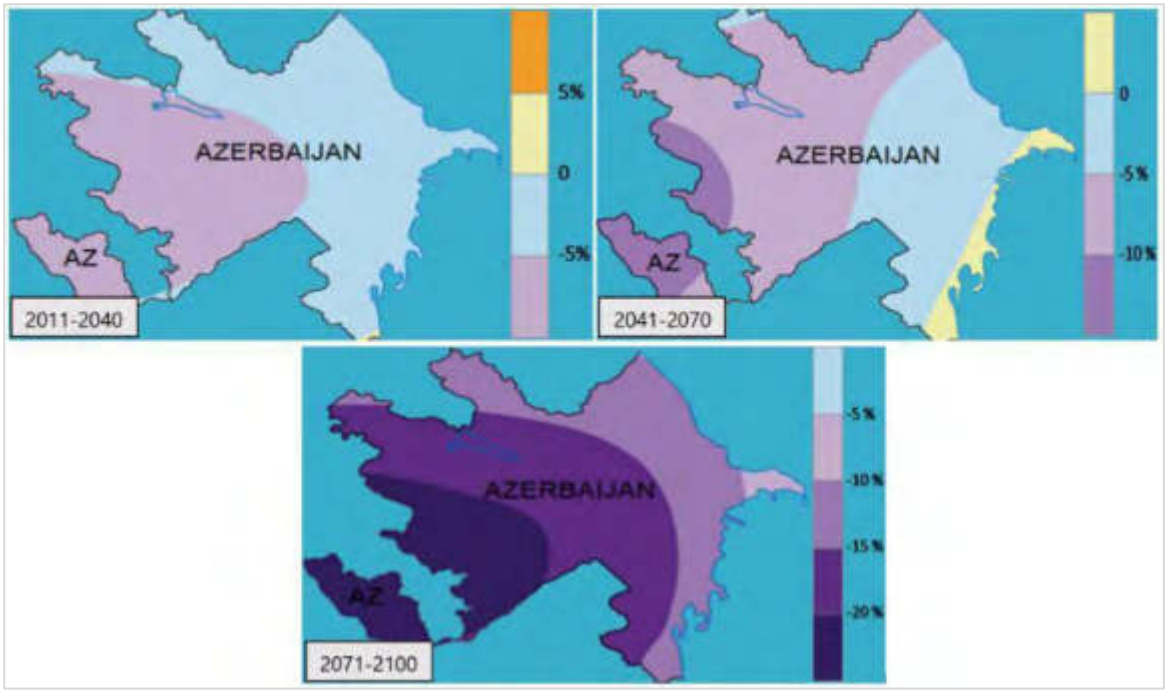


5.4 Climate change

Climate change projections on the impact to rainfall regime in Azerbaijan are typically limited. However, the available research suggests that Azerbaijan will experience reduced annual river runoff and peak flood discharge due to the influence of regional climate change (MENR 2015; Makhmudov 2016).

Figure 5.8 below displays HADCM3 annual total rainfall model projections for the three epochs 2011 to 2040, 2041 to 2017, and 2071 to2100. It is anticipated that annual rainfall totals will reduce by up to 15% within the wider region of the proposed Site in Eastern Azerbaijan by 2100 (MENR 2015).

Figure 5.8 HADCM3 annual rainfall climate change projections: 2011-2040; 2041-2070; 2071-2100 (MENR 2015)



Given the limited research and uncertainty on the impacts of climate change to the future rainfall regime of Azerbaijan, both in terms of annual change and impacts to rainfall intensity, no allowance has been made for climate change in the flood modelling described in Section 6.

6. Flood modelling

6.1 Overview of approach

Flooding can be caused by several different sources, including:

- Rivers and watercourses;
- Groundwater emergence;
- Artificial sources such as reservoirs, tanks, culvers, pipelines and sewers;
- Runoff caused by heavy rainfall.

As noted in Section 5, there are no permanent watercourses within the Project site boundary. The analysis of the topography and underlying geology suggest that the risk of groundwater flooding is low. There is no evidence from photographs of the Project site, nor from aerial photography of any significant artificial sources of flood risk. Whilst the Project site survey data and analysis of satellite imagery has identified several impounding irrigation ponds, these are not considered to pose a significant risk to the Project in the event of a failure given their relative size.

As such, the only significant source of flood risk to the site is considered to be pluvial, from runoff arising from extreme rainfall. This is evidenced by the ephemeral channels draining to the north in the northern and eastern portions of the site evident from aerial photography.

Due to the nature of risk to the site, the modelling approach focuses on pluvial flood risk through the development of a 2D direct rainfall model. The model simulates the runoff generation process by applying design storm hyetographs to a 2D surface, including properties such as surface roughness and runoff coefficients, to route the resulting runoff over the surface of the site. The model development process is described in Section 6.2 below.

A range of scenarios of differing probabilities of occurrence were selected for assessment through the hydraulic model. These consist of the following AEP storm events:

- 1 in 10 years (10% AEP);
- 1 in 25 years (4% AEP);
- 1 in 50 years (2% AEP); and
- 1 in 100 years (1% AEP).

6.2 Hydraulic model build

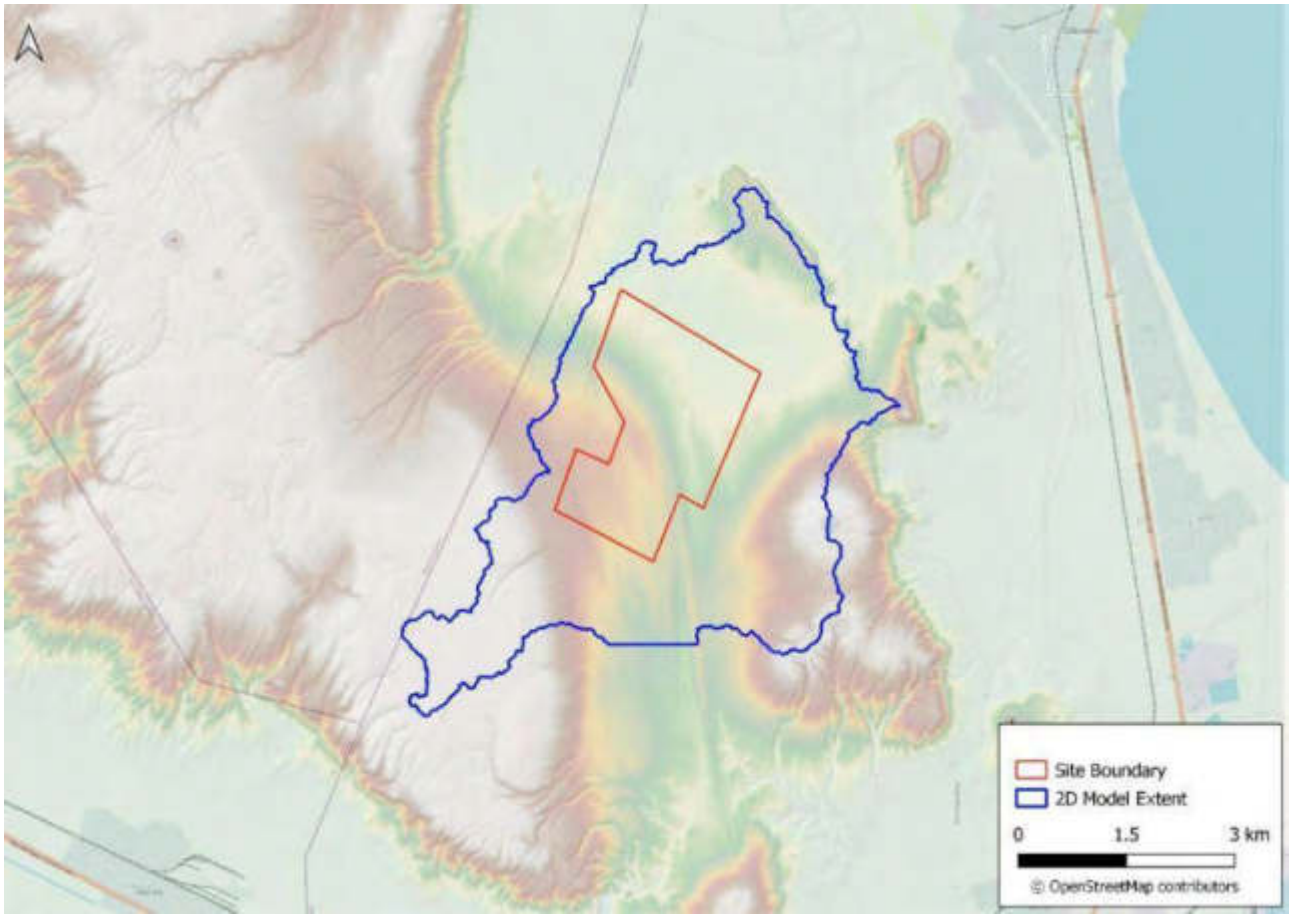
Software

Innvoyze's InfoWorks ICM (Integrated Catchment Model) hydraulic modelling package (version 10.0.6, released May 2019, Innovyze, 2019) was selected as the platform for developing the model. InfoWorks ICM allows detailed representation of flood flow pathways across a two-dimensional (2D) surface arising from direct rainfall, and offers considerable flexibility in the representation of the land surface, in the input hyetograph and surface properties.

Model domain

The 2D model represents the land surface as an irregular triangular mesh. Each triangle is assigned an elevation, along with a range of other properties, forming a surface over which flood water can flow. Displayed in Figure 6.1, the extent of the 2D model domain has been dictated by the topographical catchment analysis defined in section 4.2, including all contributing catchments that intersect the site. The model extent has been simplified where main drainage pathways intersect the boundary, to ensure the 2D domain sits perpendicular to the direction of flow.

Figure 6.1 2D model domain



The use of an irregular mesh allows the addition of more detail and complexity in locations where this is required – a feature that has been used to add detailed representation of features considered to be important in defining flood flow. The size and formation of the individual triangles making up the model domain are dictated by a number of model objects which are described below:

- The **2D Zone** defines the model domain and general rules that the mesh formation needs to adhere to such as maximum triangle size, minimum element area, and maximum height variation allowed across a triangle. The overall extent of the site model, as defined by the 2D zone is shown in Figure 6.1.
- **Mesh Level Zones** are used to dictate the formation of the triangles to allow better definition of specific topographical features. They can also be used to adjust the element elevation.
- **Roughness Zones** are used to define areas with specific surface roughness characteristics, such as roads, buildings and trees.

- **Infiltration Zones** are used to define the underlying runoff coefficient, based upon the slope, soil type, and land-cover described in Section 6.3 and shown in Figure 6.3.

The parameterisation of these different model elements for the site are described in the following sub-sections.

Terrain model

The terrain model underlying the ICM flood model was based on the creation of a TIN (Triangular Irregular Network), which interpolates a surface using the combined terrain model, consisting of the 2.5m resolution topographic model derived from local topographical survey for the Project site itself, and the 2.5m AW3D DSM for surrounding areas.

Surface roughness

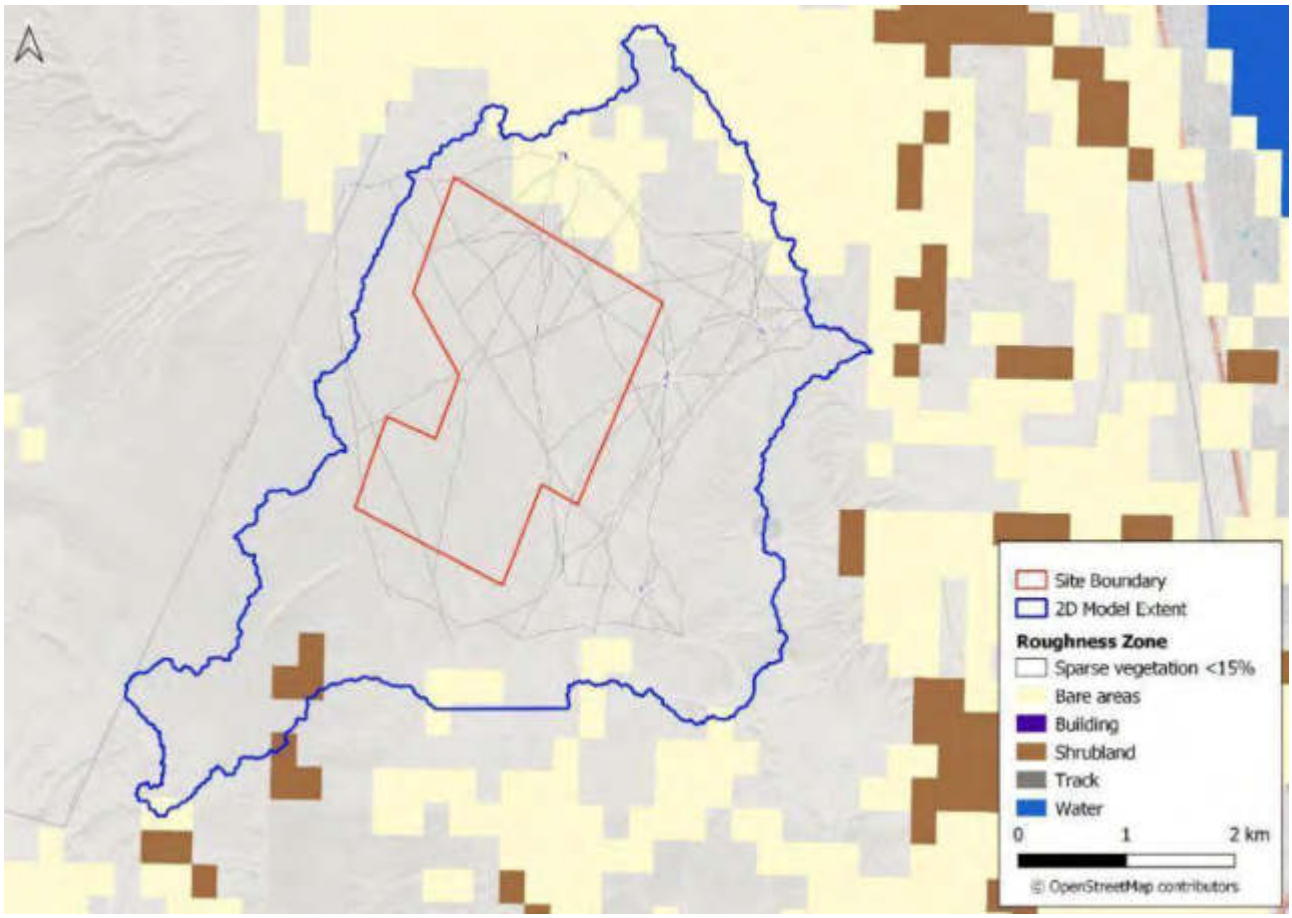
A surface roughness coefficient (referred to as Manning's n) is used in ICM to express the resistance of the land surface to overland flow. A land-use layer was created in ArcMap using a combination of data from the ESACCI-LC global land-use cover, site survey data, and satellite imagery. The ESACCI-LC land-cover classifications have been simplified to the respective roughness zones in Table 6.1. The ground survey identified several minor surface water bodies and a minor settlement at the eastern Project site boundary, in addition to a cemetery to the south of the Project site boundary. The land-cover and survey data has been further augmented by digitising main footpaths and tracks identified via satellite imagery in the vicinity of the Project site boundary, and additional building features outside of the survey coverage.

Table 6.1 Roughness coefficients for land-use types

ESACCI-LC land cover	**Simplified land cover**	**Roughness coefficient (Manning's n)**
Water bodies	Water	0.04
Sparse vegetation (tree shrub herbaceous cover) <15% Sparse herbaceous cover <15%	Sparse vegetation <15%	0.025
Shrubland Shrubland deciduous	Shrubland	0.05
Consolidated bare areas Bare areas	Bare areas	0.02
Urban	Urban	0.017
Satellite/Survey land cover		**Roughness coefficient (Manning's n)**
Buildings		0.3
Tracks		0.02
Water		0.04

The resulting roughness zones are shown in Figure 6.2. The predominant land-cover within the 2D Zone is 'Sparse vegetation <15%', and this is not included in the roughness zones below since the associated roughness value has been assigned as the default value within the 2D Zone for simplification.

Figure 6.2 Model Roughness Zones



6.3 Runoff coefficients

A runoff coefficient expresses the proportion of incident rainfall which is converted to surface runoff. This is dependent on a number of factors including soil texture, vegetation cover, slope and antecedent soil moisture condition.

Several methods have been considered, namely the Soil Conservation Service Curve Number (SCS-CN) method (Natural Resources Conservation Service, 2004), and a rainfall runoff coefficient relating to land cover, soil texture and slope following the 'WetSpa' methodology outlined in Liu and Smedt (2004).

The SCS applies an empirical equation to estimate effective rainfall and losses to infiltration through specifying a Curve Number (CN) to represent the land cover/land use type and soil texture. The SCS method produces a net rainfall hyetograph by accounting for the infiltration losses determined by the CN. A runoff coefficient grid expressing the spatial variability in this parameter across the model domain has been generated based on land cover type and soil texture. Land cover data within the 2D model domain shown in Figure 3.3 has been simplified using a conservative approach and considered as bare areas across the entire model domain. This assumption is based on review of satellite imagery and site visit photographs, which suggest that sparse vegetation across the Project site is likely ephemeral, and therefore this assumption would be plausible and represent a reasonable worst-case scenario. Soil classes have been categorised using

the USDA soil textural triangle, characterising soil by their relative fractions of sand, silt, and clay, based on the ISRIC dataset detailed in Section 3.2. Two soil types are present across the model domain, clay loam and silty clay loam, which are both classified into the hydrological soil category D. The above analysis therefore provides a SCS-CN number of 94 across the model domain.

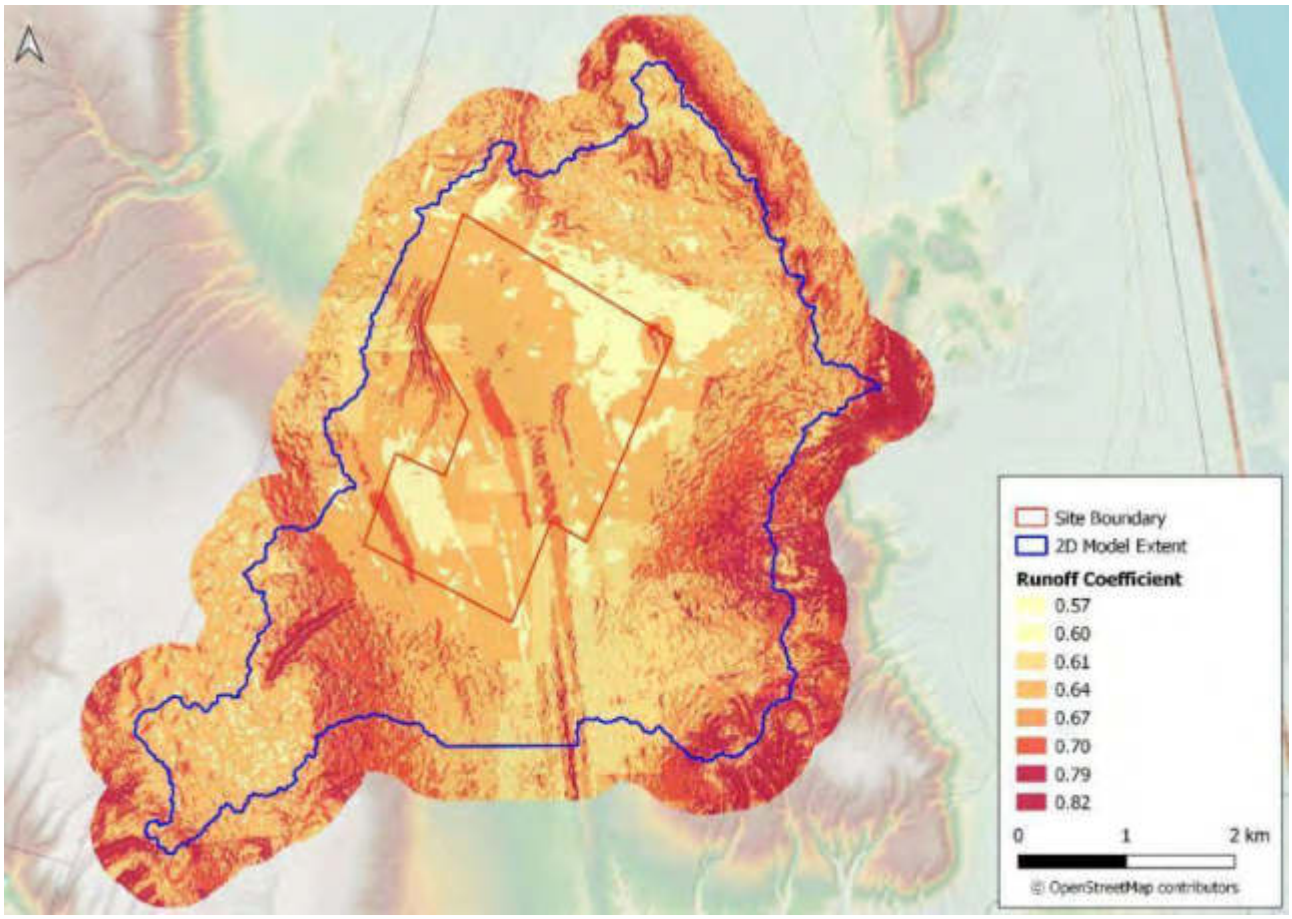
The WetSpa runoff coefficient methodology is similarly based on land cover and soil texture, though also incorporates the underlying slope, classified into four bands outlined in Table 6.2 below.

Table 6.2 WetSpa runoff coefficient methodology (Liu and De Smedt, 2004)

Land use	Slope (%)	Sand	Loamy sand	Sandy loam	Loam	Silt loam	Silt	Sandy clay loam	Clay loam	Silty clay loam	Sandy clay	Silty clay	Clay
Forest	<0,5	0.03	0.07	0.10	0.13	0.17	0.20	0.23	0.27	0.30	0.33	0.37	0.40
	0,5-5	0.07	0.11	0.14	0.17	0.21	0.24	0.27	0.31	0.34	0.37	0.41	0.44
	5-10	0.13	0.17	0.20	0.23	0.27	0.30	0.33	0.37	0.40	0.43	0.47	0.50
	>10	0.25	0.29	0.32	0.35	0.39	0.42	0.45	0.49	0.52	0.55	0.59	0.62
Grass	<0,5	0.13	0.17	0.20	0.23	0.27	0.30	0.33	0.37	0.40	0.43	0.47	0.50
	0,5-5	0.17	0.21	0.24	0.27	0.31	0.34	0.37	0.41	0.44	0.47	0.51	0.54
	5-10	0.23	0.27	0.30	0.33	0.37	0.40	0.43	0.47	0.50	0.53	0.57	0.60
	>10	0.35	0.39	0.42	0.45	0.49	0.52	0.55	0.59	0.62	0.65	0.69	0.72
Crop	<0,5	0.23	0.27	0.30	0.33	0.37	0.40	0.43	0.47	0.50	0.53	0.57	0.60
	0,5-5	0.27	0.31	0.34	0.37	0.41	0.44	0.47	0.51	0.54	0.57	0.61	0.64
	5-10	0.33	0.37	0.40	0.43	0.47	0.50	0.53	0.57	0.60	0.63	0.67	0.70
	>10	0.45	0.49	0.52	0.55	0.59	0.62	0.65	0.69	0.72	0.75	0.79	0.82
Bare soil	<0,5	0.33	0.37	0.40	0.43	0.47	0.50	0.53	0.57	0.60	0.63	0.67	0.70
	0,5-5	0.37	0.41	0.44	0.47	0.51	0.54	0.57	0.61	0.64	0.67	0.71	0.74
	5-10	0.43	0.47	0.50	0.53	0.57	0.60	0.63	0.67	0.70	0.73	0.77	0.80
	>10	0.55	0.59	0.62	0.65	0.69	0.72	0.75	0.79	0.82	0.85	0.89	0.92
IMP		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

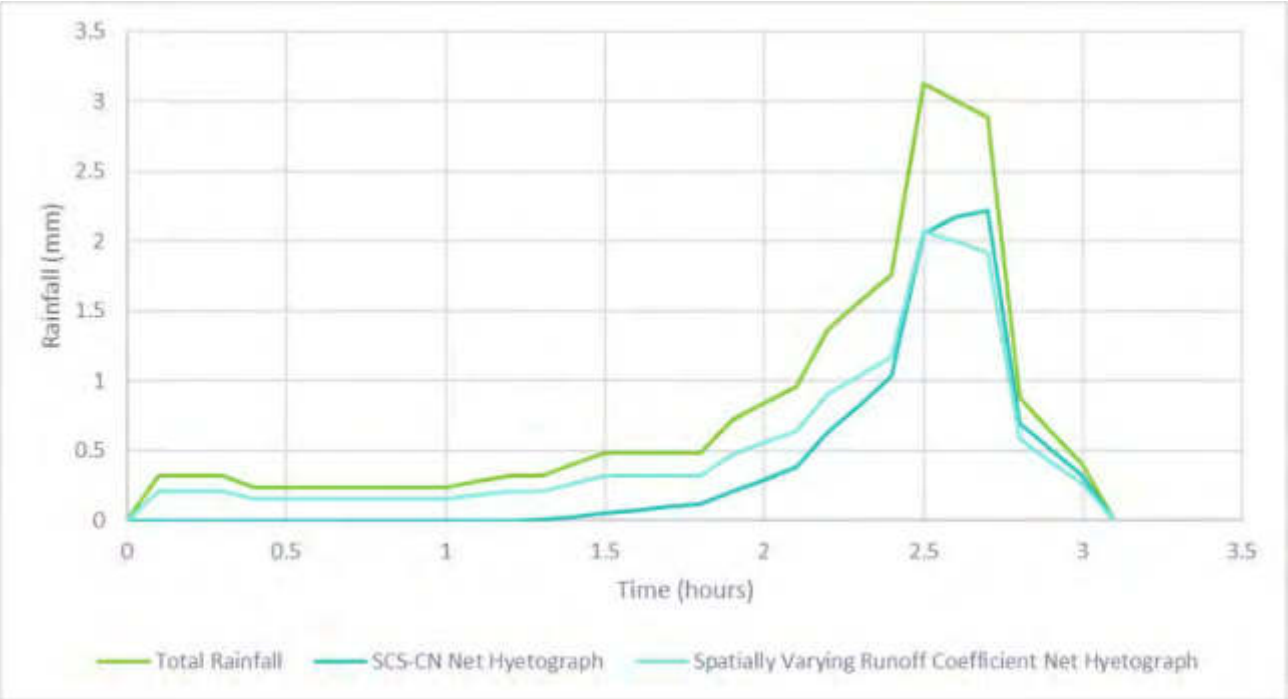
As in the SCS-CN technique, the land cover has been simplified to assume bare areas across the entire model domain applying a conservative approach. Slope has been analysed and classified based on the underlying merged topography layer detailed in Section 4.1. The resulting runoff coefficients vary between 0.57 and 0.82 across the model domain are shown in Figure 6.3 below.

Figure 6.3 WetSpa estimated runoff coefficients



The full hyetograph for the 3-hour duration 1% AEP event is compared to the net hyetograph produced by the SCS-CN method, and the 1% AEP net hyetograph produced assuming a runoff coefficient of 0.66 (representing the average runoff rate within the model domain produced by the WetSpa methodology described in Liu and Smedt, 2004) in Figure 6.4 below.

Figure 6.4 Comparison of net rainfall hyetographs produced by the SCS-CN and spatially varying runoff approaches



The two methodologies produce broadly similar net hyetographs. The SCS-CN approach accounts for greater initial losses, though produces a slightly greater peak rainfall intensity. However, whilst the method is widely accepted and applicable globally to provide runoff estimates, it is typically considered overly simplistic. The validity of the initial abstraction coefficient and ability of a single CN value to characterise the runoff response of a watershed correctly are widely scrutinised. For these reasons, the spatially varying runoff coefficient is considered a more appropriate representation for this study, with runoff rates varying between 0.57 and 0.82 dictated by the underlying slope, soil, and land-cover.

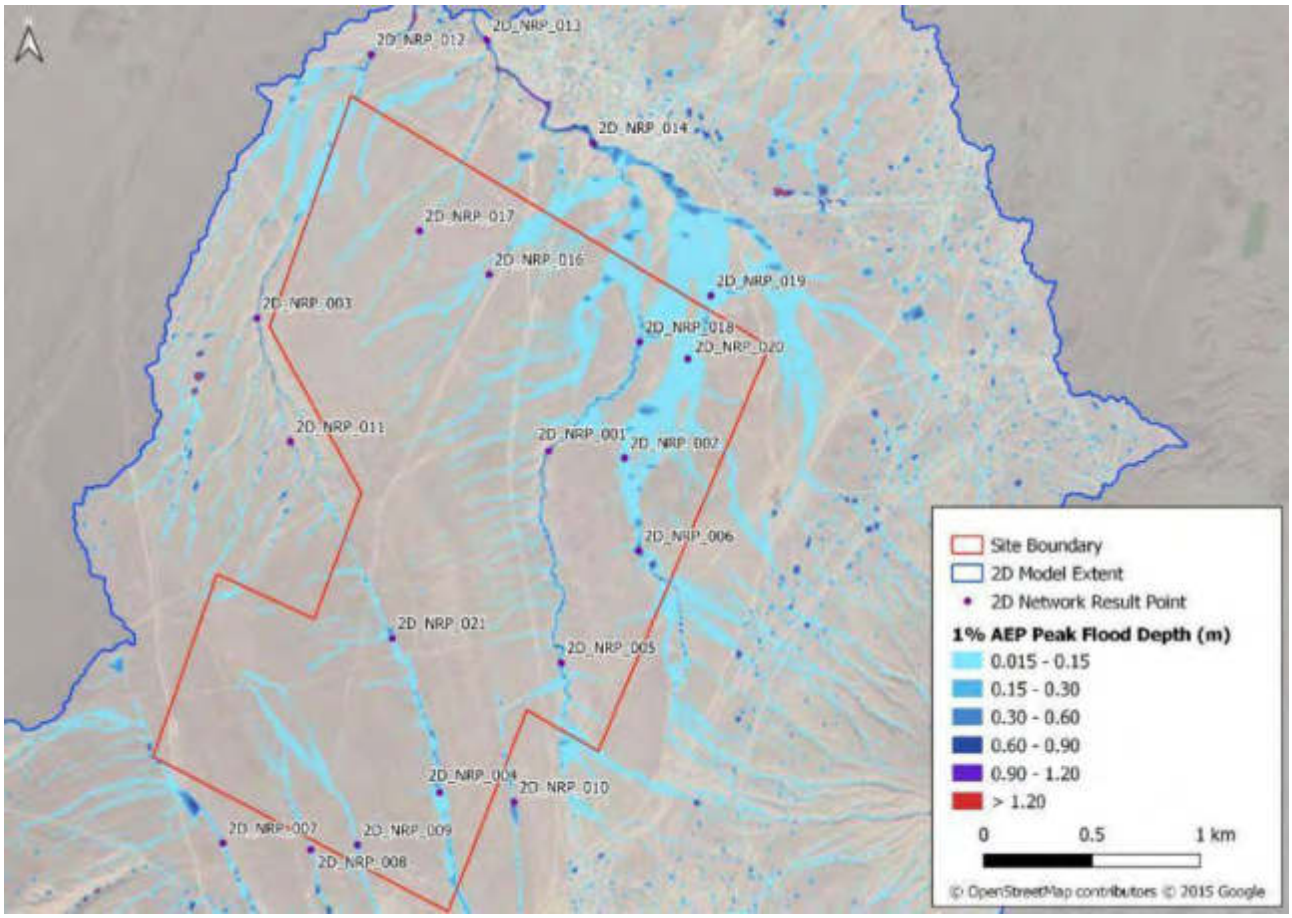
6.4 Model results summary

The results of the hydraulic modelling are presented in the following sub-sections, detailing the maximum flood depths and velocities for each of the design storm events considered: 10% AEP, 4% AEP, 2% AEP, and 1% AEP.

Flood depths

Modelled peak flood depths for the 1% AEP event at the Project site are shown in Figure 6.5, in addition to the 2D network result points. The flood depth results have been classified such that only flood depths of >0.015m are displayed. The full suite of flood depth results for all AEP events are displayed in Figure 6.5.

Figure 6.5 1% AEP maximum flood depths and result point locations



The model depth results distinguish several key flowpaths intersecting the Project site, in line with the drainage analysis described in Section 4.2. The predicted flood depths are consistent with the expected response to rainfall events, with greatest peak flood depths predicted within the entrenched channel networks which drain the Project site. Flood extents (>0.015m) are generally well distinguished and confined to the channel networks, however, a region of extensive shallow (<0.15m) flooding is indicated in the north-east portion of the Project where several channel networks open out onto a region of shallower gradient.

Peak depths of up to 0.60 to 0.90m in the 1% AEP event are anticipated in isolated locations on the main drainage flowpaths within the Project site. Peak flood depths are typically shallow (<0.15 m) elsewhere across the majority of the Project area for all AEP events.

As expected, peak flood depths and extents increase as the AEP decrease, and show the varying significance of flowpaths across each AEP. Extracted peak flood depths for result point locations shown in Figure 6.5 across all event AEPs are detailed in Table 6.3 below.

Table 6.3 Maximum flood depths at result point locations across the Site

	Peak flood depth (m)			
Results Point	**10% AEP**	**4% AEP**	**2% AEP**	**1% AEP**
2D_NRP_001	0.59	0.64	0.68	0.71
2D_NRP_002	0.05	0.06	0.07	0.07
2D_NRP_003	0.34	0.39	0.41	0.45
2D_NRP_004	0.08	0.09	0.09	0.10
2D_NRP_005	0.08	0.09	0.10	0.10
2D_NRP_006	0.36	0.39	0.41	0.44
2D_NRP_007	0.31	0.34	0.35	0.36
2D_NRP_008	0.06	0.07	0.08	0.08
2D_NRP_009	0.23	0.24	0.24	0.25
2D_NRP_010	0.34	0.37	0.39	0.40
2D_NRP_011	0.50	0.52	0.53	0.54
2D_NRP_012	0.29	0.33	0.36	0.38
2D_NRP_013	0.33	0.40	0.45	0.50
2D_NRP_014	0.53	0.60	0.65	0.69
2D_NRP_016	0.03	0.04	0.05	0.05
2D_NRP_017	0.06	0.07	0.08	0.08
2D_NRP_018	0.21	0.23	0.24	0.25
2D_NRP_019	0.07	0.08	0.09	0.09
2D_NRP_020	0.05	0.05	0.06	0.07
2D_NRP_021	0.07	0.09	0.09	0.10

Note: Network results point '2D_NRP_015' has been omitted. Results are reported to 2 decimal places.

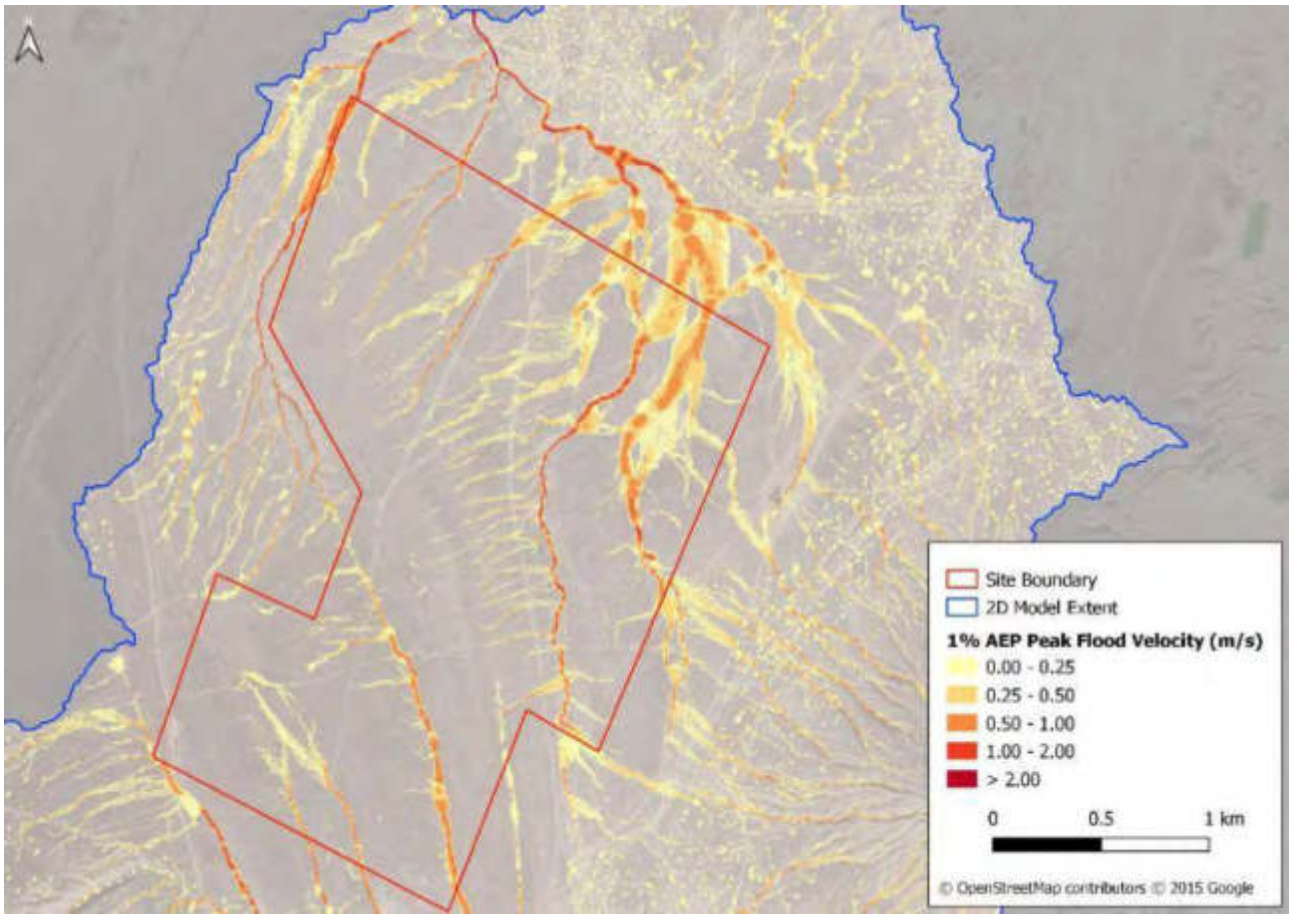
The modelled peak depth results indicate flood water ponding in areas outside of the topographical survey extent as a consequence of the underlying wider AW3D DSM. This wider elevation model has numerous widespread minor depressions across the topographic surface which prevent a smooth continuous flowpath as modelled within the topographical survey extent. The impact of this upon the validity of the results is anticipated to be low since this is typically observed on flowpaths draining away from and outside of the proposed Project site extent.

However, several flowpaths are shown to originate from the mud volcano in the south-east of the model domain and flow north across the Project area as evidenced by the drainage analysis detailed in Section 4.2 and Figure 4.5. The model results predict widespread ponding of water within the wider DSM on this flowpath at the base of the volcano, which could potentially be underestimating the modelled peak flood depth results further downstream across the Project site. However, analysis of satellite imagery in combination with the topographic data suggests an alluvial fan feature in this location, with numerous possible flow routes both to the north and south. Since the drainage analysis is based on an edited 'Hydro DEM'; whereby depressions and sinks are filled to allow a continuous flowpath to be modelled, the resulting drainage lines may not always provide a true reflection of reality where widespread edits are required to enforce a modelled flow route. Therefore, the observed ponding of water on this flowpath is not considered to have a significant impact on the validity of the modelled flood results across the Project site, since only a portion of this water is expected to flow onto the project site in reality.

Flow velocities

The distribution of the peak flow velocities across the Site for the 1% AEP event is shown in Figure 6.6 below. Flow velocities have been categorised such that only flows with depths >0.015m are shown in accordance with the peak depth results shown in Figure 6.5 above. Peak flow velocities for all AEP events are displayed in Appendix C.

Figure 6.6 1% AEP maximum flood velocities



As anticipated, the maximum flow velocities occur along the main flowpaths identified in Figure 6.5, reflecting the incised nature of the drainage channels. Peak flow velocities are seen to increase in magnitude with decreasing AEP. Peak flow velocities within the entrenched flowpath channels are typically in the magnitude of 1 to 2m/s across all events, with some localised regions where flows exceed 2m/s. Across the shallower and upstream minor flowpaths the flow velocities are typically low, below 0.50m/s.

6.5 Sensitivity testing

The objective of the sensitivity testing is to highlight the degree of change associated with the adjustment of an input in order to provide confidence that the values chosen for final runs are based on valid assumptions.

Sensitivity tests have been carried on the hyetograph profile, manning's n surface roughness coefficient, rainfall-runoff coefficient and the topographic join. These are discussed in sub-sections below.

Hyetograph profile

The baseline model has been run using a Huff fourth quartile (Q4) profile. The Q4 corresponds to the fact that the maximum rainfall intensity lies in the fourth quartile of the event duration. This is typically considered to be a conservative approach, since the highest rainfall intensity will be occurring when the topographic surface within the model is already wet and surface storage capacity is minimised. However, the sensitivity of the model to the hyetograph profile has been assessed to provide confidence in the Q4 profile selected.

The baseline model has been run with additional Q1 (first quartile), Q2 (second quartile) and Q3 (third quartile) hyetographs of 1% AEP and 3-hour duration. Resulting peak depths recorded across the 2D network result points shown in Figure 6.5 are outlined in Table 6.4 below with comparison to the Q4 peak depths.

Table 6.4 Runoff coefficient sensitivity results

	Peak Depth (m)			
Results Point	**Q1**	**Q2**	**Q3**	**Q4**
2D_NRP_001	0.66	0.65	0.68	0.71
2D_NRP_002	0.06	0.06	0.07	0.07
2D_NRP_003	0.37	0.37	0.40	0.45
2D_NRP_004	0.09	0.08	0.09	0.10
2D_NRP_005	0.09	0.08	0.09	0.10
2D_NRP_006	0.39	0.41	0.43	0.44
2D_NRP_007	0.33	0.34	0.35	0.36
2D_NRP_008	0.08	0.06	0.07	0.08
2D_NRP_009	0.24	0.24	0.24	0.25
2D_NRP_010	0.39	0.39	0.40	0.40
2D_NRP_011	0.51	0.51	0.52	0.54
2D_NRP_012	0.33	0.33	0.36	0.38
2D_NRP_013	0.44	0.46	0.49	0.50
2D_NRP_014	0.63	0.64	0.68	0.69
2D_NRP_016	0.04	0.04	0.04	0.05
2D_NRP_017	0.08	0.06	0.07	0.08
2D_NRP_018	0.24	0.23	0.25	0.25
2D_NRP_019	0.08	0.08	0.09	0.09
2D_NRP_020	0.06	0.06	0.06	0.07
2D_NRP_021	0.09	0.08	0.09	0.10

Note: Network results point '2D_NRP_015' has been omitted. Results are reported to 2 decimal places, and highlighted results indicate peak depths.

Peak depth results recorded across the model domain consistently report peak depths associated with the Q4 profile. Consequently, it can be concluded that applying the Huff Q4 hyetograph profile provides the most conservative and 'worst-case' scenario and is therefore justified for this assessment.

Manning's n roughness coefficient

The baseline manning's n roughness values applied to the hydraulic model have been chosen based on available information on the land-use, modeller experience and judgement. Baseline roughness values have been adjusted to represent the reasonable upper (SS1) and lower bounds (SS2) for each associated land-use to test the sensitivity of the model to this parameter. Changes to manning's n are detailed in Table 6.5 below.

Table 6.5 Manning's n roughness coefficient sensitivity test schematisation

	Roughness coefficient (Manning's n)		
Land-cover	**Baseline**	**SS1**	**SS2**
Buildings	0.300	0.500	0.100
Tracks	0.020	0.030	0.015
Water	0.040	0.045	0.025
Sparse vegetation <15%	0.025	0.030	0.017
Shrubland	0.050	0.070	0.035
Bare areas	0.020	0.025	0.015
Urban	0.017	0.025	0.013

The model has been run using the 1% AEP 3-hour duration Huff Q4 hyetograph, and the results analysed across the 2D network result points shown in Table 6.6 with respect to the baseline.

Table 6.6 Manning's n roughness coefficient sensitivity results

Results Point	Baseline peak flood depth (m)	SS1 peak flood depth (m)	Difference (m)
2D_NRP_001	0.71	0.72	+0.01
2D_NRP_002	0.07	0.08	+0.00
2D_NRP_003	0.45	0.45	+0.01
2D_NRP_004	0.10	0.11	+0.01
2D_NRP_005	0.10	0.11	+0.01
2D_NRP_006	0.44	0.45	+0.01
2D_NRP_007	0.36	0.37	+0.01
2D_NRP_008	0.08	0.08	+0.00

Results Point	Baseline peak flood depth (m)	SS1 peak flood depth (m)	Difference (m)
2D_NRP_009	0.25	0.25	+0.00
2D_NRP_010	0.40	0.40	+0.00
2D_NRP_011	0.54	0.54	+0.00
2D_NRP_012	0.38	0.39	+0.01
2D_NRP_013	0.50	0.56	+0.05
2D_NRP_014	0.69	0.70	+0.01
2D_NRP_016	0.05	0.05	+0.00
2D_NRP_017	0.08	0.09	+0.01
2D_NRP_018	0.25	0.25	+0.00
2D_NRP_019	0.09	0.10	+0.00
2D_NRP_020	0.07	0.07	+0.00
2D_NRP_021	0.10	0.10	+0.01

Results Point	Baseline peak flood depth (m)	SS2 peak flood depth (m)	Difference (m)
2D_NRP_001	0.71	0.70	0.00
2D_NRP_002	0.07	0.07	-0.01
2D_NRP_003	0.45	0.45	0.01
2D_NRP_004	0.10	0.08	-0.02
2D_NRP_005	0.10	0.08	-0.02
2D_NRP_006	0.44	0.43	-0.01
2D_NRP_007	0.36	0.35	-0.01
2D_NRP_008	0.08	0.07	-0.01
2D_NRP_009	0.25	0.25	0.00
2D_NRP_010	0.40	0.40	0.00
2D_NRP_011	0.54	0.54	0.00
2D_NRP_012	0.38	0.37	-0.01

Results Point	Baseline peak flood depth (m)	SS1 peak flood depth (m)	Difference (m)
2D_NRP_013	0.50	0.45	-0.06
2D_NRP_014	0.69	0.70	0.01
2D_NRP_016	0.05	0.05	0.00
2D_NRP_017	0.08	0.07	-0.02
2D_NRP_018	0.25	0.26	0.00
2D_NRP_019	0.09	0.09	0.00
2D_NRP_020	0.07	0.06	-0.01
2D_NRP_021	0.10	0.09	-0.01

Note: Network results point '2D_NRP_015' has been omitted. Results are reported to 2 decimal places.

The model performs as expected, with increased flood depths reported in SS1 in response to increased roughness coefficients, and reduced flood depths reported in SS2 associated with a reduction in roughness coefficients. Variance of up to +0.05m is reported in SS1, and up to -0.06m in SS2. In both cases, the greatest divergence was seen at result point 013 at the northern extent of the model. Variances in peak flood depths reported across the Project site was limited to +/- 0.02m. The baseline manning's n coefficients are therefore justified, given the relatively minor impact to peak flood depths.

Runoff coefficient

The runoff coefficients across the model extent have been delineated based on slope, soil texture and land-cover as outlined in Section 6.3. The sensitivity of the model to this parameter has been assessed, adjusting the coefficient by +20% (SS3) and -20% (SS4) to account for the potential variability in landcover (that appears largely ephemeral) and soil texture, the latter of which has been defined solely on the basis of a coarse global dataset.

The model has been run using the 1% AEP 3-hour duration Huff Q4 hyetograph, and the results analysed across the 2D network result points shown in Table 6.7 with respect to the baseline.

Table 6.7 Runoff coefficient sensitivity results

Results Point	Baseline peak flood depth (m)	SS3 peak flood depth (m)	Difference (m)
2D_NRP_001	0.71	0.77	+0.06
2D_NRP_002	0.07	0.09	+0.02
2D_NRP_003	0.45	0.52	+0.07
2D_NRP_004	0.10	0.11	+0.01
2D_NRP_005	0.10	0.12	+0.02

Results Point	Baseline peak flood depth (m)	SS3 peak flood depth (m)	Difference (m)
2D_NRP_006	0.44	0.49	+0.05
2D_NRP_007	0.36	0.39	+0.02
2D_NRP_008	0.08	0.09	+0.01
2D_NRP_009	0.25	0.26	+0.01
2D_NRP_010	0.40	0.42	+0.02
2D_NRP_011	0.54	0.56	+0.03
2D_NRP_012	0.38	0.43	+0.05
2D_NRP_013	0.50	0.63	+0.13
2D_NRP_014	0.69	0.78	+0.09
2D_NRP_016	0.05	0.06	+0.01
2D_NRP_017	0.08	0.09	+0.01
2D_NRP_018	0.25	0.27	+0.02
2D_NRP_019	0.09	0.11	+0.02
2D_NRP_020	0.07	0.08	+0.01
2D_NRP_021	0.10	0.11	+0.01

Results Point	Baseline peak flood depth (m)	SS4 peak flood depth (m)	Difference (m)
2D_NRP_001	0.71	0.64	-0.07
2D_NRP_002	0.07	0.06	-0.02
2D_NRP_003	0.45	0.38	-0.06
2D_NRP_004	0.10	0.08	-0.01
2D_NRP_005	0.10	0.09	-0.02
2D_NRP_006	0.44	0.38	-0.06
2D_NRP_007	0.36	0.33	-0.03
2D_NRP_008	0.08	0.07	-0.01
2D_NRP_009	0.25	0.24	-0.01

Results Point	Baseline peak flood depth (m)	SS3 peak flood depth (m)	Difference (m)
2D_NRP_010	0.40	0.37	-0.03
2D_NRP_011	0.54	0.51	-0.02
2D_NRP_012	0.38	0.33	-0.05
2D_NRP_013	0.50	0.40	-0.11
2D_NRP_014	0.69	0.60	-0.09
2D_NRP_016	0.05	0.04	-0.01
2D_NRP_017	0.08	0.07	-0.01
2D_NRP_018	0.25	0.23	-0.02
2D_NRP_019	0.09	0.08	-0.02
2D_NRP_020	0.07	0.05	-0.01
2D_NRP_021	0.10	0.08	-0.01

Note: Network results point '2D_NRP_015' has been omitted. Results are reported to 2 decimal places.

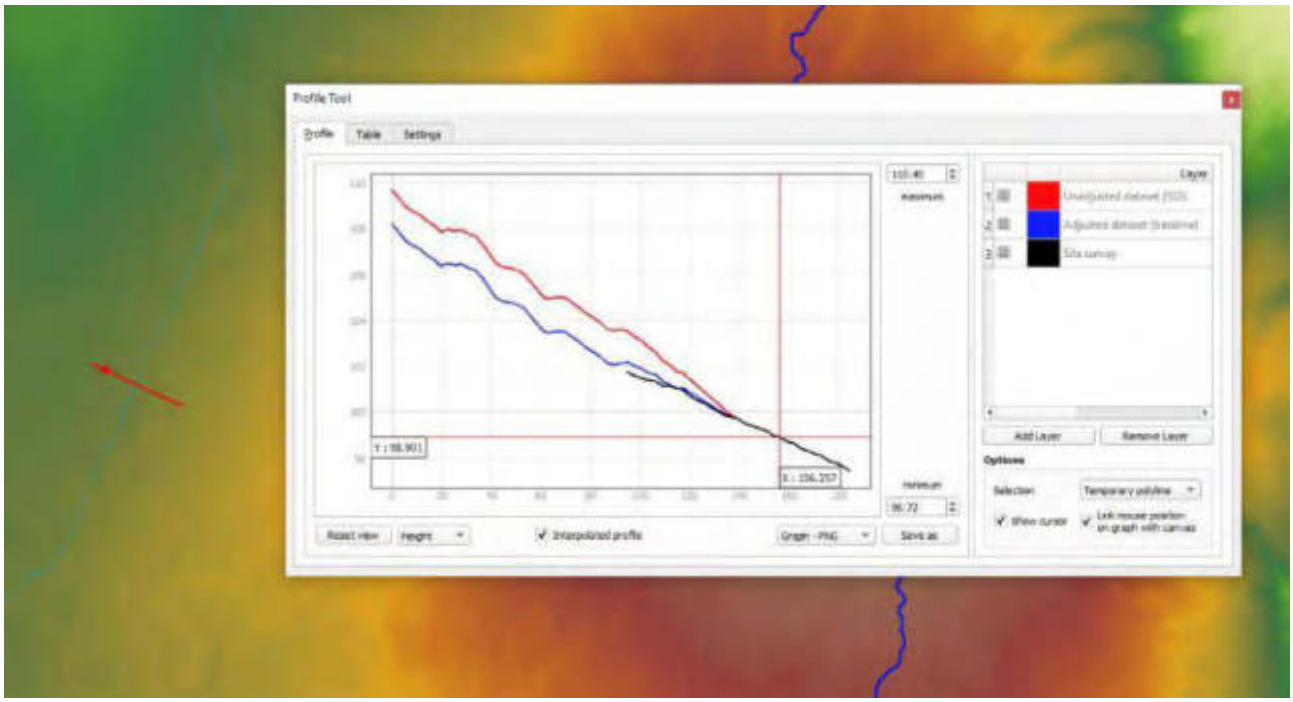
In response to an increased rainfall runoff coefficient in SS3, peak flood depths reported across the 2D network result points increase as expected. Peak flood depth increases of up to 0.06m are reported across the result points within the Project site, whilst increases of up to 0.13m are recorded at result point 013 on the main flowpath draining north of the Project site.

Peak flood depth reductions of between 0.01m and 0.05m are reported across the Site in response to a reduction in the rainfall runoff coefficients. Similarly, the greatest impact is observed at result point 013 with a reduction of 0.11m in peak flood depth.

Topography

As discussed in Section 4.1, the wider AW3D DEM was adjusted to account for the average discrepancy between the two datasets to improve the join boundary since there was strong evidence for a datum shift. The sensitivity of the model to this assumption was assessed, by running the model with an 'unadjusted' (raw) AW3D DEM in combination with the Project site survey data (SS5). The two datasets were joined using the same method with a blending distance of 50m. Figure 6.7 below shows a typical topographic profile across the join boundary (red line), displaying the Project site survey data (black), the adjusted AW3D DEM combined dataset as used in the baseline modelling (blue), and the unadjusted AW3D DEM combined dataset as used in this sensitivity test (red). The profile shows that the adjusted AW3D DEM typically provides greatest alignment at the join boundary.

Figure 6.7 Topographic join boundary profile



The model has been run using the 1% AEP 3-hour duration Q4 hyetograph. Table 6.8 below outlines the reported 2D peak depth results across the model domain with respect to the baseline. Peak depth results reported across the Project site show variance of up to +0.10m. At result points outside of the Project site, peak depth results vary from -0.05m to +0.34m at result point 013, however, this point should be ignored since it is situated within the blending boundary at the edge of the survey extent.

Table 6.8 Topography sensitivity test results

Results Point	Baseline peak flood depth (m)	SS5 peak flood depth (m)	Difference (m)
2D_NRP_001	0.71	0.81	+0.10
2D_NRP_002	0.07	0.07	-0.00
2D_NRP_003	0.45	0.45	+0.01
2D_NRP_004	0.10	0.10	+0.00
2D_NRP_005	0.10	0.09	-0.02
2D_NRP_006	0.44	0.43	-0.01
2D_NRP_007	0.36	0.40	+0.04
2D_NRP_008	0.08	0.08	+0.00
2D_NRP_009	0.25	0.25	-0.00

Results Point	Baseline peak flood depth (m)	SS5 peak flood depth (m)	Difference (m)
2D_NRP_010	0.40	0.43	+0.03
2D_NRP_011	0.54	0.54	+0.00
2D_NRP_012	0.38	0.33	-0.05
2D_NRP_013	0.50	0.85	+0.34
2D_NRP_014	0.69	0.69	-0.00
2D_NRP_016	0.05	0.06	+0.01
2D_NRP_017	0.08	0.10	+0.02
2D_NRP_018	0.25	0.36	+0.11
2D_NRP_019	0.09	0.09	-0.00
2D_NRP_020	0.07	0.07	-0.00
2D_NRP_021	0.10	0.10	-0.00

Note: Network results point '2D_NRP_015' has been omitted. Results are reported to 2 decimal places.

The results indicate that the peak flood depth results are relatively insensitive to the topographic join. However, some flowpaths intersecting the Project site report an increase in peak flood depths, as one may expect given the steeper gradient at the join boundary and potential acceleration of flood flows. In particular, this is noticeable on flowpaths originating from the south-east of the Project site and flowing north-west, as reported at result points 001 and 018. However, given the strong evidence for a datum shift between the two datasets as evident in Figure 6.7 above, the baseline flood results are expected to provide the greatest degree of confidence.

7. Conclusions and recommendations

7.1 Flood risk summary

A broad scale 2D direct rainfall modelling approach has been employed to provide an overview assessment of flood risk across the proposed Project site. The modelling outputs have demonstrated that the majority of the Project site is typically at low risk of flooding, with predominantly shallow (<0.15m) peak flood depths. The greatest flood risk, both in terms of depth and velocity, is anticipated within the entrenched drainage channels that drain the Project site area flowing north and south-east, whilst an extensive region of shallow water flooding is anticipated in the north-east portion of the Project site across all AEP flood events.

The modelling approach employed in this study has been developed on the basis of commercially available terrain data to supplement the detailed topographic Project site survey data. This is considered appropriate to provide an overall indication of the distribution and severity of flood risk across the site for the purposes of optimising the Project site layout to avoid areas of high flood risk.

The model results summary in Section 6.4 highlighted the issue of extensive ponded water across the model where the wider AW3D has been utilised, which may be leading to an underestimation of floodwater across the Project site. However, as previous discussed this upstream ponding in the wider terrain is not considered to have a significant impact on the validity of the modelled flood results across the Site. An extension of the Project site topographic survey to include the upstream catchment contributing to the site would provide more accurate estimates of flood levels and velocities and confidence if required for the design of watercourse crossings and flood resilience measures in the future.

7.2 Recommendations for managing flood risk

A hierarchy of mitigation measures is recommended as follows:

- Infrastructure that is most vulnerable to flooding, should be located in areas of lowest flood risk (i.e. areas of solar PV panels should be situated outside of the main flood risk corridors);
- As far as possible, access roads should be routed outside of areas of highest flood risk (noting that at some locations roads will need to cross high flood risk corridors); and
- Where this is not possible, flood mitigation measures will need to be defined as part of ongoing scheme design.

Appropriate flood mitigation and resilience measures may include:

- Hard engineering or 'flood resistance' measures, for example:
  - If access roads and watercourse crossings need to remain operational during flood events, minimum road levels and sufficient bridge/culvert conveyance should be defined with reference to an appropriate design event frequency;
  - Appropriate erosion protection measures, such as rip-rap or gabion baskets may need to be specified in areas of highest erosion risk;
- Operational or 'flood resilience' measures, for example:

a. Developing and maintaining a flood response plan for both construction and operational phases of the development, setting out the key flood risk areas, and appropriate evacuation procedures/ access restrictions, in the event that extreme rainfall is forecast;

b. Making provision for rapid recovery following flood events. For example, keeping a road grading machine on stand-by to make good any damage to access tracks following flooding.

Bibliography

Journal articles

Beck, H., Zimmermann, N., McVicar, Vergopolan, N., Berg, A., and Wood, E. F (2018) Present and future Köppen-Geiger climate classification maps at 1-km resolution. Scientific Data 5, 180214

Brunet, M-F., Korotaev, M. V., Ershov, A. V., and Nikishin, A. M. (2003). The South Caspian Basin: a review of its evolution from subsidence modelling: Sedimentary Geology, v. 156, no. 1-4, p. 119-148.

Huff, F.A. (1990) Time Distributions of Heavy Rainstorms in Illinois, Illinois State Water Campaign, Circular 173.

Israfilov R.G. (2002). Groundwater Anomalies in the Urban Areas of Azerbaijan. In: Howard K.W.F., Israfilov R.G. (eds) Current Problems of Hydrogeology in Urban Areas, Urban Agglomerates and Industrial Centres. Nato Science SeriesBooks

Liu, Y & Smedt, F. (2004). WetSpa Extension, A GIS-based Hydrologic Model for Flood Prediction and Watershed Management.

Makhmudov, R.N. (2016). Regional climate changes and river runoff in Azerbaijan. Russ. Meteorol. Hydrol. 41, 635–639

Zapata-Sierra, A.J., Manzano-Agugliaro, F., Ayuso Muñoz, J.L., (2009). Assessment of methods for obtaining rainfall intensity-duration-frequency ratios for various geographical areas.

Books

Alizadeh. A., & Guliyev. I., & Kadirov. F.A., & Eppelbaum. L.V. 2016. Geosciences of Azerbaijan: Volume I "Geology".

USDA Soil Taxonomy, 1999. A basic system of soil classification for making and interpreting soil surveys.

Government publications

Ministry of Ecology and Natural Resources. (2015). Third National Communication to the United Nations Framework Convention on Climate Change. Baku: UNFCC

Appendix A
Rainfall hyetographs

Figure A.1 10% AEP Huff Q4 3-hour duration hyetograph

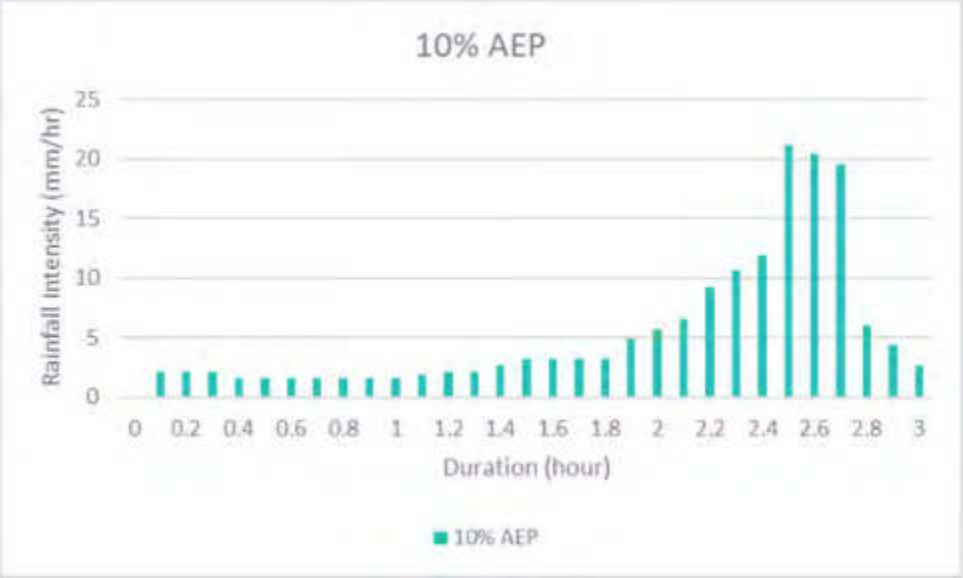


Figure A.2 4% AEP Huff Q4 3-hour duration hyetograph

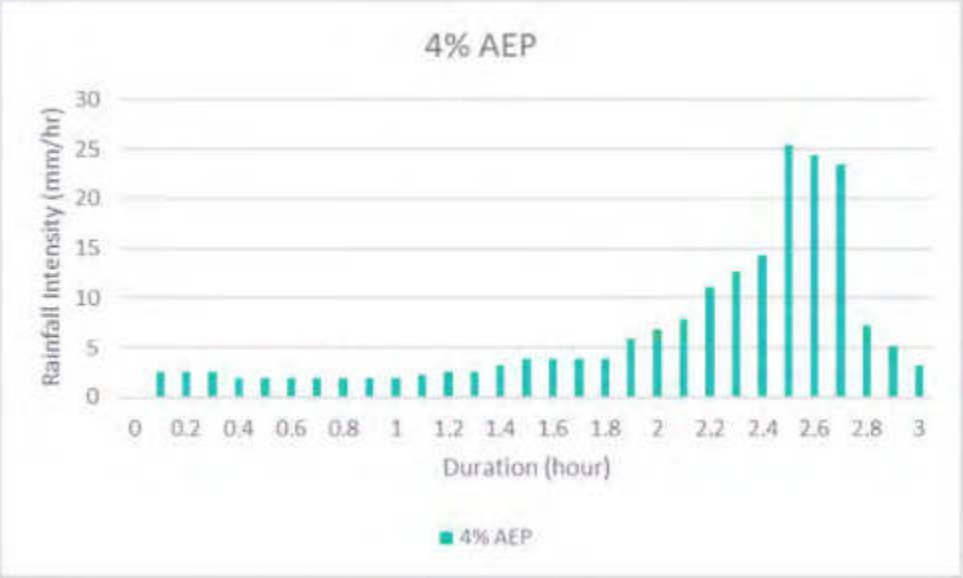


Figure A.3 2% AEP Huff Q4 3-hour duration hyetograph

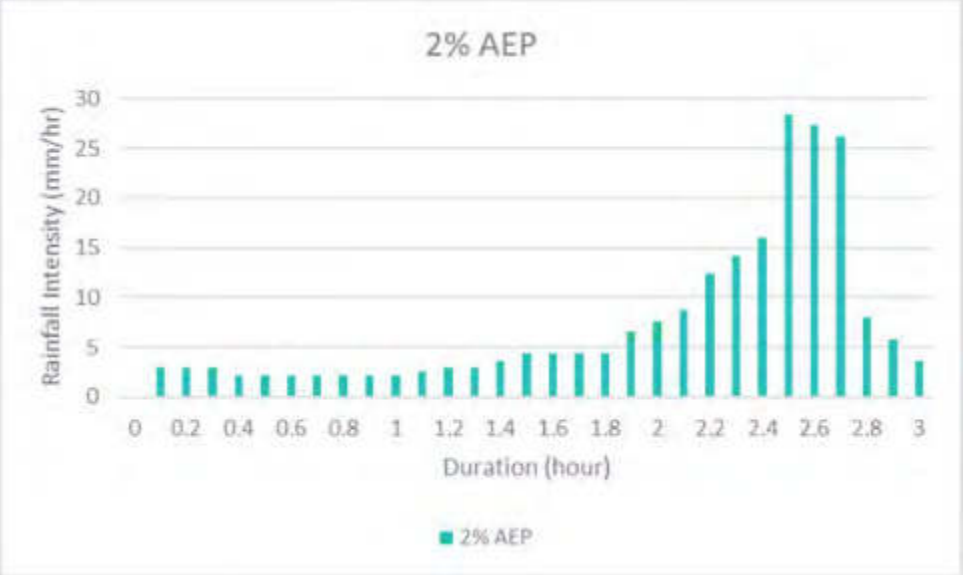
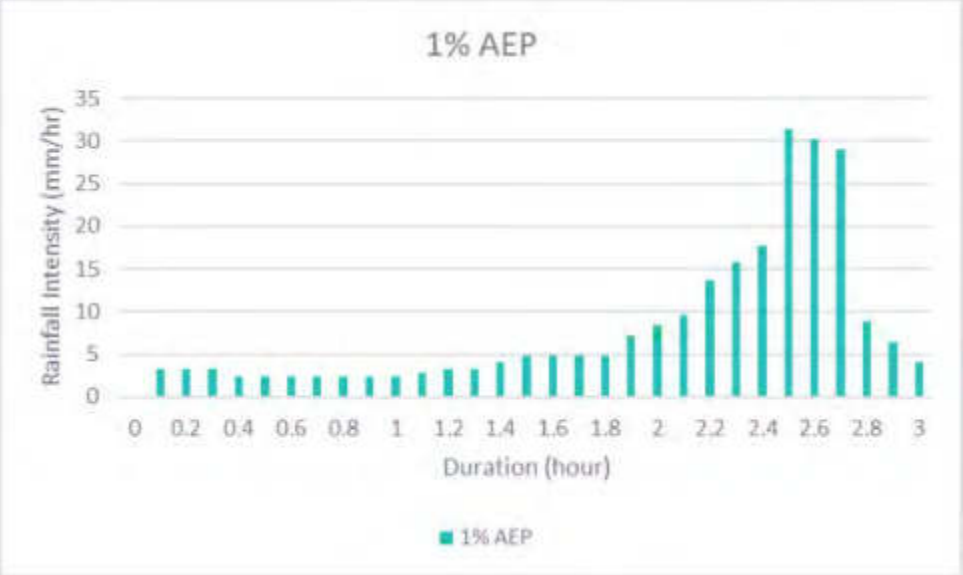
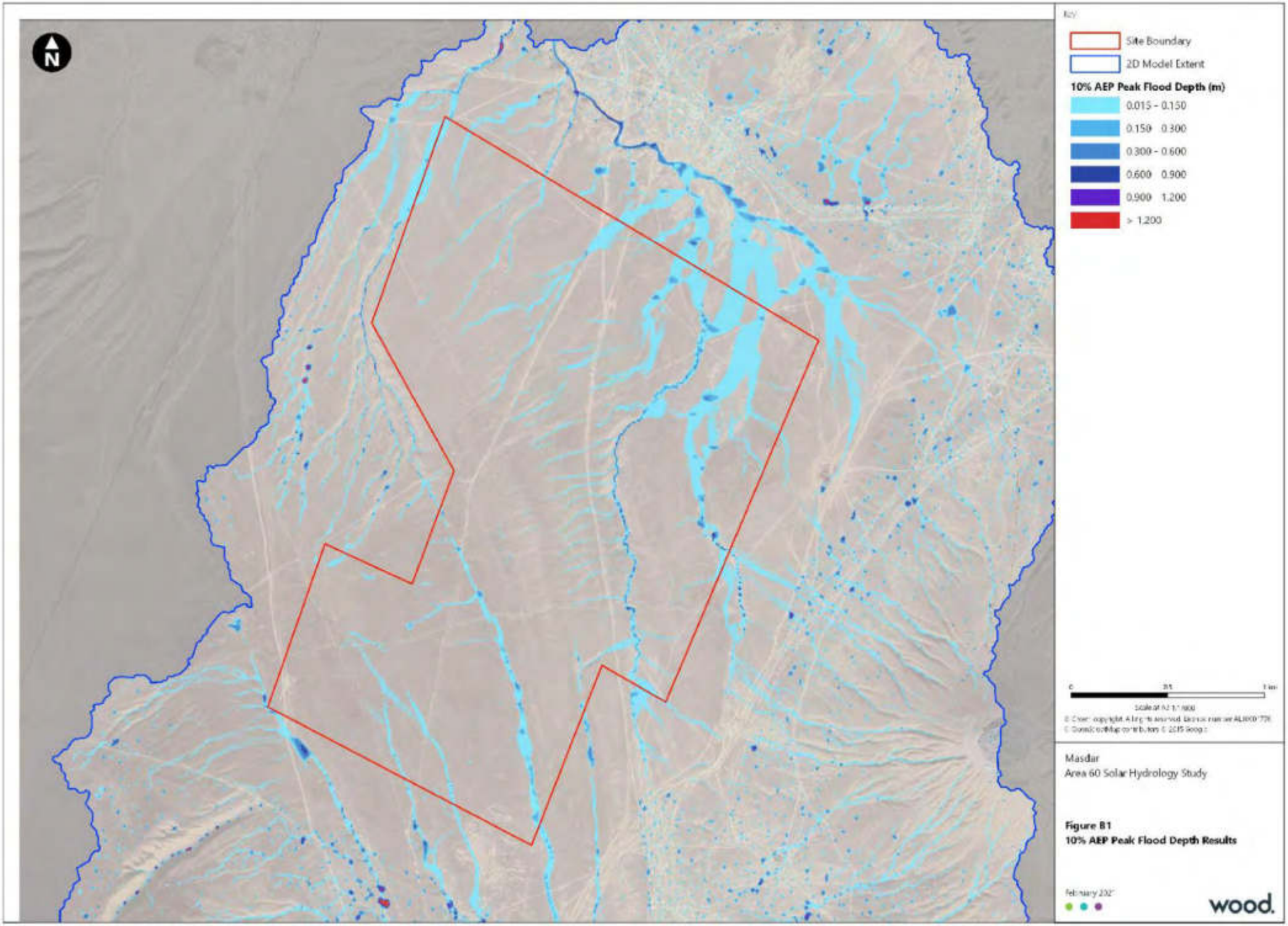
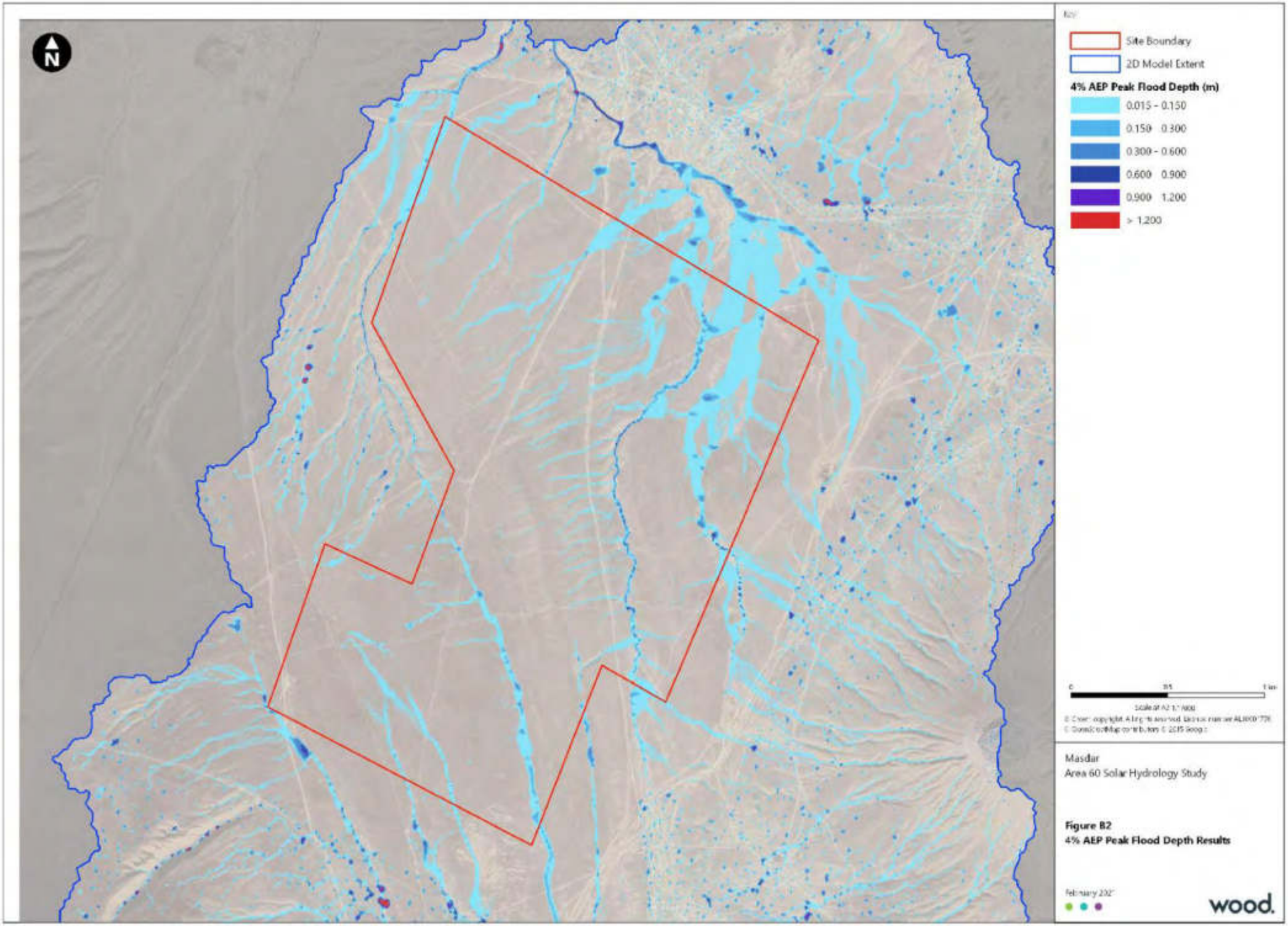


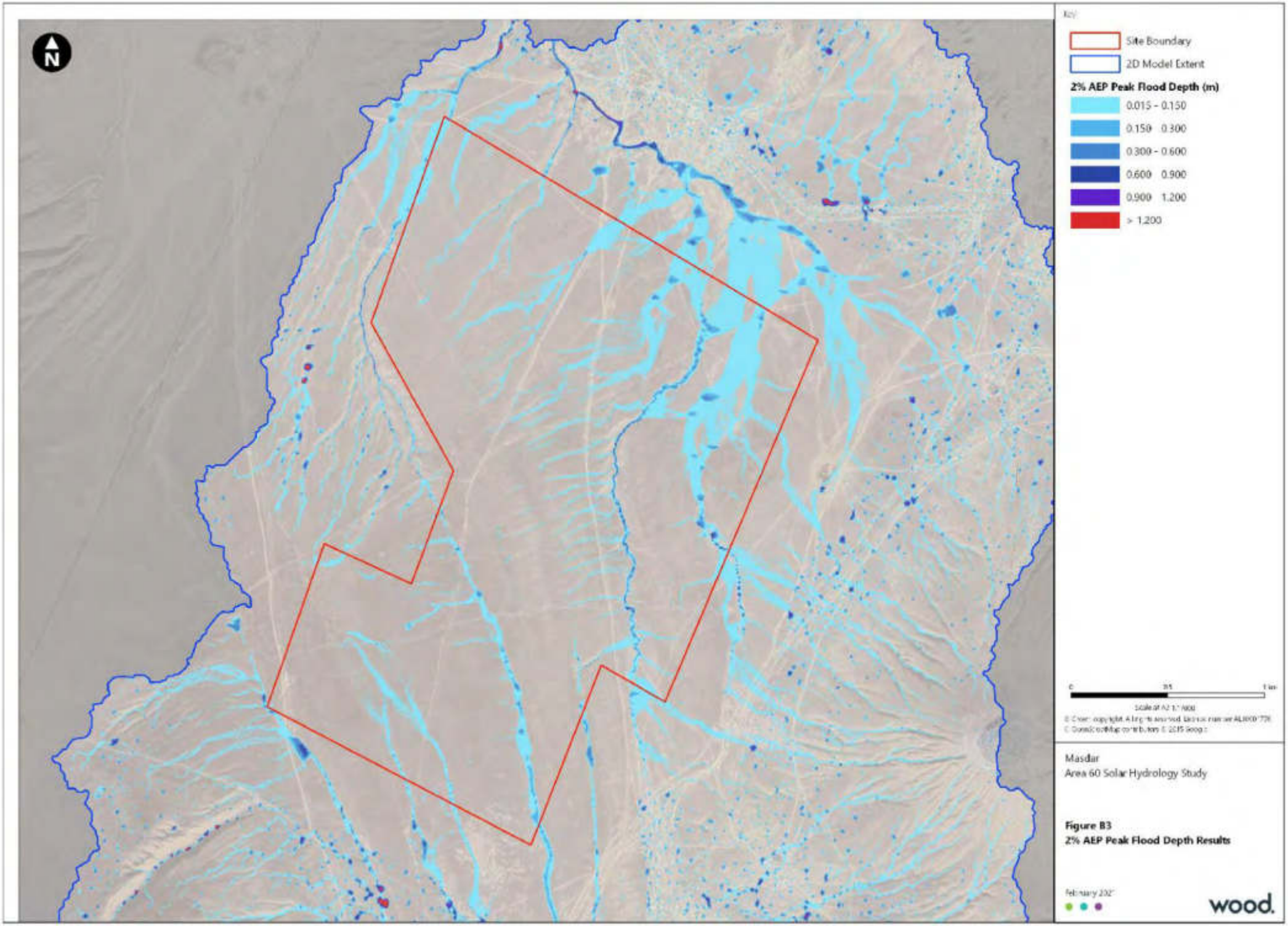
Figure A.4 1% AEP Huff Q4 3-hour duration hyetograph

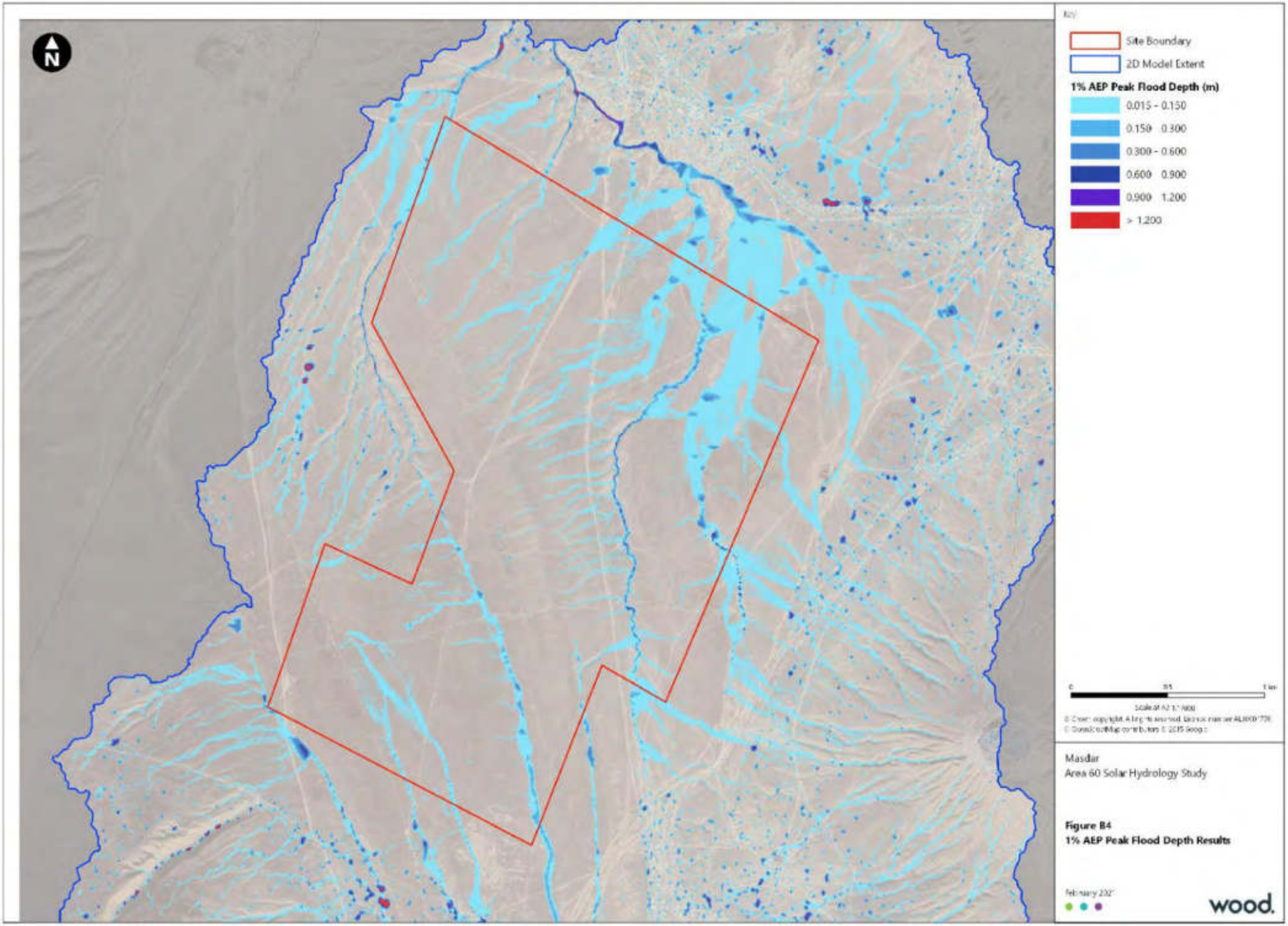


Appendix B
Peak flood depth maps

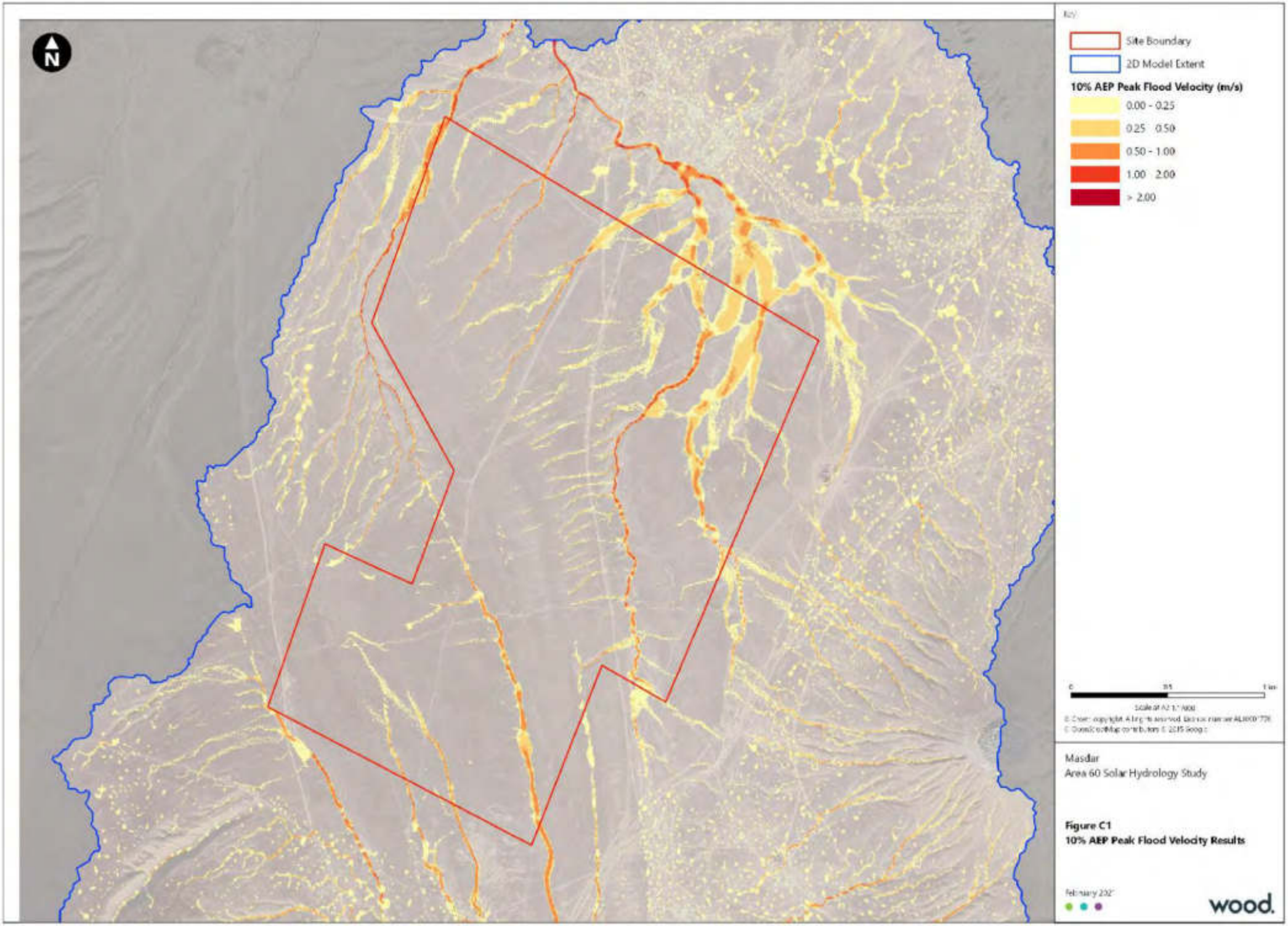

N
Key
Site Boundary
2D Model Extent
10% AEP Peak Flood Depth (m)
0.015 - 0.150
0.150 - 0.300
0.300 - 0.600
0.600 - 0.900
0.900 - 1.200
> 1.200
Masdar
Area 60 Solar Hydrology Study
Figure B1
10% AEP Peak Flood Depth Results
February 202
wood.


N
Key
Site Boundary
2D Model Extent
4% AEP Peak Flood Depth (m)
0.015 - 0.150
0.150 - 0.300
0.300 - 0.600
0.600 - 0.900
0.900 - 1.200
> 1.200
0
Masdar
Area 60 Solar Hydrology Study
Figure 82
4% AEP Peak Flood Depth Results
February 202
wood.


N
Key
Site Boundary
2D Model Extent
2% AEP Peak Flood Depth (m)
0.015 - 0.150
0.150 0.300
0.300 - 0.600
0.600 0.900
0.900 1.200
> 1.200
0
0.5
1 km
Masdar
Area 60 Solar Hydrology Study
Figure B3
2% AEP Peak Flood Depth Results
February 202
wood.


N
Site Boundary
2D Model Extent
1% AEP Peak Flood Depth (m)
0.015 - 0.150
0.150 0.300
0.300 - 0.600
0.600 0.900
0.900 1.200
> 1.200
Masdar
Area 60 Solar Hydrology Study
Figure B4
1% AEP Peak Flood Depth Results
February 202
wood.

Appendix C
Peak flood velocity maps

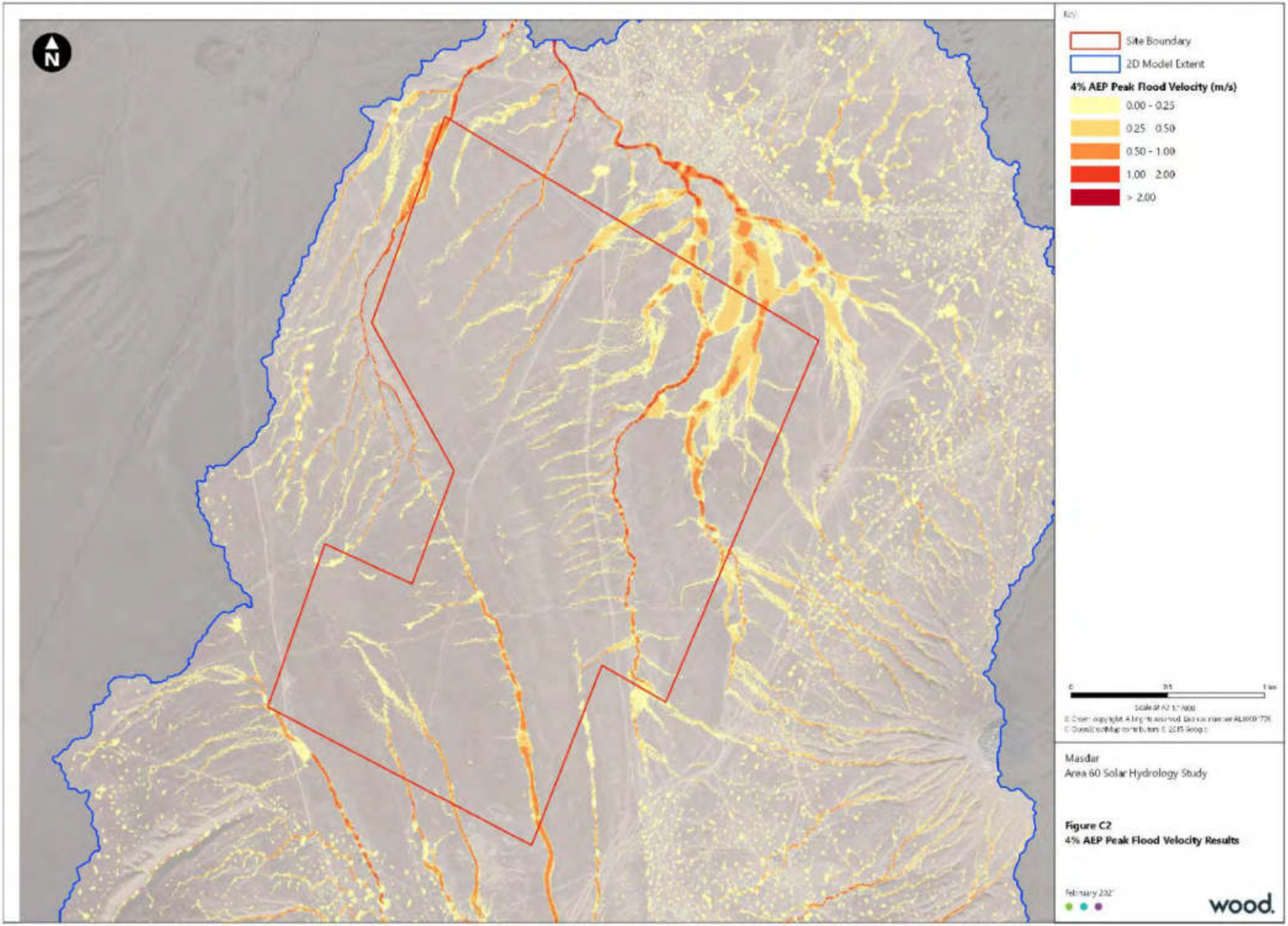


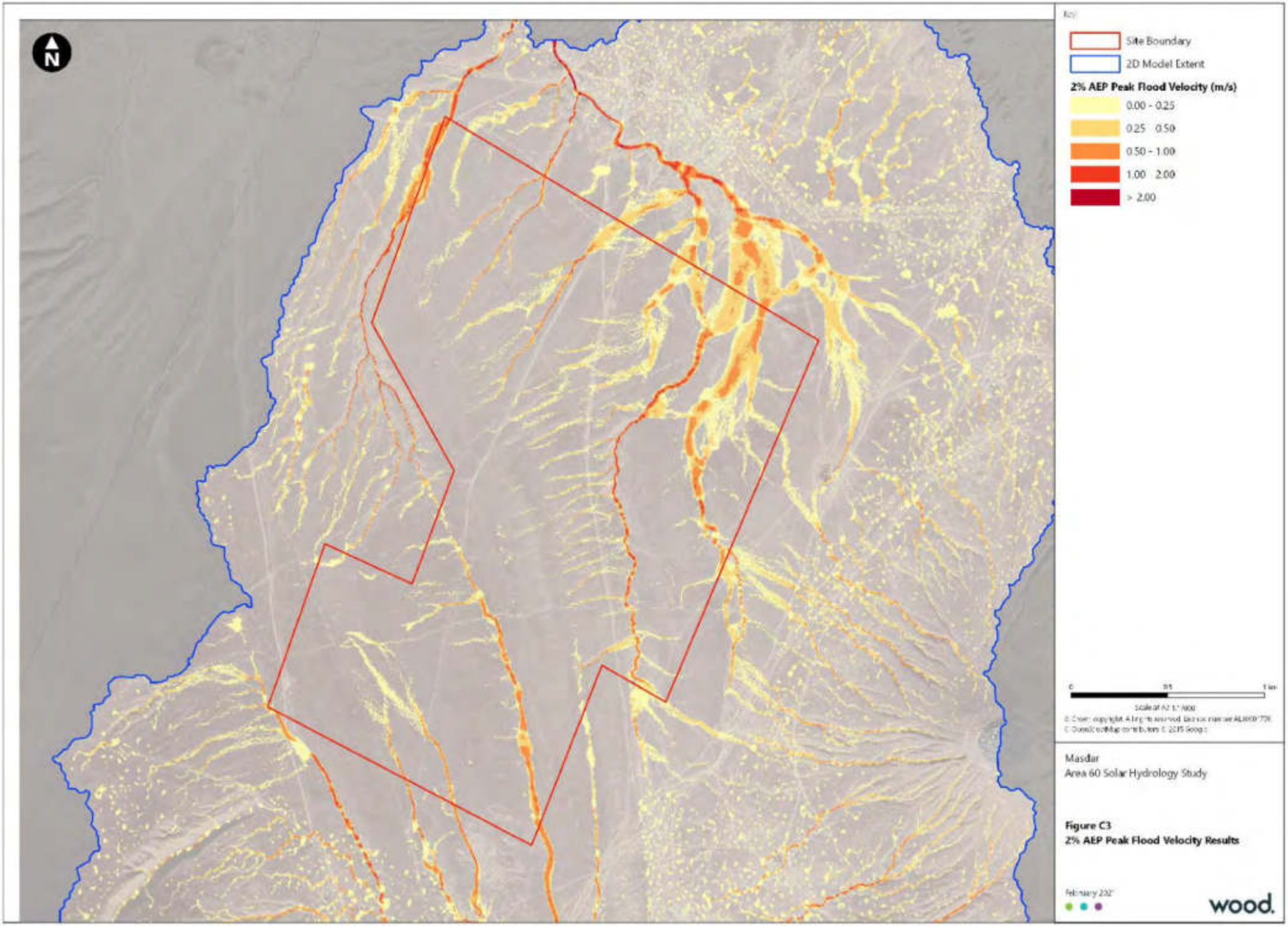
Masdar
Area 60 Solar Hydrology Study

Figure C1
10% AEP Peak Flood Velocity Results

February 202

wood.


N
Key
Site Boundary
2D Model Extent
4% AEP Peak Flood Velocity (m/s)
0.00 - 0.25
0.25 - 0.50
0.50 - 1.00
1.00 - 2.00
> 2.00
0
1 km
Masdar
Area 60 Solar Hydrology Study
Figure C2
4% AEP Peak Flood Velocity Results
February 202
wood.

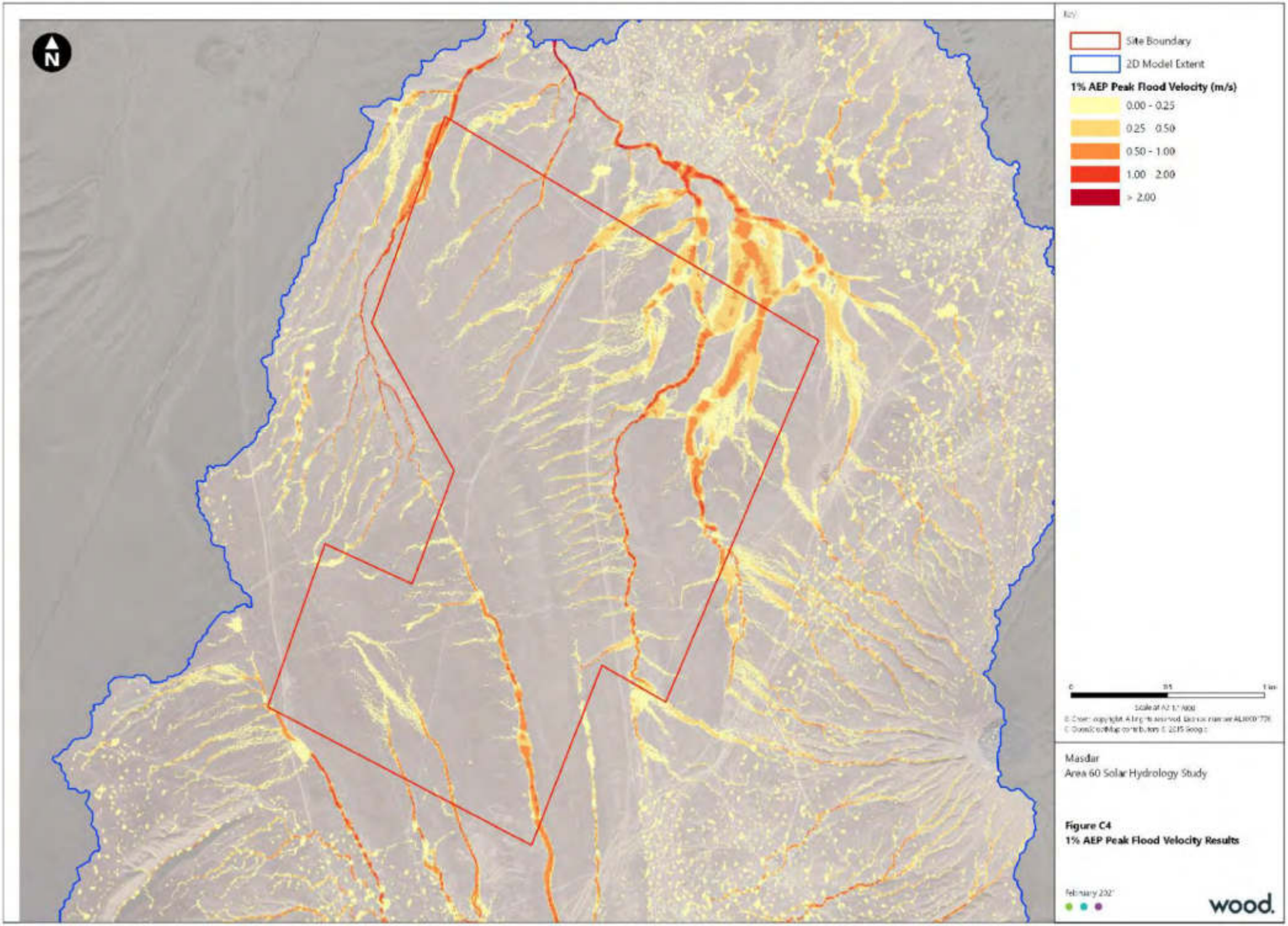


Masdar
Area 60 Solar Hydrology Study

Figure C3
2% AEP Peak Flood Velocity Results

February 202

wood.


N
Key
Site Boundary
2D Model Extent
1% AEP Peak Flood Velocity (m/s)
0.00 - 0.25
0.25 0.50
0.50 - 1.00
1.00 2.00
> 2.00
0
1 km
Masdar
Area 60 Solar Hydrology Study
Figure C4
1% AEP Peak Flood Velocity Results
February 202
wood.

Appendix G Human Rights Risk Assessment (HRRA) Scan

Human Rights Risk Assessment Scan
Area 60 Solar PV Project

14 March 2022

Final

Environmental and Social Advisory Services (ESAS) Limited

Prepared for:

Wood Group UK Ltd

Sir Ian Wood House

Altens Industrial Estate

Hareness Road, Aberdeen

AB12 3LE

Table of Contents

ESAS contact details:

Environmental and Social Advisory Services Limited (ESAS)

Company registration No.: 07581160.

35 Waldegrave Gardens, Twickenham, London. TW1 4PH. United Kingdom.

Phone: +44 79 205 32584

E-mail: stuart.hume@esaservices.co.uk

Website: www.esaservices.co.uk

Revision History

Rev	Date	Reason for Issue	Prepared	Checked	Approved
0	21 Feb 2022	Initial release for Client review	**S Hume**	**S Hume**	**V McLean**
		Signatures		SIGNED	SIGNED
1	14 March 2022	Updated following Lender comments	**S Hume**	**S Hume**	**V McLean**
		Signatures			

Acronyms and Abbreviations

Acronym	Description
EP	Equator Principle
ESAS	Environmental and Social Advisory Services Limited
ESIA	Environmental and Social Impact Assessment
ESMS	Environmental and Social Management System
GIS	Geographic Information System
HRRA	Human Rights Risk Assessment
LRP	Livelihood Restoration Plan
MW	Mega Watt
NGO	Non-Governmental Organisation
OHL	Overhead Transmission Line
SEP	Stakeholder Engagement Plan

1 Introduction

This Human Rights Risk Assessment (HRRA) has been prepared by Environmental and Social Advisory Services Limited (ESAS) for Wood for a proposed 230 MW Solar Photo Voltaic (PV) Power Project in Azerbaijan (the 'Project'). The Project is being developed by the Special Purpose Vehicle (SPV) 'Masdar Azerbaijan Energy' which is a Limited Liability Company established under the laws of the Republic of Azerbaijan, whose registered address is at 43, Mammad Araz Street, Narimanov District, Baku, AZ1106, Republic of Azerbaijan.

The Equator Principles Association recognises that financial institutions and their clients have a responsibility to respect Human Rights. Equator Principles Financial Institutions ("EPFIs") demonstrate this in line with the United Nations Guiding Principles on Business and Human Rights ("UNGPs") by carrying out Human Rights due diligence on the projects EPFIs finance.

The UNGPs serve as the global authoritative framework for defining the corporate responsibility to respect Human Rights and for carrying out due diligence to prevent and address abuses. The UNGPs state that governments have the duty to protect Human Rights, including from harms committed by private-sector actors, and companies have the responsibility to respect Human Rights, no matter where or how they operate and regardless of their size. The responsibility to respect is operationalised by companies carrying out Human Rights due diligence to assess their actual and potential adverse Human Rights impacts to understand what their Human Rights risks are based on their severity and likelihood.

In the context of the fourth version of the Equator Principles ("EP4"), each client is expected to conduct Human Rights due diligence in line with the UNGPs and to document that process in its Assessment Documentation. As indicated in Principle 2, clients are expected "to refer to the UNGPs when assessing Human Rights risks and impacts" (EP4, Principle 2) (particularly paragraphs 17-21 of the UNGPs). Accordingly, the depth of the Assessment should be dictated by the scope of project risks, which will also dictate the level of detail to be included in project documentation provided to the EPFI (EP 4, Principle 2). This document is the HRRA.

2 Overview of the Project

The Project is located 60km south of Baku, near to the Gobustan Mud Volcanoes, as part of a bilateral agreement with the government of Azerbaijan and the SPV. The Project Area ('Area 60') covers an area of 550 hectares. The closest urban areas are within Gobustan (5 km east – northeast 60) and Alyat (8 km southeast). The site is predominantly desert and semi-desert. There are no residential dwellings or other type of physical structures within the Project Area.

The land within the Project Area and surrounding region is owned by the government and is classified as industrial in Soviet times (meaning before 1989), being allocated for use in the oil and gas industry by the Ministry of Energy. The land is located in a zone that has long been identified as Industrial Zone and was specifically allocated by the Ministry of Energy for the development of the solar PV plant. In order to get official access, a Land Lease Agreement will be signed in the between SPV and the Ministry of Energy.

The Project will include the following components:

- Solar PV plant and a new substation;
- Road improvements to create a new access road along an existing track.

An overhead transmission line (OHL) of 330 kV connecting the site substation to national grid is currently planned by Azerenerji. The OHL will connect the area to the Janub station in Shirvan, 50-60 km in south-west direction. It will connect the already established Alat Trade Zone, Masdar Solar Project and other future strategic projects in the area. The OHL line is not considered as an associated facility in light of this Project as it will be constructed as part of the regional expansion of electrical distribution infrastructure and its development is not specifically linked to the development of this specific Project.

The new access road will follow the path of an existing track. The Ministry of Environment consented the access road on 11 August 2021, and permission from Garadagh Executive Power was also obtained. Permission from Absheron is expected in 2022. Construction of the road will be of the 5th technical category, which is a road without asphalt pavement and instead will use a compacted gravel coating.

The location of the Project is provided in Figure 1.1 and an example of the existing track which is to be used for the access road is provided in Figure 1.2.

Figure 1-1: Location of the Project Area

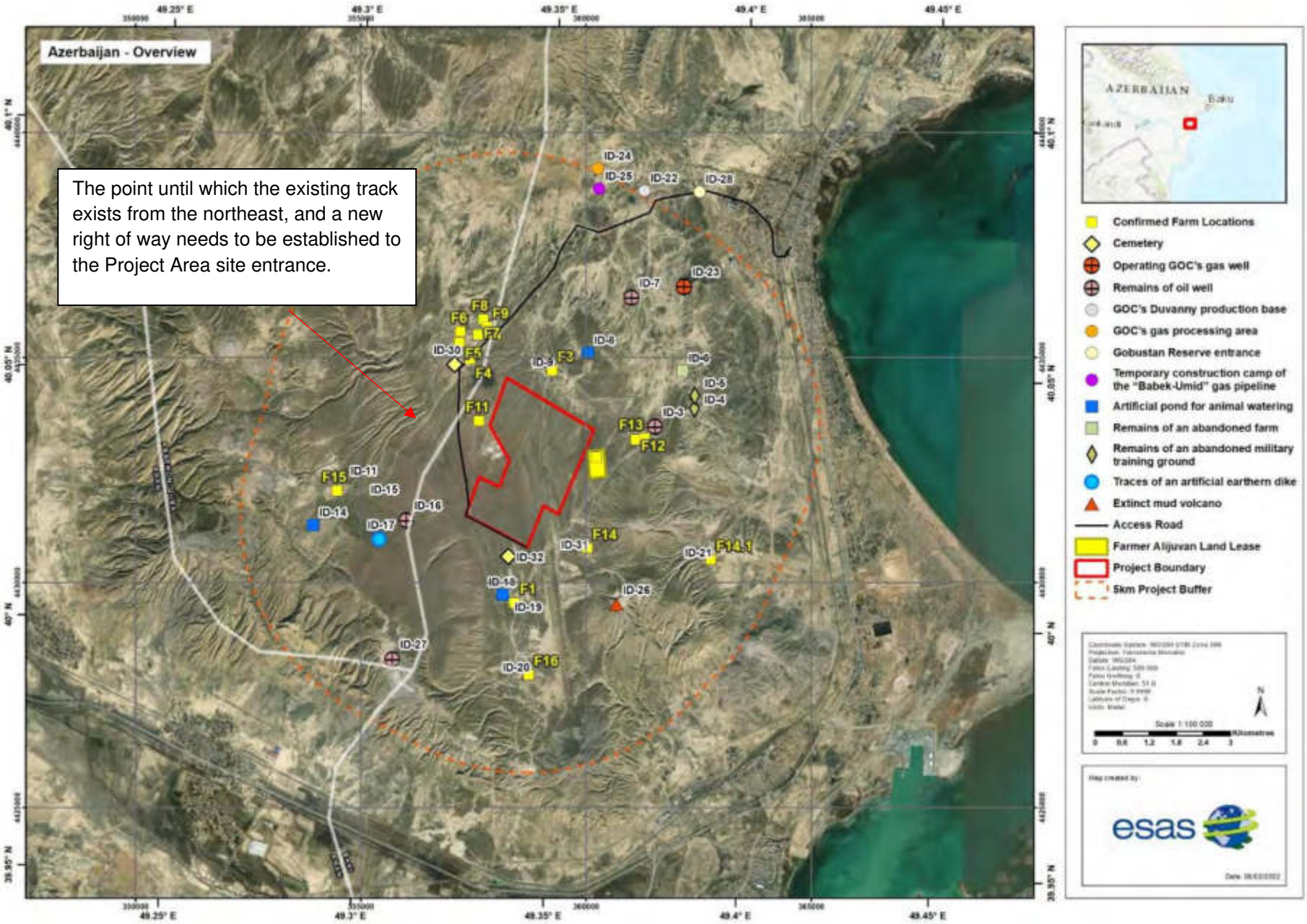


Figure 1-2: Views inside the Project Area

Figure 1-3: Example section of the existing track to be used for the new access road

Before any construction works start, the entire Project Area will be fenced off and the access road will be upgraded to allow the movement of large trucks to transport materials and personnel to the site. An existing track will be used from the northeast until there is a 'kink' in its path and a new right of way (2km long) will be established to the Project Area site entrance. Assuming that the width of the new road is 8m this will require an additional 1.6 hectares of land.

Activities during construction will include site clearance, construction of unpaved roads, temporary storage areas for different materials, and sub-station, installation of solar panels and development of the overhead transmission line. Construction activities will take 1.5 years to complete (18 months).

The temporary construction compound will include a parking area, a generator with fuel storage, and temporary buildings to provide accommodation and support facilities for managers and workers, secure storage, site offices, and welfare and first aid facilities. Security personnel will be present at the entrance gate as access to the Project Area during construction and operation will be prohibited. The project will intend not to use any land outside the boundary of the Project Area for offices, storage, etc. as all temporary facilities shall be located inside the Project Area. The location for the non-local workforce to be accommodated is not yet known although this is likely to be in Baku or a similarly large settlement. Temporary use of land may be necessary for worker accommodation and laydown areas.

During operation solar panels will be regularly cleaned of dust using water, and the electrical equipment will be regularly checked. During operations, up to 230 MW will be supplied to the national grid. The operational lifetime of the Project is 23 years.

While the land had been historically identified as an industrial zone, during the time it was not used by the Ministry of Energy, farmers and herders had started to use the lands to graze their animals. The Environmental and Social Impact Assessment (ESIA) Report prepared by Wood (16 June 2021), identified 11 farmers and 14 herders who were using the land to graze their animals.

Of the 11 farmers, 10 use the area to graze their animals between October and April and 1 grazes his animals throughout the entire year. These farmers also employ 14 herders to look after their livestock. All herders using the area are employees of the farmers and are using the facilities (houses and barns) of the farmers. There are no independent herders. The herders also have animals of their own. If the herders lose their job (or decide to move on), they lose their access to land. All farmers and herders had been living in the area for more than 5 years. The 11 farmer and 14 herder households, in total 25 project affected households (PAHs) consist of 53 + 55 = 108 family members or Project Affected People (PAPs). As the area has long been established as an industrial zone whose use rights only belonged to the Ministry of Energy, the farmers and herders are considered to be informal users of the land. While they are not entitled for compensation for the land they used, the project established a number of livelihood restoration measures to ensure that the affected people are better-off than pre-project times.

3 Objectives and scope

The HRRA was prepared based upon the Equator Principles 4 (EP4) Guidance Note: '*Implementation of Human Rights Assessments under the Equator Principles'* dated September 2020. The risk assessment takes into consideration the findings of the Environmental and Social Impact Assessment (ESIA), relevant concerns raised from stakeholders during implementation of the Stakeholder Engagement Plan (SEP), and other publicly available literature relevant to the assessment.

In accordance with the EP4 Guidance Note, the HRRA commences with the completion of an 'Initial scan for human rights impacts'. The scan identifies potential human rights risks within 11 topic areas. The topic areas included in the scan, which are relevant to the Project, are taken from the EP4 Guidance Note and are listed below:

<u>1. Labour:</u>

- Child labour
- Collective bargaining and freedom of association
- Modern slavery (forced labour/human trafficking) (this is assessed separately for Azerbaijan and also for China where solar panel components are to be procured from)
- Grievance mechanism and remedy
- Job security and the right to work

- Non-discrimination
- Occupational health and safety
- Wages (pay equity, standard of living)
- Working hours.
- Torture, cruel, inhuman and/or degrading treatment or punishment

2. Civil and political:

- Freedom of expression
- Right to life and security of person
- Right to privacy.
- Anti-bribery and corruption

3. Economic, social, and cultural:

- Right to education
- Right to health
- Right to water
- Cultural development
- Right to participate in the cultural life of the community

4. Social insurance and security

5. Land and resettlement:

- Right to property ownership
- Compensation and the right to an adequate standard of living
- Compensation in the context of gender and vulnerability.
- Right to freedom of movement.

6. Group rights / heightened risk of vulnerability:

- Children's rights
- Disability rights
- Indigenous peoples / migrants rights / ethnic minorities
- Women's rights.

4 Local context

As stated in Section 1, the Project is located in a rural area of Azerbaijan, 60km from Baku with the nearest settlement being Gobustan which lies 5 km to the east. The site is predominantly desert and semi-desert and there are no residential dwellings or other type of physical structures within the Project Area. Land within the Project Area is used for the grazing of livestock by farmers and herders (as herders typically have their own animals), informally.

The findings of a socio-economic survey undertaken during preparation of a Livelihood Restoration Plan (LRP) indicates that the average income of the farmers is generally higher compared to the herders. Farmer households also have a wider variety of income sources which include livestock as well as public/private salaries and access to pensions, compared to herder households who typically rely on livestock for income. Based upon this understanding, herder households are more vulnerable to external sources of change (such as land access restrictions arising from the Project, drought, increases in animal feed, etc.) compared to farmer households, although both types of households' experience very similar challenges to their livelihoods (a lack of water for livestock, expensive animal feed, and poor grazing land productivity). What is also clear is both types of

household's reliability on single areas of land for their livelihood, very few have an alternative land area available.

Farmers recruit herders to look after their livestock using verbal (not written) contracts. If a written contract is agreed between a farmer and a herder then they would need to pay tax and potentially provide other benefits, so farmers just provide verbal contracts only. Many of the farmers live on the outskirts of Baku City or Gobustan settlement, leaving the herders to live at the farm in shelters and very basic accommodation which provides them with a low standard of living. These structures are provided and maintenance by the farmer and access is granted whilst the herder is employed. The herder typically stays with his family and provide bedding and basic provisions, with all livestock equipment (fences, enclosures, etc.) being provided and owned by the herder.

Sometimes the herders can comprise part of the extended family of the farmer. The herders move with the entire livestock herd (their own and the farmer's animals as well) using large trucks and vehicles, to the summer pasture which varies considerably. The family moves with the herder so that they do not become separated. During the summer, farmers typically stay at their same location as they have other sources of income (see below) and visit the summer pasture area on an occasional basis. When the livestock herd is moved, this typically takes 2-3 weeks to move all of the animals. The women and children of the herder move in advance to establish the next place of living and wait for the male of the household (the herder) to arrive when all of the animals are transported.

A few of the herders engaged with are paid in livestock rather than just cash, whilst others are just paid in cash. The herders rely on farmers providing them with access to land and in this sense, they are 'tenants', whereby if they lose their job or decide to move on to another location, they lose access to this land. Herders typically move in and out of the region frequently, some decide to move on seeking improved economic opportunities elsewhere, whilst others may stay for long periods of time. Herders typically have their own livestock as well and it is estimated from the socio-economic surveys that around 20% of a herd can belong to the herder and 80% may be owned by the farmer.

Key issues associated with human rights risk at the local context include the following:

- Poor living standards faced by herders who are reliant on farmers to provide them with housing;
- The vulnerability of herders as they are essentially 'tenants' whose access to both grazing land and their housing is linked to the non-written, verbal employment contract with the relevant farmer;
- Evidence of fraudulent activity amongst regional government departments which is linked to the submission of written agreements (non-legal documents) by four farmers who claim they have access rights over parts of the Project Area. These written agreements are linked to activities within ''Azeraqrar Dovlet Istehsalat ve Emal Birliyi" MMC ("Azeraqrar State Production and Processing Union" LLC) which is part of the Ministry of Agriculture, "LLC" which is part of a regional government state entity, Absheron rayon Qobu Devecilik Damazliq Muessise (Absheron District Qobu Camel Breeding Institution), and Absheron Regional Executive Power. None of these written agreements are legally valid.

At a broader level, civic freedom in Azerbaijan is generally limited. There is a lack of independent media in the country. Political activism and criticism of the government is minimised by the State.

5 Potential Risks and Impacts Related to Human Rights

The purpose of this section is to describe the human rights risks that are connected to the Project, using a combination of severity and likelihood, noting where risks intersect or are interrelated to vulnerable people. A list of vulnerable people that could, potentially, be directly affected by the Project has been compiled and is listed below:

<u>Vulnerable people potentially impacted by economic displacement:</u>

- Persons who are elderly (defined as being aged 65 or over);
- Families who have lost both parents (they are orphans);
- Families where a disabled child is present, or a disabled parent is present;

- A family who is on a low income and lives below the national poverty line. This is classified by the State Statistical Committee for 2020 (the most recent published data available) to comprise a monthly household income of 195 AZN (USD 115) or less, or a household in substantial debt
- A widower raising two or more children under the age of 14, living separately from other relatives;
- Mothers or fathers who are bringing up the children in a single-parent family;
- Families in which both parents are unemployed;
- Single retired persons living on their own;
- Internally Displaced Persons (IDP) household;
- People with poor health status, or illiteracy in a farmer or herder household; and
- People who are discriminated against in society due to their ethnicity, belief system, health status (including HIV/COVID-19), sexual or gender orientation/self-identity.

Other types of vulnerable people potentially impacted by the Project or activities related to the Project:

- Children who may be part of the workforce;
- Workers amongst the directly contracted workforce (those holding a contract with the EPC Contractor) who may be subjected to violence and harassment, poor working conditions, inadequate occupational health and safety standards, and others.
- Workers based in supply chain companies who may be subjected to labour violations including those detailed above, in addition to child and forced labour.

The potential human rights risks that are directly connected to the Project, due to Project activities such as land-access restrictions, employment, and the use of a supply chain, are presented below in Table 5.1.

Table 5.1. Summary of potential human rights that are connected to the Project

Human rights risk	Potentially connected to the Project through one or more activities?	Probability (High, Medium Low)	Consequence (High, Medium, Low)	Links to vulnerable people?
Child labour	Yes – through employment	Low	High	Children who are part of the workforce
Collective bargaining and freedom of association	Yes – through employment	Low	Medium	None
Modern slavery	Yes – through employment and procurement from solar panels originating from China	Low for Azerbaijan-based suppliers. Medium for China-based suppliers.	High	None (Azerbaijan). Workers in supply chain companies (China)
Grievance mechanism and remedy	Yes – through employment	Low	Medium	Workers amongst the directly contracted workforce
Job security and the right to work	Yes – through employment	Low	Medium	Workers amongst the directly contracted workforce
Non-discrimination	Yes – through employment	Low	Medium	Workers amongst the directly contracted workforce
Occupational health and safety	Yes – through employment	Low	Medium	Workers amongst the directly contracted workforce
Wages (pay equity, standard of living)	Yes – through employment	Low	Medium	Workers amongst the directly contracted workforce
Working hours.	Yes – through employment	Low	Medium	Workers amongst the directly contracted workforce

Human rights risk	Potentially connected to the Project through one or more activities?	Probability (High, Medium Low)	Consequence (High, Medium, Low)	Links to vulnerable people?
Torture, cruel, inhuman and/or degrading treatment or punishment	Yes – through the use of security personnel	Low	Medium	Potentially, any type of person could be abused by a security personnel, irrespective of whether they are vulnerable, or not. However, women and young people may be subjected to abuse more frequently compared to a man of working age.
Freedom of expression	Not connected to the Project. There will be no restrictions on people's ability to criticise the Project should they wish to do so.			
Right to life and security of person	Yes – through the use of security personnel	Low	Medium	See above.
Right to privacy	Yes – through the collection of personal details from employment	Low	Medium	Workers amongst the directly contracted workforce
Anti-bribery and corruption	Yes – through procurement of materials and services	Low	Medium	None.
Right to education	No – there are no risks to educational rights.			
Right to health	No – there are no risks to health rights.			
Right to water	No – there are no risks to water rights.			
Cultural development	No – there are no risks to cultural development rights.			
Right to participate in the cultural life of the community	No – there are no risks to the right to participate in the cultural life of the community.			
Social insurance and security	No – there are no risks to social insurance and security. This will be provided to workers.			
Right to property ownership	No – the Project is not taking a person's property. There are no structures within the Project Area.			
Compensation and the right to an adequate standard of living	Yes – the Project will result in land-access restrictions.	Medium – land access restrictions will occur	Medium	Vulnerable people amongst affected farmer and affected herder households.
Compensation in the context of gender and vulnerability.	Yes – compensation will be provided to affected persons, including women.	Medium – land access restrictions will occur	Medium	Women amongst affected farmer and affected herder households.
Right to freedom of movement.	No – the Project will not restrict people's movement.			
Children's rights	No – there are no risks to children's rights.			
Disability rights	No – there are no risks to disabled people's rights.			
Indigenous peoples / migrants rights / ethnic minorities	No – there are no indigenous peoples, migrants or ethnic minorities identified amongst the Project Affected Persons.			
Women's rights.	No adverse risks have been identified. Women's rights will be strengthened by the Project through the provision of compensation specifically targeted to women, and local employment opportunities where specific measures will be undertaken to encourage women to attend.			

6 Methodology of Human Rights Assessment

The purpose of this section is to describe the approach followed to conduct the HRRA. The HRRA was undertaken during February in parallel with the final development of the Environmental and Social Impact Assessment (ESIA) and the LRP. The HRRA was prepared by ESAS in close collaboration with Wood and Wood's local in-country consultant Synergetics. The key documents used therefore comprised the following:

The ESIA, LRP, and also the United States Department of State: 2020 Country Reports on Human Rights Practices: Azerbaijan.

The human rights issued evaluated comprise all of those included under 'scope' in Section 3 which include the following categories:

1. Labour:
2. Civil and political:
3. Economic, social, and cultural:
4. Social insurance and security
5. Land and resettlement:
6. Group rights / heightened risk of vulnerability

Based upon these categories (and the relevant sub-categories include under 'Scope' in Section 3) The affected groups assessed under the HRRA comprised either 'Affected Communities' which comprise local people (generally) as well as the Project Affected Persons (these are the affected farmer and herder households) and 'workers' who comprise the workforce either based in Azerbaijan, or in supply chain companies to be used internationally for the sourcing of materials that are essential to the success of the Project, such as the procurement of solar panels from China.

The level of risk to the affected group was then assessed using the terminology included in the EP4 Guidance Note which comprises the following factors:

- Scale: High, medium or low – which reflects the magnitude of change associated with the human rights risk before mitigation is applied.
- Scope: Individual, household, community, region – which reflects the geographic area of the human rights risk before mitigation is applied.
- Remediability: - a description of the steps that will be taken by the SPV to address the risk before the harm occurs using mitigation and monitoring measures.
- Likelihood: High, Medium or Low – which reflects the potential for the human rights risk to occur, after standard mitigation has been applied. These refer to various plans that are to be prepared and implemented which form part of the SPV's Environmental and Social Management System (ESMS). Note that the list of plans and procedures in the final column of the table in Section does not include Masdar's Human Rights Policy as this is applies to every row in the table.

In accordance with the EP4 Guidance Note, overall human rights risks have been classified, after the mitigation measures have been applied, into:

Low-risks – where risks are unlikely to occur, if they did occur would not impact the Project or can be eliminated or mitigated through adherence to the SPV's Environmental and Social Management System (ESMS) through the use of standard mitigation and monitoring measures. These measures are considered as 'standard' in that the management plans referred to in the final column in Table 1 are already prepared, or under preparation, and therefore no additional actions are needed.

High-risks – which are those where further assessment and an in-depth analysis is required and where risks could cause a delay, reputational risk or breach of national or lender requirements for the Project, due to the specific characteristics of the Project and Project Area context.

7 Human Rights Initial Scan Findings

Human Rights Issue	Risk to workers and/or Affected Communities?	Human Rights Context in Azerbaijan and the Project Area	Inherent risk level (High or Low)	Human Rights Scan Assessment: Scale: High, Medium or Low Scope: Individual, household, community, region Remediability: Steps that could be taken to address the risk before the harm occurs. Likelihood: High, Medium or Low	Residual risk level (High or Low)	Proposed mitigation through implementation of Project plans and procedures
Human Rights category: Labour						
Child labour: ILO standards prohibit hazardous work for all persons under 18 years. They also prohibit labour for those under 15, with limited exceptions for developing countries. (Intersects with the rights of children and education).	Workers – There is a potential for child labour to be present within supply chain companies used by the EPC Contractor, particularly those that are contracted to provide catering, cleaners and other low-skilled roles, or from the suppliers of construction materials.	Azerbaijan has ratified all key international conventions concerning child labor including the International Labor Organization (ILO) No.182: Convention concerning the Prohibition and Immediate Action for the Elimination of the Worst Forms of Child Labour. Under Article 42 and 249 of the Labor Code the minimum age for a person to be employed is 15 years with a written employment contract. Children who are 14 may work in family businesses or, with parental consent, in daytime after-school jobs that pose no hazard to their health. Children younger than 16 may not work more than 24 hours per week; children 16 or 17 may not work more than 36 hours per week. The minimum age for hazardous work is 18 years under Article 250 of the Labor Code and Article 192 of the Code of Administrative Offenses (37,38). There is a list of hazardous occupations that prohibit children to work in, under Articles 98, 250–252, and 254 of the Labor Code, and also in Decree 58 of the Cabinet of Ministers in 2000: Article 9 of the Law on the Rights of the Child (37,39,40). Irrespective of what the law requires, children in Azerbaijan are involved in child labour within the agriculture sector primarily associated with harvesting potatoes and the production of cotton, tea, and tobacco. There is limited data to indicate the extent children are involved in other sectors of the economy. According to the United States Azerbaijan 2020 Human Rights Report[1] the government did not effectively enforce laws prohibiting child labor and setting a minimum age for employment. The government maintained a moratorium on routine and unannounced inspections, which may have prevented effective enforcement of child labor law. Resources and inspections were inadequate to enforce compliance, and penalties for violations were not commensurate with those for other analogous serious crimes. Although the Ministry of Labor and Social Protection could receive and respond to complaints, its response did not include worksite inspections. Instead, the State Labor Inspection Service within the Ministry of Labor and Social Protection investigated complaints by requesting information from the employer in question. On 22 July 2020, the president approved the National Action Plan for 2020-2024 on Combating Trafficking in Human Beings in the Republic of Azerbaijan. The plan tasked the relevant government bodies to continue efforts to: identify victims of human trafficking and forced labor including children; carry out special work with children engaged in begging; develop general standards of communication with child victims or potential victims of human trafficking; conduct training on the identification and protection of child victims or potential victims of human trafficking; and conduct awareness-raising work with entrepreneurs and employers in order to prevent the exploitation of child labor. During visits by foreign observers to observe the 2019 cotton harvest, they did not note any instances of child labor. Some non-governmental observers, however, reported instances of rural children younger than 15 sometimes working on the family farm or accompanying parents working as day laborers to agricultural fields.	**Low**	**Scale:** High as an incident could result in the injury or death of the child. **Scope:** Individual children and their household could be affected from human rights abuses. **Remediability:** Screening of all primary supply chain companies to understand their controls on the prevention of child labour in their organisation, and the actions they take to monitor the presence of children within their supply chain companies. Audits and inspections on primary suppliers will be undertaken. SPV and their EPC Contractor to only work with approved primary suppliers. **Likelihood:** Low. The presence of child labour is very unlikely to occur given the controls described above, although ongoing monitoring is required within the primary supply chain. This human rights risk will be addressed through standard control measures that are applied using SPV's ESMS.	**Low**	Standard controls (these already exist within SPV's ESMS): • Contractor and Supplier Management Plan • Construction Labour and Working Conditions Management Plan • Human Resources Policies and Procedures
Collective bargaining and freedom of association: Collective bargaining: Individuals have the right to form or join trade unions of their choice. Trade unions must be permitted to function freely, subject only to limitations that are in line with international Human Rights standards. Workers have the right to strike, in conformity with reasonable legal requirements.	Workers – Contracted workers within the supply chain may not be able to create or join a union or other type of association of their choice due to the attitude of senior management or other type of barrier.	The Law About Trade Unions determines the rights of trade unions in the Republic of Azerbaijan, details their activities in the protection of labour, social, economic rights and legal interests of trade union members in accordance with the Common Declaration of Human Rights, conventions and recommendations of the International Labour Organisation, the European Social Charter. Under Article 3, there is the right for employees, pensioners, and persons to be able to voluntary establish a trade union without permission or join an existing union. The membership of a trade union is very common in the public sector and is less common in the private sector. Senior managers do not discriminate against workers who have joined a trade union.	**Low**	**Scale:** High as a lack of collective bargaining could result in lower standards of working terms and conditions amongst the workforce. **Scope:** A number of individuals within the workforce could be affected from human rights abuses. **Remediability:** The ability of workers to form a union is guaranteed under national legislation. SPV and their EPC Contractor already have included in their labour policy, text that allows workers to	**Low**	Standard controls: • Human Resources Policies and Procedures • Construction Labour and Working Conditions Management Plan Contractor and Supplier

[1] United States Department of State. 2020 Country Reports on Human Rights Practices: Azerbaijan. Available at: https://www.state.gov/reports/2020-country-reports-on-human-rights-practices/azerbaijan/ [accessed 18 February 2022]

Human Rights Issue	Risk to workers and/or Affected Communities?	Human Rights Context in Azerbaijan and the Project Area	Inherent risk level (High or Low)	Human Rights Scan Assessment: Scale: High, Medium or Low Scope: Individual, household, community, region Remediability: Steps that could be taken to address the risk before the harm occurs. Likelihood: High, Medium or Low	Residual risk level (High or Low)	Proposed mitigation through implementation of Project plans and procedures
Freedom of Association: Protects the right to form or join all types of associations, including political, religious, sporting/recreational, non-governmental, and trade union associations.		According to the United States Azerbaijan 2020 Human Rights Report, unions are not always effective in negotiating wage levels and working conditions because government-appointed boards typically run large state-owned firms and set wages for government employees. The law provides most private-sector workers the right to conduct legal strikes but prohibits civil servants from striking. Categories of workers prohibited from striking include high-ranking executive and legislative officials; law enforcement officers; court employees; fire fighters; and health, electric power, water supply, telephone, railroad, and air traffic control workers. The law prohibits discrimination against trade unions and labor activists and requires the reinstatement of workers fired for union activity. The law also prohibits retribution against strikers, such as dismissal or replacement. Many unions are not independent, and the overwhelming majority remained tightly linked to the government. Collective bargaining agreements were often treated as formalities and not enforced. Although labor law applies to all workers and enterprises, the government may negotiate bilateral agreements that effectively exempt multinational enterprises from it. For example, production-sharing agreements in the oil and gas sector supersede domestic law and often do not include provisions for employee participation in a trade union. While the law prohibits employers from impeding the collective bargaining process, employers engaged in activities that undercut the effectiveness of collective bargaining, such as subcontracting and using short-term employment agreements.		freely form, or join, a union without any discrimination. **Likelihood:** Low. The prohibition of union membership is unlikely to occur, given the controls described above although ongoing monitoring will still be required within the primary supply chain. This human rights risk will be addressed through standard control measures that are applied using SPV's ESMS.		Management Plan to include audits and inspections on high-risk supply companies.
Modern slavery (forced labour/human trafficking) - Azerbaijan: Slavery exists when one human effectively owns another. Forced or compulsory labour is defined by the ILO as all work or service that is extracted under menace of any penalty and for which the person has not voluntarily offered themselves.	Workers – Modern slavery may exist within the contracted workforce where people (including migrants and women) are forced to work, or where their employer has placed them into a position of financial debt upon their start of work. There is also the potential for workers' passports to be retained by their employer to prevent them from leaving the workplace.	National legislation associated with the prohibition of slavery comprises the Prohibition of Forced Labor (Article 35 of the Constitution) and Article 144-2 of the Criminal Code. In 2020, the Ministry of Internal Affairs a single case of forced labor involving two minors. On 22 July 2020, the president approved the National Action Plan for 2020-2024 on Combating Trafficking in Human Beings in the Republic of Azerbaijan. According to the United States Trafficking in Persons Report June 2021[2], Azerbaijan is on the Tier 2 Watch List (defined as Countries whose governments do not fully meet the Trafficking Victims Protection Act's minimum standards but are making significant efforts to meet those standards. The government investigated and prosecuted fewer suspects and convicted fewer traffickers. The government lacked proactive identification efforts, resulting in victims likely penalized for unlawful acts their traffickers compelled them to commit. The government continued to lack interagency cooperation on anti-trafficking efforts and continued its moratorium on scheduled and unannounced labor inspections through 2021. Because the government has devoted sufficient resources to a written plan that, if implemented, would constitute significant efforts to meet the minimum standards, Azerbaijan was granted a waiver per the Trafficking Victims Protection Act from an otherwise required downgrade to Tier 3.	**Low**	**Scale:** High, as slavery could have a long-term impact on the mental health and general wellbeing of the individual. **Scope:** A number of individuals could be affected from human rights abuses. **Remediability:** Screening of primary suppliers to understand their controls on the prevention of modern slavery in their organisation. Audits and inspections on primary suppliers will be undertaken. SPV and their EPC Contractor to only work with approved primary suppliers. **Likelihood:** Low. Forced labour is unlikely to occur within the Project's nationally based primary suppliers. This human rights risk can be addressed through standard control measures that are applied using SPV's ESMS.	**Low**	Standard controls: • Contractor and Supplier Management Plan to include audits and inspections on high-risk supply companies (apart from the solar pans supplier – see below) • Construction Labour and Working Conditions Management Plan • Human Resources Policies and Procedures • SPV and their EPC Contractor to only work with approved suppliers
Modern slavery (forced labour/human trafficking) - China: Slavery exists when one human effectively owns another. Forced or compulsory labour is defined by the ILO as all work or service that is extracted under menace of any penalty and for which the person has not voluntarily offered themselves.	Workers – Modern slavery may exist within the contracted workforce where people (including migrants and women) are forced to work, or where their employer has placed them into a position of	There have been international media reports in 2021[3] associated with allegations associated with the use of forced labour camps to manufacture photovoltaic panels from the Xinjiang province in China. The potential risk of modern slavery was identified as a potential source of human rights risk at an early stage by Masdar. The Masdar group (which includes all subsidiaries which Masdar controls) observes and practises the highest level of professional ethics, fairness, transparency and compliance with international standards with respect to all activities it undertakes, including its tendering process. On this basis, Masdar adopted the Mubadala code of conduct in 2014 as well as the Mubadala Supplier Code. Both policies, along with the extensive Ethics & Compliance	**High**	**Scale:** Low, as this risk was identified during the early tendering stage and Masdar's requirements have been clearly defined and specified during the procurement process. **Scope:** A number of individuals could be affected from human rights abuses. **Remediability:** Detailed checks on potential bidders during the tendering stage prior to contract award which have been completed.	**Low**	Standard controls: • Mubadala Code of Conduct • Mubadala Supplier Code • Mubadala Ethics & Compliance Program

[2] United States Department of State. United States Trafficking in Persons Report June 2021. Available at: https://www.state.gov/wp-content/uploads/2021/09/TIPR-GPA-upload-07222021.pdf [accessed 18 February 2022]
[3] Fears over China's Muslim forced labor loom over EU solar power. 2021. POLITICO. Available at: https://www.politico.eu/article/xinjiang-china-polysilicon-solar-energy-europe/ [accessed 18 February 2022]

Human Rights Issue	Risk to workers and/or Affected Communities?	Human Rights Context in Azerbaijan and the Project Area	Inherent risk level (High or Low)	Human Rights Scan Assessment: Scale: High, Medium or Low Scope: Individual, household, community, region Remediability: Steps that could be taken to address the risk before the harm occurs. Likelihood: High, Medium or Low	Residual risk level (High or Low)	Proposed mitigation through implementation of Project plans and procedures
	financial debt upon their start of work. There is also the potential for workers' passports to be retained by their employer to prevent them from leaving the workplace.	Program which Mubadala has in place, are rigorously observed, and complied with by the Masdar group. In addition, Masdar takes the principles of the Suppler Code (which prohibits the use of Slave Labour) seriously when dealing with vendors and suppliers. The tendering and procurement process of the PV modules has accordingly been conducted in line with the above requirements. Specific, legally-binding wording shall be included in the EPC Contract for ongoing negotiations, and applied to the EPC Contractor, and its own suppliers and contractors. Written confirmation on the compliance with these codes has already been obtained from the EPC Contractor.		**Likelihood:** Low. The potential human right risks from modern slavery in the supply chain associated with the procurement of solar panels from China has been taken into consideration and has a low likelihood of occurring.		• LONGi Green Energy Co. Code of Conduct for LONGI Suppliers (Nov 2020) • Masdar and their EPC Contractor to only work with approved suppliers
Grievance Mechanism and Remedy: All people have the right to remedy when their rights have been violated. Where business enterprises identify that they have caused or contributed to adverse Human Rights impacts, they should provide for or cooperate in their remediation through legitimate processes, whether through the company's own operational-level grievance mechanism or through cooperation with independent, non-judicial mechanisms.	Workers and Affected Communities – People may not be able to raise a grievance or seek remedy from a Project impact if they are unaware of the grievance mechanism, or do not understand/are unwilling to use it for fear of retribution or other issue.	An individual is able to raise a complaint against a business in accordance with Law "On the procedure for considering appeals of citizens" (2015, № 1308-IVQ). Typically, a citizen would approach a community leader in advance of launching any administrative action. The court system can be slow. The price of judicial action is a minimum of 30 AZN (18 USD or higher depending upon the monetary value of the claim. Article 8 of the legislation referred to above includes details of the state fee for filing a claim and how this should be undertaken. Grievances that are not labour-related are typically resolved using local community leaders and judicial remedy is also available through the court system. The constitution process for the presumption of innocence and the right to a fair public trial.	**Low**	**Scale:** High to low depending upon the nature of the grievance. **Scope:** Both individuals and their communities could be affected from human rights abuses. **Remediability:** A fully implemented grievance mechanism will be available for the workforce to raise concerns, should they wish to do so. Details of the worker grievance mechanism will be included in the basic HSE induction that all of the workforce will be provided with (including all workers in primary suppliers). During the Project, workers will be reminded about the availability of the grievance mechanism on a regular basis. SPV and their EPC Contractor to only work with approved suppliers. A community grievance mechanism will also be available and implemented in accordance with the Stakeholder Engagement Plan. **Likelihood:** Low. There will be established procedures for workers and local community residents to raise a grievance, should they wish to do so. This human rights risk will be addressed through standard control measures that are applied using SPV's ESMS.	**Low**	Standard controls: • Worker Grievance Mechanism • Human Resources Policies and Procedures • Community Grievance Mechanism • Stakeholder Engagement Plan
Job Security/Right to Work: The termination of an employment relationship is likely to be a traumatic experience for a worker and the loss of income has a direct impact on the family's well-being. The employment of a worker should not be terminated unless there is a valid reason for such termination connected with the worker's capacity or conduct or based on the operational requirements of the undertaking, establishment, or service.	Workers – The construction workforce are likely to be employed on a contract basis that reflects the duration of the construction stage.	A worker's employment can be terminated in accordance with the Labor Code (01 February 1999). Legal grounds for terminating an employment contract can be any of the following: a) the initiative of one of the parties; b) expiration of the employment contract; c) a change in terms and conditions of employment; d) cases related to a change in the ownership of an enterprise (employees indicated in Subsection II of Section 63 of this Code); e) Cases established by the Parties in the employment contract. An employment contract may be terminated at the employer's initiative in the following cases: a) the enterprise is liquidated; b) there is a personnel cut-back at the enterprise; c) a competent body decides that the employee does not have the professional skills for the job he holds; d) the employee does not fulfil his job description or fails to perform his duties as defined by the employment contract and job description. An employee may terminate an employment contract by notifying the employer in writing one calendar month in advance. If an individual employment contract is terminated due to a reduction in employees or staff, the employee shall be officially notified by the employer two months in advance.	**Low**	**Scale:** High, as sudden termination of their contract could have a significant impact on the wellbeing and economic status of the household. **Scope:** Both individuals and their household could be affected from human rights abuses. **Remediability:** Workers shall be informed on a regular basis that their contract is temporary so that termination does not come as a sudden shock to them. SPV and their EPC Contractor to only work with approved primary suppliers. **Likelihood:** Low. Workers shall be contracted on short-term contracts and no retrenchment is expected to occur. Workers in all primary suppliers will also be regularly informed of their short-term contract terms and conditions.	**low**	Standard controls: • Human Resources Policies and Procedures • Contractor and Supplier Management Plan. • Human Resources (HR) Department to ensure that workers understand the terms of their employment. This will include regularly informing workers of the short-term nature of their contract.
Non-discrimination: The practice of ensuring equal treatment and respect for all individuals regardless of class,	Workers – Part of the workforce may be subject to discrimination	Article 25 of the Constitution of the Republic of Azerbaijan approved on 12 November 1995 equal rights and liberties for all citizens irrespective of gender and prohibits any restrictions of human and citizen rights and freedom on grounds of gender. Additionally, the principle of equality	**High**	**Scale:** High, as discrimination or harassment in the workplace could have significant impact on an individual's wellbeing.	**Low**	Standard controls:

Human Rights Issue	Risk to workers and/or Affected Communities?	Human Rights Context in Azerbaijan and the Project Area	Inherent risk level (High or Low)	Human Rights Scan Assessment: Scale: High, Medium or Low Scope: Individual, household, community, region Remediability: Steps that could be taken to address the risk before the harm occurs. Likelihood: High, Medium or Low	Residual risk level (High or Low)	Proposed mitigation through implementation of Project plans and procedures
race, colour, sex, religion, gender, age, political or other opinion, national or social origin, property, sexual orientation, disability, employee status, marital status, familial connection, etc. Includes ensuring employees are free from harassment.	or harassment. Migrants and women are particularly at risk.	between men and women has been widely established in the legislative system and Article 35 of the Constitution mentions that every citizen based on his/her capability is entitled to freely choose a certain type of activity, occupation, employment or workplace, to work in a safe and healthy environment and to be paid without any kind of discrimination for his/her work no less than the amount of minimum wage defined by the government. Sections 12 and 16 of the Labor Code (01 February 1999) deal with discrimination in the workplace. During the hiring or termination process no discrimination is permitted on the basis of citizenship, gender, race, nationality, language, place of residence, economic standing, social origin, age, family circumstances, religion, political views, affiliation with trade unions or-other public associations, professional standing, beliefs, or other factors unrelated to the professional qualifications, job performance, or professional skills of the employees, nor is permitted to establish privileges and benefits or directly or indirectly limit rights on the basis of these factors. An analysis of the labour rights appeals sent to the Ombudsman office (672 complaints in 2014, 960 in 2015, 958 in 2016) demonstrates that no complaint was received on cases of employment discrimination, as well as gender-based discrimination (particularly equal payment for equal work of women and men) and sexual and emotional harassment at work. According to the United States Azerbaijan 2020 Human Rights Report, although women nominally enjoy the same legal rights as men, societal and employment-based discrimination remains a problem. According to the State Statistical Committee, there was discrimination against women in employment, including wide disparities in pay and higher rates of unemployment.		**Scope:** Individuals could be affected from human rights abuses. **Remediability:** Workers will be required to sign to a Worker Code of Conduct that will prohibit any form of discrimination or harassment in the workplace and ensure that the workplace is suitable for the presence of all persons. SPV and their EPC Contractor to only work with approved primary suppliers. There will also be a specific code of conduct for security personnel that includes non-discrimination, treatment of women, and the use of force (all weapons are prohibited). **Likelihood:** Low. This human rights risk will be addressed through standard control measures that are applied using SPV's ESMS. The Worker Grievance mechanism can be used to raise any concerns about the behaviour of other workers.		• Human Resources Policies and Procedures • Worker Code of Conduct • Worker Grievance Mechanism • Construction Labour and Working Conditions Management Plan • Security and Human Rights Management Plan • Gender Management Plan
Occupational health and safety: A company should provide safe and healthy working conditions to workers, develop a policy to minimise safety risks, provide personal protective equipment free of charge, training, monitoring measures, and the ability of workers to remove themselves from work situations where imminent and serious health dangers are reasonably perceived, without undue consequences.	Workers – The direct and contracted workforce may be exposed to unsafe conditions, be required to pay for PPE, or undertake acts that they do not consider to be safe. Occupational health and safety risks that will need to be identified and mitigated to as low as reasonably practicable.	National legislation associated with occupational health and safety in the workforce is Act No. 313 of 29 September 1992 on labour protection followed by the Labour Code (01 February 1999) which also contains provisions on occupational safety and health (refer to chapters 33-36). A company does have to hold occupational insurance that can be used to compensate a worker in the event of an injury or fatality in the workplace. insurance payments are made to employees on disability or death as a result of occupational accidents and diseases, and injuries that prevent work in the future.	**High**	**Scale:** High as an occupational health and safety incident could result in injury or death of a worker. **Scope:** The individual and their household could be affected from human rights abuses. **Remediability:** The primary suppliers used will be checked to ensure that they have adequate experience and competence to complete the tasks assigned to them, including the correct use of Personnel Protective Equipment (PPE), standard operating procedures associated with high-risk activities such as electrical safety, permit to work system, adequate emergency response measures and the provision of medical evacuation facilities. The occupational health and safety risks to the workforce will be addressed through the implementation of a risk-based Health and Safety Plan, method statements and standard procedures. A specialist team will be involved in commissioning electrical equipment and all commissioning work will be undertaken by competent persons. SPV and their EPC Contractor will only work with approved primary suppliers. **Likelihood:** Low. This human rights risk will be addressed through standard control measures that are applied using SPV's ESMS. All primary suppliers have experience in the type of construction activities to be undertaken, and the risks to the workforce are not unique.	**Low**	Standard controls: • Health and Safety Policy • Occupational Health and Safety Plan • Contractor and Supplier Management Plan Emergency Preparedness and Response Plan • Human Resources Policies and Procedures • Worker Grievance Mechanism

Human Rights Issue	Risk to workers and/or Affected Communities?	Human Rights Context in Azerbaijan and the Project Area	Inherent risk level (High or Low)	Human Rights Scan Assessment: Scale: High, Medium or Low Scope: Individual, household, community, region Remediability: Steps that could be taken to address the risk before the harm occurs. Likelihood: High, Medium or Low	Residual risk level (High or Low)	Proposed mitigation through implementation of Project plans and procedures
Wages (pay equity, standard of living): A company must protect the right to remuneration that provides workers with fair wages and equal remuneration for work of equal value. Remuneration must also be enough to provide workers with a decent living for themselves and their families.	Workers – The contracted workforce (such as cleaning staff or manual labourers) may be asked to work for very low pay (minimum wage) that does not provide a decent standard of living.	According to the Labor Code (01 February 1999) the minimum wage is a social norm that determines the minimum level of monthly wages for unskilled labor and services, taking into account economic and social conditions. As of February 2022, this is currently 250 AZN per month (147 USD per month). Over the last 3 years the minimum wage has increased. The national legislation still applies to workers on a contract that are not full-time employees of a company. Violations associated with the payment of wages below the minimum statutory level are not common.	**Low**	**Scale:** Medium, as this depends on the difference between the salary provided and the relevant minimum wage category and salary. **Scope:** The individual and their household could be affected from human rights abuses. **Remediability:** In accordance with the Construction Labour Management Plan, primary supply chain companies will be audited to understand their salary levels and compliance with minimum wage legislation and checked to ensure that this provides a decent standard of living standard. This Plan will include a employment contract template for EPC locally hired direct staff. Also, the plan will outline the minimum conditions for work for any sub-contracted staff. SPV and their EPC Contractor will only work with approved primary suppliers. **Likelihood:** This human rights risk will be addressed through standard control measures that are applied using SPV's ESMS.	**Low**	Standard controls: • Human Resources Policies and Procedures • Contractor and Supplier Management Plan which will include auditing primary supply chain companies to gather information on their salary levels. • Worker Grievance Mechanism • Construction Labour and Working Conditions Management Plan which will include completion of the benchmarking exercise.
Working Hours: Working hours should be no more than 48 hours a week, or 10 hours a day. Workers should have 1 day off every 7 consecutive days.	Workers – The workforce may be asked to excessive hours during construction.	According to the Labour Code (01 February 1999) working hours are divided into normal working hours, shorter working hours, overtime and part-time work. Normal working hours is determined in Article 89 as maximum 8 hours per day while not exceeding 40 hours in a week. The working week can be determined as either 5-day or 6-day. Shorter working hours are defined in the Articles 91, 92, 93 for the specific categories of employees based on their age, health, working conditions and duties. Part-time work is agreed between the parties and conditions are determined in the contract (Article 94). This applies to both full-time and contracted workers. When the hours worked exceed those agreed in contract based on the employer's order and employee's consent, it is considered as overtime. Every worker cannot be involved in overtime work for more than 4 hours over the 2 consecutive working days. The overtime hours worked must be reimbursed in accordance with Article 165. This applies to both full-time and contracted workers. During the working day or shift, employees should be provided with a break for rest and lunch. The time and duration of the break is determined by the internal disciplinary rules, shift schedule or employment contract. The rest period after the end of the working day shall not be less than 12 hours (Article 103). Weekly rest periods cover 2 consecutive days in 5-day working week and one day in 6-day working week (Article 104). According to Article 105 public holidays are not considered as working days in Azerbaijan. Worker's leave is categorised into annual leave (including standard and additional vacation time), social leave for maternity and childcare, educational leave and unpaid leave. Annual leave is measured in working days. A prerequisite for its use is work of at least 6 months for at least 21 working days. Depending on the work experience of the employee, additional vacation time is added to the standard annual leave. This applies to both full-time and contracted workers.	**Low**	**Scale:** Medium, depending upon the quantity of excess overtime hours worked. **Scope:** Individuals and their household could be affected from human rights abuses. **Remediability:** All construction workers in primary suppliers shall be provided with details of the terms of their employment (including working hours, wages, deductions, etc.) prior to them accepting the role so that they are fully aware of the accommodation arrangements (if any), working time and period they are expected to attend the workplace on consecutive days without a break. SPV and their EPC Contractor to only work with approved primary suppliers. **Likelihood:** Low. Whilst provisions of national legislation do not typically cover contracted workers, working terms and conditions will be provided to the workforce in primary suppliers. This human rights risk will be addressed through standard control measures that are applied using SPV's ESMS.	**Low**	Standard controls: • Human Resources Policies and Procedures • Contractor and Supplier Management Plan • Worker Grievance Mechanism • Construction Labour and Working Conditions Management Plan
Torture, cruel, inhuman and/or degrading treatment or punishment: No one shall be subjected to torture or to cruel, inhuman or degrading treatment or punishment. In particular, no one shall be subjected without his or	Affected Communities – Security personnel could be abusive and degrade local people who are seeking to protest or raise a grievance against the Project.	Stakeholder perceptions towards the Project gathered during preparation of the ESIA and LRP are broadly positive towards the Project, and extensive consultation has been undertaken to inform Project Affected Persons about the compensation strategy for land-related access restrictions. Security personnel will be contracted using third-party company and government-provided security personnel will not be used.	**Low**	**Scale:** Individuals and their household. **Scope:** Individuals and their household could be affected from human rights abuses. **Remediability:** All security personnel involved in the Project will be screened prior to their use, for past involvement in human rights abuses. Ongoing monitoring of their behaviour shall be undertaken,	**Low**	Standard controls: • Security Personnel Management Plan • Security Personnel Code of Conduct

Human Rights Issue	Risk to workers and/or Affected Communities?	Human Rights Context in Azerbaijan and the Project Area	Inherent risk level (High or Low)	Human Rights Scan Assessment: Scale: High, Medium or Low Scope: Individual, household, community, region Remediability: Steps that could be taken to address the risk before the harm occurs. Likelihood: High, Medium or Low	Residual risk level (High or Low)	Proposed mitigation through implementation of Project plans and procedures
her free consent to medical **or scientific experimentation.**				and a Security Personnel Code of Conduct will be used. **Likelihood:** Low. It is considered to be very unlikely that a security personnel will subject a local person to degrading treatment at the site. This human rights risk will be addressed through standard control measures that are applied using SPV's ESMS.		• Community Grievance Mechanism
Human Rights category: Civil and political						
Freedom of expression: The right to hold opinions free from outside interference is an absolute right, with narrow restrictions by States only permissible when in line with international Human Rights standards. Individuals have a right to seek, receive and impart ideas in whatever media or form they choose.	Workers – The direct and contracted workforce may not be able to express their opinions freely without fear of retribution. Affected Communities - The government may try and censor information in the public domain about a Project in a way which is not aligned with international human rights standards.	The Constitution is the basis of the freedom of speech and expression in Azerbaijan. Provisions that are relevant to the freedom of expression are Article 47 (freedom of thought and speech), Article 50 (freedom of information), and Article 51 (freedom of artistic speech). According to the United States Azerbaijan 2020 Human Rights Report, although the constitution provides for freedom of expression, the government continued to repress persons it considered political opponents or critics. Government-owned and progovernment outlets continued to dominate broadcast and print media. Foreign media outlets, including Voice of America, RFE/RL, and the BBC, remained prohibited from broadcasting on FM radio frequencies although the Russian service Sputnik, which was also originally prohibited from broadcasting, was subsequently allowed to broadcast news on a local radio network.	**Low**	**Scale:** High as this freedom of expression applies to entire communities. **Scope:** Individuals and their communities could be affected from human rights abuses. **Remediability:** The Worker Code of Conduct will allow opinions to be freely expressed about the Project and activities undertaken by SPV, unless this has the potential to cause offence to other workers such as the use of discriminatory language for example. Farmers and herders present within 5km of the Project Area will be provided with accurate and timely information about the Project through the implementation of the Stakeholder Engagement Plan. **Likelihood:** The outcome of stakeholder engagement activities with farmers and herders has recorded some negative perceptions towards the Project from the reduction in grazing land from land access restrictions. The right to hold opinions free from outside interference can be addressed through standard control measures that are applied using SPV's ESMS.	**Low**	Standard controls: • Worker Code of Conduct • Worker Grievance Mechanism • Stakeholder Engagement Plan • Community Grievance Mechanism
Right to life and security of person: Individuals have the right not to be deprived of life arbitrarily or unlawfully. This includes the right to have one's life protected, for example, from physical attacks or health and safety risks.	Workers and Affected Communities – Security personnel used by the Project, which may include a combination of government and private security forces, may use inappropriate force against workers of people from Affected Communities.	There are no ongoing security risks or concerns in the Project Area. According to the United States Azerbaijan 2020 Human Rights Report, although the law prohibits arbitrary arrest and detention and provides for the right of persons to challenge the lawfulness of their arrest or detention in court, the government generally did not observe these requirements.	**Low**	**Scale:** High, as an incident could result in injury or death of a local person or substantially affect their wellbeing. **Scope:** Individuals and communities could be affected from human rights abuses. **Remediability:** SPV will contract the services of a third-party security company to provide security at the Project Area. All security personnel contracted for the Project by primary suppliers will be screened to check if they have been involved in past human rights abuses, be provided with training and a Security Code of Conduct, a risk assessment will be completed, and their behaviour monitored by SPV during completion of their contract. SPV will encourage the third-party company to recruit female personnel so that not all of the security personnel are male. **Likelihood:** Low. The unlawful use of force by security forces is unlikely to occur given the controls described above although ongoing monitoring will still be required. This human rights risk can be addressed through standard control measures that are applied using SPV's ESMS.	**Low**	Standard controls: • Security and Human Rights Management Plan • Security Personnel Code of Conduct • Community Grievance Mechanism

Human Rights Issue	Risk to workers and/or Affected Communities?	Human Rights Context in Azerbaijan and the Project Area	Inherent risk level (High or Low)	Human Rights Scan Assessment: Scale: High, Medium or Low Scope: Individual, household, community, region Remediability: Steps that could be taken to address the risk before the harm occurs. Likelihood: High, Medium or Low	Residual risk level (High or Low)	Proposed mitigation through implementation of Project plans and procedures
Privacy: Individuals have a right to be protected from arbitrary, unreasonable or unlawful interference with their privacy, family, home or correspondence and from attacks on their reputation. The State is allowed to authorize restrictions on privacy in line with international Human Rights standards, but 'arbitrary' restrictions are always prohibited.	Workers – Confidential information will be held by the Project and supply chain companies of the direct and contracted workforce.	Personal data in Azerbaijan, its protection, transmission, the responsibility of data users and other aspects of data regulations are expressly regulated by the laws, specifically by the Personal Data Law (11 May 2010 No 998-IIIQ). The law prohibits arbitrary invasions of privacy and monitoring of correspondence and other private communications. According to the United States Azerbaijan 2020 Human Rights Report, the government generally did not respect these legal prohibitions.	**Low**	**Scale:** Medium, although this depends upon the extent of any breach in privacy through the uncontrolled release of data. **Scope:** Individuals could be affected from human rights abuses. **Remediability:** All data gathered on workers and their personal situation (including health certificates) must be stored in a confidential manner in a locked room for paper records, and using password protected digital devices. **Likelihood:** Low, as the information to be held is likely to comprise basic details on each person for the purpose of human resources records only. Data breeches for this type of information are uncommon in Azerbaijan. This human rights risk can be addressed through standard control measures that are applied using SPV's ESMS.	**Low**	Standard controls: • Human Resources Policies and Procedures • Worker Grievance Mechanism
Anti-bribery and corruption: Corruption can have a devastating impact on the availability, quality and accessibility of human rights-related goods and services. Moreover, it undermines the functioning and legitimacy of institutions and processes, the rule of law and ultimately the State itself.	Workers – Workers involved in the Project may attempt to gain procurement opportunities through bribery and corruption. Individuals working in government departments involved in the implementation of the LRP.	Individuals working in government departments involved in the implementation of the LRP may try and influence the implementation of compensation measures through corrupt means. There is also the potential for workers to try and seek procurement opportunities and economic benefits to themselves, through corruption and bribery.	**Low**	**Scale:** Medium, although this depends upon the extent of corruption amongst the workforce, or in government departments. **Scope:** Individuals and their households could be affected from human rights abuses. **Remediability:** Strict controls on procurement shall be undertaken by SPV. Implementation of the LRP shall be carefully monitored using the monitoring and evaluation metrics, and financial records shall be held centrally by the Project Team during LRP implementation, to demonstrate that compensation has been delivered to those who are eligible for it. **Likelihood:** Low, as procurement and implementation of the LRP's compensation is to be very carefully monitored by senior management. Interference from a government department or a worker is very unlikely to occur. This human rights risk can be addressed through standard control measures that are applied using SPV's ESMS.	**Low**	Standard controls: • Anti-Bribery and Corruption Policy. • Worker Code of Conduct • Procurement controls • Community Grievance Mechanism • Worker Grievance Mechanism
Human Rights category: Economic, social and cultural						
Right to education: All children have the right to free and compulsory primary education. The right also includes equal access to education and equal enjoyment of educational facilities, among other aspects.	Affected Communities – Restrictions in access to educational facilities during construction could disrupt children's education.	National legislation requires children to attend school in accordance with Article 19 of the Law on Education. Education is provided free of charge under Article 13. According to the United States Azerbaijan 2020 Human Rights Report, while education is compulsory, free, and universal until age 17, large families in impoverished rural areas sometimes placed a higher priority on the education of boys and kept girls in the home to work.	**Low**	**Scale:** Low as changes in access to educational facilities are not expected from the Project. **Scope:** Individuals and communities could be affected from human rights abuses. **Remediability:** None required as the Project will not generate access restrictions to schools. **Likelihood:** Low. This human rights risk can be addressed through standard control measures that are applied using SPV's ESMS.	**Low**	Standard controls: • Community Grievance Mechanism
Right to health: Individuals have a right to the highest attainable standard of physical and mental health. This includes the right to have control over one's health and body, and freedom from interference.	Affected Communities – The Project will generate community health and safety risks associated with the use of vehicles, construction machinery, the presence of excavations, and other	Public hospitals are run by the state and medical care is offered free of charge for Azerbaijani residents. The introduction of compulsory health insurance in the country is scheduled for completion in 2021. Individuals can pay for private healthcare should they wish to do so. Health facilities in Alyat and Gobustan lack qualified doctors and medical equipment, including ambulances for first aid purposes and emergencies. The recent United city hospital No. 17 and Children's polyclinic No. 9 in Gobustan are reported as the main health facilities nearby in the Project area, ensuring the availability of all types of medical services..	**Low**	**Scale**: High as an incident could result in injury or death of a local person. **Scope:** Individuals and communities could be affected from human rights abuses. **Remediability:** Construction risks and impacts for this type of Project are well-understood. A Community Health and Safety Plan will be implemented and include commitment to, for	**Low**	Standard controls: • Community health and safety within the CEMP, OEMP, Traffic and Transport Management Plan (TTMP) and

Human Rights Issue	Risk to workers and/or Affected Communities?	Human Rights Context in Azerbaijan and the Project Area	Inherent risk level (High or Low)	Human Rights Scan Assessment: Scale: High, Medium or Low Scope: Individual, household, community, region Remediability: Steps that could be taken to address the risk before the harm occurs. Likelihood: High, Medium or Low	Residual risk level (High or Low)	Proposed mitigation through implementation of Project plans and procedures
	sources of risk during construction. During operation, the OHLs will generate electronic magnetic fields (EMF). *NOTE: although there is often concern about the potential health effects associated with exposure to EMF there is no empirical data demonstrating adverse health effects from exposure to typical EMF levels from power transmission lines and equipment.*			example, fence off all working areas where machinery and/or excavations are present to prevent unauthorised entry, provide workers with free medical care, informing local people (including farmers and herders) of the presence of construction works in advance and the associated risks of trying to enter them, and the Project Area will be attended by security personnel to prevent trespass. Workers will be provided with first aid, free of charge (including the non-local workforce), suitable sun protection and shaded areas for respite, access to clean water to avoid heat stress and dehydration, and welfare facilities. Worker health screening to be undertaken including preventative measures for the control of transmissible diseases such as COVID-19. **Likelihood:** Low, as health risks to workers and affected communities can be managed through the use of standard controls. This human rights risk can be addressed through standard control measures that are applied using SPV's ESMS.		Security and Human Rights Management Plan. • Stakeholder Engagement Plan • Community Grievance Mechanism • Health and Safety Policy • Occupational Health and Safety Plan • Worker Grievance Mechanism
Right to Water: Individuals have the right to water and sanitation	Workers – The direct and contracted workforce will need to be provided with safe drinking water and suitable sanitation facilities. Affected communities – have the right to drinking water supplies.	The right to water is reflected in the constitution. Water scarcity is a problem within farms in the Project Area and there have been numerous requests for assistance in improving access to clean water during the stakeholder engagement activities completed.	**Low**	**Scale:** High as water is essential for sustaining life and the Project is in a dry, hot location where water intake will be important to maintain and monitor to prevent dehydration. **Scope:** Individuals could be affected from human rights abuses. **Remediability:** Adequate drinking water and sanitation facilities will be provided to the workforce at construction site and at accommodation facilities (a pipeline will be extended from Gobustan to provide potable drinking quality water). The standard of accommodation provided to the workforce shall comply with the applicable requirements of the IFC/EBRD Guidance Note on Workers' accommodation: processes and standards (2010). **Likelihood:** Low. Potable drinking water quality shall be obtained from an extension to the existing regional water supply network.	**Low**	Standard controls: • Occupational Health and Safety Plan • Worker Accommodation Management Plan (or similar depending upon the accommodation arrangements of the non-local construction workforce) • Worker Grievance Mechanism
Social Insurance and Security: This right obliges the State to create and maintain a system of social security that provides adequate benefits for a range of issues, including injury in the workplace and from unemployment.	Workers – The direct and contracted workforce will need to be provided with social insurance from their employer in accordance with national legislation to ensure that they have adequate compensation from any injury or fatality that occurs.	The social protection system in Azerbaijan consists of programs aimed at reducing the poverty and economic problems of the population through promoting effective labor markets as well as reducing the risks faced by citizens. Social insurance consists of pensions, unemployment benefit, and other social benefits. Social allowances consist of monthly payment for pensions, a separate pension for disabled persons, to parents who have children under 18 years with a disability, and also for families with a low-income with children under 1 year old. Additionally, one-off payments are provided to eligible working parents of newborn babies, support to pay for funerals, treatment to victims of industrial accidents, and those affected by war.	**Low**	**Scale:** High, as an occupational health and safety incident could result in injury or death of a worker or local person. **Scope:** Individuals could be affected from human rights abuses. **Remediability:** All companies involved in the Project will be required to provide occupational insurance in accordance with national legislation, and this will be reflected in the tender and contractual documents used with primary suppliers. SPV and their EPC Contractor to only work with approved primary suppliers. **Likelihood:** Low, as occupational insurance shall be provided to all workers. This human rights risk can	**Low**	Standard controls: • Human Resources Policies and Procedures • Worker Grievance Mechanism • Labour and Working Conditions Management Plan • Contractor and Supplier Management Plan

Human Rights Issue	Risk to workers and/or Affected Communities?	Human Rights Context in Azerbaijan and the Project Area	Inherent risk level (High or Low)	Human Rights Scan Assessment: Scale: High, Medium or Low Scope: Individual, household, community, region Remediability: Steps that could be taken to address the risk before the harm occurs. Likelihood: High, Medium or Low	Residual risk level (High or Low)	Proposed mitigation through implementation of Project plans and procedures
				be addressed through standard control measures that are applied using SPV's ESMS.		
Economic, social and cultural development: Economic, social, and cultural rights are the freedoms, privileges, and entitlements that individuals and communities require to live a life of dignity. These human rights include the rights to food, housing, health, education, cultural identity, and more.	Affected Communities – The loss of access to land could potentially include economic development.	The LRP has identified the Project Affected Persons who are to be impacted from the land-access restrictions. No additional human rights risks have been identified that are connected to economic, social and cultural development (see below under Human Rights category: Land and resettlement)	**Low**	See below under Human Rights category: Land and resettlement	**Low**	Standard controls: Livelihood Restoration Plan
Right to participate in the cultural life of the community: The right to take part in cultural life guarantees the right of everyone to access, participate in and enjoy culture, cultural heritage and cultural expressions.	Affected Communities – The loss of access to land could influence people's rights to participate in cultural rights	The LRP has identified the Project Affected Persons who are to be impacted from the land-access restrictions. No additional human rights risks have been identified to the right to participate in the cultural life of the community (see below under Human Rights category: Land and resettlement)	**Low**	See below under Human Rights category: Land and resettlement	**Low**	Standard controls: Livelihood Restoration Plan
Human Rights category: Land and resettlement						
The right to property ownership: The right obliges the State to enable citizens to have the right to enjoy private property (land, structures and other assets) without the fear or expropriation being undertaken in a way that does not provide them with adequate notice and compensation.	Affected Communities – The loss, or loss of access to, privately held land and assets could impact the health, wellbeing and economic livelihoods of affected persons.	Article 29 of the Constitution (Right to Property: IV) states that no-one may be deprived of his/her property without a court decision. The outright confiscation of property is prohibited. The expropriation of property for the needs of the state may be permitted only on condition of fair compensation in advance in accordance with the Law on "Acquisition of Lands for State Needs".	**High**	**Scale:** Low. Within a 5km distance from the outer boundary of the Project Area, there are 16 farmers using land informally. Out of the 16 farmers, 4 have produced written agreements between themselves (or another party they claim to represent) and the Ministry of Agriculture. The written agreements include coordinates of agricultural land which they claim to have access to, and these areas overlap, to various extents, the Project Area. The extent of overlap is 1.7%, 1.8%, 13.7% and 30.5%. None of these written agreements are legally valid. To address human rights risks from land and resettlement, a Livelihood Restoration Plan has been prepared in accordance with national legislation and Lender requirements. **Scope:** Individuals (farmers and herders) and their respective households could be affected. The Livelihood Restoration Plan has identified a total of 11 farmer Project Affected Households (PAHs) and 14 herder PAHs **Remediability:** To address impacts arising from economic displacement SPV has prepared a Livelihood Restoration Plan. **Likelihood:** Low. Whilst impacts to farmer's and herder's livelihoods are expected to occur these can be adequately addressed through implementation of the Livelihood Restoration Plan.	**Low**	Standard controls: • Livelihood Restoration Plan
Compensation and the right to an adequate standard of living: Compensation should be calculated at full replacement cost which does not take into consideration the depreciation of structures and other non-land assets. Affected persons have the right to be compensated prior to land access restrictions being imposed and be provided with additional measures to	Affected Communities – The resettlement of affected persons has the potential to result in long-term changes to mental health and wellbeing of the household, standards of living and livelihood status.	Under the Civil Code (Articles 246, 247, 248 and 249) the Decree on acquisition of lands for state needs should be registered in a state real estate registration office. The Executive Agency should: (a) send official notifications to all affected persons about land acquisition; (b) pay full compensation to the affected persons within 90 days after the transaction agreement made in advance of relocation; (c) assist relocated people; and (d) pay compensation for affected assets on the market rates. The principle of 'full replacement cost' is not adopted as market rates are used which take into consideration the physical depreciation of assets. The outcome of the valuation report is subsequently increased by 20% for residential buildings (to reflect any loss of income and the reconnection of utilities) in accordance with Decree of the President No. 506-3 QD dated 7 December 2007.	**High**	**Scale:** Low. A detailed survey of the Project Area has indicated that there are no physical assets of any type (such as a structure or artificial drainage feature for example) present. On this basis, the Project's economic displacement is limited to the loss of area available within the Project Area for animal grazing activities. **Scope:** Individuals (farmers and herders) and their respective households could be affected. The	**Low**	Standard controls: • Livelihood Restoration Plan

Human Rights Issue	Risk to workers and/or Affected Communities?	Human Rights Context in Azerbaijan and the Project Area	Inherent risk level (High or Low)	Human Rights Scan Assessment: Scale: High, Medium or Low Scope: Individual, household, community, region Remediability: Steps that could be taken to address the risk before the harm occurs. Likelihood: High, Medium or Low	Residual risk level (High or Low)	Proposed mitigation through implementation of Project plans and procedures
maintain their standard of living and livelihood. Such measures include the provision of in-kind compensation rather than cash, practical support (including legal advice and relocation allowances), transitional support, livelihood restoration measures and the ability to raise a grievance.		Article 16 of the Law on Land Lease (1998) states that when the leased land is acquired for state needs, another land plot having a same size and a same quality can be provided to lessee. Losses incurred in this land shall be paid in accordance with the legislation.		Livelihood Restoration Plan has identified a total of 11 farmer PAHs and 14 herder PAHs. **Remediability:** To address impacts arising from economic displacement SPV has prepared a Livelihood Restoration Plan. **Likelihood:** Low. This human rights risk can be addressed through standard control measures that are applied using SPV's ESMS.		
Compensation in the context of gender and vulnerability: Impacts arising from resettlement may be disaggregated by gender and vulnerability status due to a complex combination of cultural issues where land-related agreements are typically undertaken by men only, educational barriers where women are less educated than men and less willing to 'have a voice' in households affected by resettlement, and less able to adapt to a new place of living or livelihood once land access restrictions have been imposed by the Project.	Affected Communities – Resettlement impacts may be disproportionally experienced by women and vulnerable people.	In a resettlement context, there are no specific provisions to provide vulnerable people or women with additional support under national legislation. Support is provided at a general level to disabled people (refer to the category below).	**High**	**Scale:** Economic displacement arising from the Project has the potential to disproportionately impact vulnerable people. **Scope:** Individuals (farmers and herders) and their respective households could be affected. The Livelihood Restoration Plan has identified a total of 33 vulnerable people amongst the 11 farmer PAHs and 32 vulnerable people amongst the 14 herder PAHs. **Remediability:** Preparation of the Livelihood Restoration Plan has involved detailed engagements with women of farmer and herder households. The Livelihood Restoration Plan includes a budget that aims to specifically provide additional support to vulnerable people, commits to a range of future stakeholder engagement activities with women, and will include a range of livelihood restoration measures that are specifically designed to address women's livelihood priorities. These specific measures need additional engagement with women for their design and future implementation. **Likelihood:** Low. In principle, impacts from economic displacement could occur to women and vulnerable people and these have been identified in the LRP. However, the overall severity of the impact is low. This human rights risk can be addressed through standard control measures that are applied using SPV's ESMS.	**Low**	Standard controls • Livelihood Restoration Plan • Gender Management Plan
Right to freedom of movement: Everyone has the right to freedom of movement and residence within the borders of each state. Everyone has the right to leave any country, including his own, and to return to his country.	Workers – as if a temporary construction camp is used then controls may be imposed on the worker's ability to leave the camp during non-working hours.	it is not currently clear whether a temporary camp is to be used, or not. If a worker camp is used to provide accommodation to the non-local workforce then worker's movements are not expected to be restricted and they will be free to leave the camp during non-working hours.	**Low**	**Scale:** Low as this applies to just the non-local workforce. **Scope:** Individual workers could be impacted. **Remediability:** The non-local workforce will be able to leave the camp during non-working hours. This will not be restricted. **Likelihood:** Low, as the non-local workforce will be able to depart form the camp (if a camp is used) during non-working hours. Their movement will not be restricted.	**Low**	Standard controls • Human Resources Policies and Procedures • Construction Labour and Working Conditions Management Plan • Worker Grievance Mechanism
Human Rights category: Group Rights/Heightened Risk of Vulnerability						
Children's Rights: The Convention on the Rights of the Child establishes global standards to ensure the protection, survival, and development of all children, without discrimination.	Workers and Affected Communities – The employment of children, or the forcing of parents to work excessive hours, will impact the welfare rights of children.	Specific protections are included in legislation to protect the well-being of children including the Law "On guarantees of the rights of the child" (No. 3РУ-139 07.01.2008) and law "On the Protection of Children from Information Harmful to Their Health" (No. 3РУ-444 09/08/2017). Azerbaijan has one of the highest imbalances on male/females in the world, with 114 boys for every 100 girls. In 2020 the approved an Action Plan on the prevention of gender-biased sex selection for the period of 2020-2025. The Action Plan combines a series of important activities	**Low**	**Scale:** Low as remote working will only apply to the non-local workforce which is estimated to be 50% of the total construction workforce (420 personnel) reflecting a potential 210 workers who work remotely.	**Low**	Standard controls • Human Resources Policies and Procedures • Contractor and Supplier Management Plan

Human Rights Issue	Risk to workers and/or Affected Communities?	Human Rights Context in Azerbaijan and the Project Area	Inherent risk level (High or Low)	Human Rights Scan Assessment: Scale: High, Medium or Low Scope: Individual, household, community, region Remediability: Steps that could be taken to address the risk before the harm occurs. Likelihood: High, Medium or Low	Residual risk level (High or Low)	Proposed mitigation through implementation of Project plans and procedures
		and measures to be implemented over the next 5 years by local authorities and institutions to address the phenomenon of son preference and promote the value of a girl child[4].		**Scope:** Individual children and their household could be affected from human rights abuses associated with long working hours. **Remediability:** The incoming, non-local workforce will be provided with details of the terms of their employment prior to them accepting the role so that they are fully aware of worker accommodation arrangements, working periods and the time they are expected to attend the workplace on consecutive days without a break. **Likelihood:** Low, as it is common for workers to work away from home in Azerbaijan and it will be clear to workers, before they accept the contract, that they will be based away from home for extended periods of time. This human rights risk can be addressed through standard control measures that are applied using SPV's ESMS.		• Construction Labour and Working Conditions Management Plan • Gender Management Plan
Disability Rights: The Convention on the Rights of Persons with Disabilities promotes global standards intended to protect the rights and dignity of people with disabilities in and outside of the workplace.	Workers – Discrimination in the workforce against the employment of people with disabilities impacts the rights of the disabled.	There is specific national legislation that protects the general welfare of disabled people reflected by Law of 31 May 2018 No. 1153-VQ "About the rights of persons with disability". The law prohibits discrimination to disabled people in the workplace. According to the United States Azerbaijan 2020 Human Rights Report, employers generally hesitated to hire persons with disabilities, and workplace access to disabled people remains very limited.	**Low**	**Scale:** Low as impacts to the rights of the disabled will only occur through land and resettlement-related impacts. **Scope:** Individuals and their household could be affected. Two disabled persons have been identified within 2 farmer PAHs. **Remediability:** The Livelihood Restoration Plan has identified the presence of disabled people in the PAHs and has identified them as being vulnerable. The Worker Code of Conduct shall prevent discrimination in the workplace to disabled people. **Likelihood:** Low, as the Project will be able to prevent discrimination in the workforce to disabled people through the measures described above. This human rights risk can be addressed through standard control measures that are applied using SPV's ESMS.	**Low**	Standard controls: • Human Resources Policies and Procedures • Worker Code of Conduct • Livelihood Restoration Plan
Indigenous peoples / migrants rights / ethnic minorities / migrants Rights: The International Convention on the Protection of the Rights of All Migrant Workers and Members of their Families establishes how migrant workers, and their families should be protected.	Workers – Migrant works from elsewhere in the country or from a neighbouring country, including refugees, may be present in the direct and contracted workforce, and may be subjected to different working conditions due to their migrant status.	The Migration Code (02 July 2013) was established to provide a framework for the implementation of state policy on migration issues, and to regulate migration processes and the legal status of foreigners and stateless persons in Azerbaijan. In addition to general provisions, the Code includes rules on the entry and exit from the territory, documentation required for legal labour migration, the legal status of foreigners and stateless persons in Azerbaijan, and expulsion of foreigners and stateless persons from the territory. Able-bodied foreigners and stateless persons over 18 years old can work in Azerbaijan after obtaining a work permit; permits are typically issued with a legal validity of 1 year or less. Irregular migration to Azerbaijan is the act of foreigners entering Azerbaijan, without government permission and in violation of the given nationality law, or staying beyond the termination date of a visa, also in violation of the law. Deporting irregular migrants is regulated by the Code of Administrative Offences, Code of Execution of Punishments of the Republic of Azerbaijan and the Code on Migration. There are no indigenous peoples, migrants or ethnic minorities amongst the Project Affected Persons identified in the LRP.	**Low**	**Scale:** Medium as approximately half of the Project's workforce during construction are expected to be from outside of the Project Area. **Scope:** Individuals and their household could be affected by human rights abuses. **Remediability:** Screening of all primary suppliers to understand their internal controls to ensure workers are treated equally, irrespective of their origin, ethnicity or other difference, and the actions they take to monitor the presence of migrants within their own, internal supply chain companies. SPV and their EPC Contractor to only work with approved suppliers. **Likelihood:** Low as whilst there is the potential for non-local workers to be considered as 'migrants' to the area even if they are citizens, this human rights risk can be addressed through standard control measures that are applied using SPV's ESMS.	**Low**	Standard controls: • Human Resources Policies and Procedures • Worker Code of Conduct • Worker Grievance Mechanism • Contractor and Supplier Management Plan • Construction Labour and Working Conditions Management Plan

[4] United Nations Population Fund. Azerbaijan adopts Action Plan to combat gender-biased sex selection. 03 March 2020. Available at: https://azerbaijan.unfpa.org/en/news/azerbaijan-adopts-action-plan-combat-gender-biased-sex-selection [accessed 19 February 2022].

Human Rights Issue	Risk to workers and/or Affected Communities?	Human Rights Context in Azerbaijan and the Project Area	Inherent risk level (High or Low)	Human Rights Scan Assessment: Scale: High, Medium or Low Scope: Individual, household, community, region Remediability: Steps that could be taken to address the risk before the harm occurs. Likelihood: High, Medium or Low	Residual risk level (High or Low)	Proposed mitigation through implementation of Project plans and procedures
Women's Rights: The Convention on the Elimination of all Forms of Discrimination Against Women exists to promote women's rights and their protection.	Workers – There is the potential for women to be subject to discrimination, harassment and be provided with lower working conditions compared with men. Affected Communities – Women in local communities may be less willing to raise a grievance or apply for a temporary job.	The Constitution (adopted in November 1995) required gender equality and there is specific legislation including the "Law on Guarantees of Gender Equality" dated October 2006. There is a National Action Plan for Combating Domestic Violence in the Republic of Azerbaijan for 2020-2023 which was approved by a Decree on 27 November 2020. There are no civil society organisations that specifically support the interests of women in the Project Area.	**Low**	**Scale:** High as discrimination or harassment in the workplace could have significant impact on an individual's wellbeing. **Scope:** Individuals could be affected from human rights abuses. **Remediability:** Workers will be required to agree to comply with the Worker Code of Conduct that will prohibit any form of discrimination or harassment in the workplace and ensure that the workplace is suitable for the presence of women and different ethnic groups. SPV will actively encourage women to apply for temporary employment positions during construction, in accordance with the Labour Management Plan and Livelihood Restoration Plan (this provided preferential access to people (including women) from farmer and herder PAHs). SPV and their EPC Contractor to only work with approved suppliers. **Likelihood:** Low, as the Project will be able to prevent discrimination in the workforce through the measures described above. This human rights risk can be addressed through standard control measures that are applied using SPV's ESMS.	**Low**	Standard controls: • Human Resources Policies and Procedures • Worker Code of Conduct • Worker Grievance Mechanism • Contractor and Supplier Management Plan • Construction Labour and Working Conditions Management Plan • Livelihood Restoration Plan • Gender Management Plan

8 Disclosure and Communication

The purpose of this section is to describe the means, tools, frequency and responsible parties that will communicate the Project's human rights risks and mitigation measures to external parties including affected workers, workers, and other stakeholders.

The following will be implemented:

- Prior to the start of construction SPV will disclose and advertise its Human Rights Policy. This will be the responsibility of the SPV E&S Department Manager who shall be supported by the SPV Community Liaison Officers. A copy of the policy document shall be included on the country's website, and a hard copy version (in Azeri) shall be posted on a notice board established at the entrance of the site.
- The LRP Committee shall be provided with capacity building activities before the start of LRP implementation, to ensure that members are aware of the of the findings of the Human Rights Risk Assessment Scan, and reference will be made to the various plans and procedures that comprise the ESMS. This shall be led by the SPV E&S Department Manager who shall take the lead in the formation of the LRP Committee and provision of capacity building activities.
- A short summary reflecting the outcome of the HRRA shall be made publicly available (in Azeri) upon request to stakeholders who wish to obtain additional information.

9 Summary

The results of the Human Rights Risk Assessment have not identified any 'High' risks which require further investigation and detailed assessment.

The Human Rights Risk Assessment references a number of management plans that will be prepared to support the implementation of the ESMS. Management plans consist of a combination of operational policies, procedures and practises. These plans will provide a system against which to monitor and audit environmental and social performance. In addition, they will detail the practical methods required to ensure work is completed in accordance with current best practice, the mitigation measures in the ESIA and legislative and regulatory requirements.

The construction management plans are anticipated to include (but not be limited to):

- Site Mobilisation Plan.
- Labour and Working Conditions Management Plan
- Human Resources Policies and Procedures.
- Workers' Code of Conduct.
- Worker Grievance Mechanism.
- Construction Environmental Management Plan.
- Worker Accommodation Management Plan.
- Stakeholder Engagement Plan.
- Community Grievance Mechanism.
- Contractor and Supplier Management Plan.
- Security Personnel Code of Conduct
- Security and Human Rights Management Plan
- Emergency Preparedness and Response Plan.
- Occupational Health and Safety Plan.
- Hazardous Materials and Waste Management Plan.

- Biodiversity Management Plan.
- Worker Accommodation Management Plan
- Livelihood Restoration Plan
- Community Development Plan
- Gender Management Plan
- Traffic and Transportation Management Plan.
- Emergency Preparedness and Response Plan

A variety of operational management plans shall be prepared, in advance of the start of operations and these documents shall take into consideration any lessons learned gained from the construction stage of the Project.